

Recognition is strong. Calculation is uneven.

782 / 938

follow-up items correct

71.8 s

192 sequential batches

467 / 470

correct at confidence $\geq 0.9^*$

Follow-up: 83.4%. Original discovery sample: 52/58. Combined: 834/996.
This report includes every scored question, all options, the reference answer and Jev’s recorded answer.

*Confidence slice excludes two course-context warmups. These are adapted multiple-choice tasks, not original student grades. Proof choices can be substantially easier than constructing proofs. The full limitations and coverage inventory accompany the evidence bundle.

What was tested

All 14 exams linked from the course archive snapshot. The Fall 2025 final is the original discovery run (58 items). Thirteen other exams supply 938 follow-up items, including two course-context warmups. The mathematical analysis uses 936 items. Grouped response boxes are one exact-match item; original point weights and partial credit are not reproduced.

Input boundary

The evaluator read official solutions to author plausible alternatives. Jev received only the frozen questions, original hints, necessary context, textual diagram transcriptions and unmarked alternatives. Per-section requests share generic instructions only; each judgment has its own complete problem. No sibling proof prompt reveals an earlier answer. The original discovery run used shared sibling context and is reported separately.

Protocol

Pinned jev-1.13.0; one first-pass judgment per item; deterministic option shuffling. Task labels and private references were hashed before inference. No answer-driven edits, retries, tools, retrieval, solutions or corrective feedback were supplied. All 192 requests succeeded on their first attempt. Full-body median latency 357 ms; p95 480 ms. The 71.8 s total includes checkpoint writes.

Coverage and repairs

Pledges, one ungraded drawing and one zero-point joke are excluded. Four classroom-response warmups and three undefined infinite-polynomial questions are withheld with reasons. Two answerable course-context warmups remain visible. Sixty-six mathematical items carry explicit pre-run repairs; exam-wide convention notes are also supplied. Selected high-risk keys have 30 executable checks; this is not independent human validation of every question.

What the scores do not establish

Selecting an argument is not writing a proof. Jev selected 113/113 supplied proofs, but the longest-option rule gets 90/113, exposing an authoring cue. Correct alternatives were not independently difficulty-matched. Public exams may have appeared in training, recurring questions are correlated, and task labels are subjective. No claim of general confidence calibration or human-equivalent exam performance is made.

Fall 2023 final	74 / 86 86.0%
Fall 2024 final	83 / 95 87.4%
Spring 2023 final	63 / 76 82.9%
Spring 2024 final	46 / 63 73.0%
Spring 2025 final	92 / 107 86.0%
Summer 2025 final	70 / 91 76.9%
Fall 2023 midterm	56 / 62 90.3%
Fall 2024 midterm	62 / 72 86.1%
Fall 2025 midterm	35 / 43 81.4%
Spring 2023 midterm	59 / 68 86.8%
Spring 2024 midterm	32 / 42 76.2%
Spring 2025 midterm	49 / 62 79.0%
Summer 2025 midterm	61 / 71 85.9%

Mathematical tasks

Calculation
167/206 (81.1%)

Multi Step
247/311 (79.4%)

Recognition
367/419 (87.6%)

Multi-step excluding proof selection:
139/203 (68.5%). This is a diagnostic subset, not a replacement for the full score.

Confidence >=0.9: 467/470
0.5 to <0.9: 207/249
Below0.5: 107/217

Source: <https://www.eecs70.org/resources/previous-exams>
Each following page identifies the exam and source part; source PDFs and hashes are linked in the evidence bundle.

QUESTION + OPTIONS

Is $((P \text{ AND } Q) \text{ IMPLIES } R)$ equivalent to $(P \text{ IMPLIES } (Q \text{ IMPLIES } R))$?

A. Always True

B. Sometimes False

REFERENCE ANSWER

A. Always True

JEV / CORRECT

A. Always True

API confidence: 0.97
Option probabilities:
{ "A": 0.98, "B": 0.02 }

Section batch: 427 ms
Not per-question latency

QUESTION + OPTIONS

Is $[\text{forall } x, (P(x) \text{ IMPLIES } Q(x))]$ equivalent to $[(\text{forall } x, \text{NOT } P(x)) \text{ OR } (\text{forall } x, Q(x))]$?

A. Always True

B. Sometimes False

REFERENCE ANSWER

B. Sometimes False

JEV / CORRECT

B. Sometimes False

API confidence: 0.99
Option probabilities:
{ "A": 0.0, "B": 1.0 }

Section batch: 427 ms
Not per-question latency

QUESTION + OPTIONS

For integers a, b , let $d = \gcd(a, b)$. Which argument proves that d divides $ax + by$ for every pair of integers x, y ?

- A. Since d divides a and b , Bezout gives $ax + by = d$ for every pair of integers x, y . Therefore $ax + by$ is always equal to d and hence divisible by d .
- B. Since d divides a and b , write $d = ak$ and $d = bj$ for integers k, j . Substituting gives $ax + by = d(x/k + y/j)$, whose parenthesized term must be an integer.
- C. Since d divides a and b , write $a = dk$ and $b = dj$ for integers k, j . Then $ax + by = d(kx + jy)$, and $kx + jy$ is an integer, establishing divisibility.
- D. Since d is the greatest common divisor, every integer smaller than d divides both a and b . In particular x and y divide both, so d divides $ax + by$.

REFERENCE ANSWER

C. Since d divides a and b , write $a = dk$ and $b = dj$ for integers k, j . Then $ax + by = d(kx + jy)$, and $kx + jy$ is an integer, establishing divisibility.

JEV / CORRECT

C. Since d divides a and b , write $a = dk$ and $b = dj$ for integers k, j . Then $ax + by = d(kx + jy)$, and $kx + jy$ is an integer, establishing divisibility.

API confidence: 1.00
Option probabilities:
{ "D": 0.0, "B": 0.0, "A": 0.0, "C": 1.0 }

Section batch: 450 ms
Not per-question latency

QUESTION + OPTIONS

7 divides $4^{186} - 1$. Hint: $186 = 31 \cdot 6$.

A. True

B. False

REFERENCE ANSWER

A. True

JEV / CORRECT

A. True

API confidence: 0.76
Option probabilities:
{"B": 0.12, "A": 0.88}

Section batch: 450 ms
Not per-question latency

QUESTION + OPTIONS

5 divides $4^n - 1$ for all even natural numbers n .

A. True

B. False

REFERENCE ANSWER

A. True

JEV / CORRECT

A. True

API confidence: 0.66
Option probabilities:
{**"B"**: 0.17, "A": 0.83}

Section batch: 450 ms
Not per-question latency

QUESTION + OPTIONS

What is the last digit (ones place) of 3^{47} ?

- A. 2
- B. 9
- C. 1
- D. 3
- E. 5
- F. 6
- G. 4
- H. 8
- I. 0
- J. 7

REFERENCE ANSWER

J. 7

JEV / CORRECT

J. 7

API confidence: 0.57
Option probabilities:
{
 "D": 0.06, "E": 0.02, "G": 0.03, "A": 0.11,
 "C": 0.02, "I": 0.0, "J": 0.61, "F": 0.03, "B":
 0.06, "H": 0.06
}

Section batch: 450 ms
Not per-question latency

QUESTION + OPTIONS

Alice implements RSA correctly with $N=33$ and $e=7$ and sends ciphertext $y=6$.
Given $33=3\cdot 11$, what was the original message x ?

- A. 15
- B. 27
- C. 18
- D. 6

REFERENCE ANSWER

C. 18

JEV / INCORRECT

D. 6

API confidence: 0.13
Option probabilities:
{`"D"`: 0.35, `"B"`: 0.19, `"A"`: 0.19, `"C"`: 0.27}

Section batch: 450 ms
Not per-question latency

QUESTION + OPTIONS

Find $(6^7 + 7^6) \bmod 91$. Hint: use CRT; $91=7 \cdot 13$.

- A. 13
- B. 6
- C. 0
- D. 78

REFERENCE ANSWER

B. 6

JEV / INCORRECT

D. 78

API confidence: 0.16
Option probabilities:
{ "D": 0.37, "B": 0.26, "A": 0.28, "C": 0.09 }

Section batch: 450 ms
Not per-question latency

QUESTION + OPTIONS

Working modulo 6, how many distinct formal polynomials of degree exactly two are there?

- A. 125
- B. 180
- C. 216
- D. 150

REFERENCE ANSWER

B. 180

Pre-run repair:
Formal polynomials, rather than functions, specified.

JEV / CORRECT

B. 180

API confidence: 0.28
Option probabilities:
{"B": 0.45, "C": 0.14, "D": 0.34, "A": 0.07}

Section batch: 425 ms
Not per-question latency

QUESTION + OPTIONS

Over $\text{GF}(7)$, find $g(x)$ of degree strictly less than 7, with coefficients in $\text{GF}(7)$, giving the same output as $f(x)=9x^{66}+7x^{58}+5x^{55}+5x^{24}+10x^{19}$ for every x in $\text{GF}(7)$.
Hint: the solution is a simple polynomial.

- A. $g(x)=x^6$
- B. $g(x)=0$
- C. $g(x)=1$
- D. $g(x)=x$

REFERENCE ANSWER

D. $g(x)=x$

JEV / INCORRECT

A. $g(x)=x^6$

API confidence: 0.18
Option probabilities:
{ $"B"$: 0.03, $"C"$: 0.22, $"D"$: 0.37, $"A"$: 0.38}

Section batch: 425 ms
Not per-question latency

QUESTION + OPTIONS

You receive $n+2k$ points from a polynomial of degree $n-1$, with up to k corruptions. How many messages can you recover using Berlekamp-Welch?

- A. k
- B. $n+2k$
- C. n
- D. 1

REFERENCE ANSWER

D. 1

JEV / CORRECT

D. 1

API confidence: 0.83
Option probabilities:
{**"B"**: 0.03, "C": 0.03, "D": 0.88, "A": 0.06}

Section batch: 425 ms
Not per-question latency

QUESTION + OPTIONS

K_4 is planar.

A. True

B. False

REFERENCE ANSWER

A. True

JEV / CORRECT

A. True

API confidence: 0.12
Option probabilities:
{ "A": 0.56, "B": 0.44 }

Section batch: 341 ms
Not per-question latency

QUESTION + OPTIONS

K_5 has an Eulerian tour.

A. True

B. False

REFERENCE ANSWER

A. True

JEV / CORRECT

A. True

API confidence: 0.27
Option probabilities:
{ "A": 0.64, "B": 0.36 }

Section batch: 341 ms
Not per-question latency

QUESTION + OPTIONS

A 12-sided die is a planar graph wrapped around a sphere, with 12 faces and 20 vertices. How many edges does it have?

- A. 18
- B. 24
- C. 32
- D. 30

REFERENCE ANSWER

D. 30

JEV / CORRECT

D. 30

API confidence: 0.96
Option probabilities:
{"D": 0.97, "C": 0.03, "A": 0.0, "B": 0.0}

Section batch: 341 ms
Not per-question latency

QUESTION + OPTIONS

Which argument proves that, if a finite undirected graph has one odd-degree vertex, it must have another odd-degree vertex?

- A. The sum of degrees equals twice the number of edges, so it is even. If exactly one degree were odd and all others even, that sum would be odd, a contradiction.
- B. Removing any odd-degree vertex leaves all remaining degrees even. Restoring it changes every remaining degree by one, so every other vertex then has odd degree.
- C. An edge incident to the odd-degree vertex has another endpoint. That endpoint has odd degree because the common edge contributes one to both endpoint degrees.
- D. The sum of degrees equals the number of edges, so it is even. If exactly one degree were odd and all others even, that sum would be odd, a contradiction.

REFERENCE ANSWER

A. The sum of degrees equals twice the number of edges, so it is even. If exactly one degree were odd and all others even, that sum would be odd, a contradiction.

JEV / CORRECT

A. The sum of degrees equals twice the number of edges, so it is even. If exactly one degree were odd and all others even, that sum would be odd, a contradiction.

API confidence: 1.00
Option probabilities:
{"D": 0.0, "C": 0.0, "A": 1.0, "B": 0.0}

Section batch: 341 ms
Not per-question latency

QUESTION + OPTIONS

State whether each set is Finite, Countably Infinite, or Uncountably Infinite.

The set of all complex numbers.

- A. Finite
- B. Countably Infinite
- C. Uncountably Infinite

REFERENCE ANSWER

C. Uncountably Infinite

JEV / CORRECT

C. Uncountably Infinite

API confidence: 1.00
Option probabilities:
{ "C": 1.0, "B": 0.0, "A": 0.0 }

Section batch: 289 ms
Not per-question latency

QUESTION + OPTIONS

State whether each set is Finite, Countably Infinite, or Uncountably Infinite.

The set of all prime numbers.

- A. Finite
- B. Countably Infinite
- C. Uncountably Infinite

REFERENCE ANSWER

B. Countably Infinite

JEV / CORRECT

B. Countably Infinite

API confidence: 1.00
Option probabilities:
{ "C": 0.0, "B": 1.0, "A": 0.0 }

Section batch: 289 ms
Not per-question latency

QUESTION + OPTIONS

State whether each set is Finite, Countably Infinite, or Uncountably Infinite.

The real interval $[0.001, 0.1]$.

- A. Finite
- B. Countably Infinite
- C. Uncountably Infinite

REFERENCE ANSWER

C. Uncountably Infinite

JEV / CORRECT

C. Uncountably Infinite

API confidence: 1.00
Option probabilities:
{`"C": 1.0, "B": 0.0, "A": 0.0`}

Section batch: 289 ms
Not per-question latency

QUESTION + OPTIONS

State whether each set is Finite, Countably Infinite, or Uncountably Infinite.

The complex numbers $a+bi$ where a,b are integers.

- A. Finite
- B. Countably Infinite
- C. Uncountably Infinite

REFERENCE ANSWER

B. Countably Infinite

JEV / CORRECT

B. Countably Infinite

API confidence: 1.00
Option probabilities:
{`"C": 0.0, "B": 1.0, "A": 0.0`}

Section batch: 289 ms
Not per-question latency

QUESTION + OPTIONS

State whether each set is Finite, Countably Infinite, or Uncountably Infinite.

The set of edges of the complete bipartite graph $K_{100,100}$.

- A. Finite
- B. Countably Infinite
- C. Uncountably Infinite

REFERENCE ANSWER

A. Finite

JEV / CORRECT

A. Finite

API confidence: 0.97
Option probabilities:
{`"C"`: 0.0, `"B"`: 0.01, `"A"`: 0.99}

Section batch: 289 ms
Not per-question latency

QUESTION + OPTIONS

State whether each set is Finite, Countably Infinite, or Uncountably Infinite.

The set of all integer powers of 2.

- A. Finite
- B. Countably Infinite
- C. Uncountably Infinite

REFERENCE ANSWER

B. Countably Infinite

JEV / CORRECT

B. Countably Infinite

API confidence: 1.00
Option probabilities:
{ "C": 0.0, "B": 1.0, "A": 0.0 }

Section batch: 289 ms
Not per-question latency

QUESTION + OPTIONS

State whether each set is Finite, Countably Infinite, or Uncountably Infinite.

The set of real polynomials of degree at most two passing through (1,1) and (2,2).

- A. Finite
- B. Countably Infinite
- C. Uncountably Infinite

REFERENCE ANSWER

C. Uncountably Infinite

JEV / CORRECT

C. Uncountably Infinite

API confidence: 0.46
Option probabilities:
{ "C": 0.64, "B": 0.34, "A": 0.02 }

Section batch: 289 ms
Not per-question latency

QUESTION + OPTIONS

Two programs F and G are equivalent if, for every input, both halt with the same output or both do not halt. Suppose EQUIVALENT(F,G) always halts and returns TRUE iff F and G are equivalent. Complete HALT(P,x) to decide whether P halts on x:

```
def HALT(P,x):
def F(y):
----(1)----
----(2)----
def G(y):
return 0
return EQUIVALENT(----(3)----, ----(4)----)
```

Choose the ordered tuple filling blanks (1),(2),(3),(4).

- A. (return 0; P(x); F; G)
- B. (P(x); return 0; F; G)
- C. (P(x); return 0; F; F)
- D. (P(y); return 0; F; G)

REFERENCE ANSWER

B. (P(x); return 0; F; G)

JEV / CORRECT

B. (P(x); return 0; F; G)

API confidence: 0.91
Option probabilities:
{ "B": 0.94, "D": 0.04, "A": 0.02, "C": 0.0 }

Section batch: 461 ms
Not per-question latency

QUESTION + OPTIONS

Answers may be unsimplified (binomial coefficients, factorials, exponents), but do not use summation or product notation. $C(n,k)$ denotes a binomial coefficient.

A deck has 52 cards, 4 suits and 13 ranks per suit. A hand is an unordered set of five cards. How many hands contain exactly one 6 and exactly one 7?

- A. $C(4,2)*C(44,3)$
- B. $4*4*C(50,3)$
- C. $4*4*C(44,3)$
- D. $4*4*C(44,3)*5!$

REFERENCE ANSWER

C. $4*4*C(44,3)$

JEV / CORRECT

C. $4*4*C(44,3)$

API confidence: 0.93
Option probabilities:
{ $"D"$: 0.0, $"B"$: 0.05, $"C"$: 0.95, $"A"$: 0.0}

Section batch: 317 ms
Not per-question latency

QUESTION + OPTIONS

Answers may be unsimplified (binomial coefficients, factorials, exponents), but do not use summation or product notation. $C(n,k)$ denotes a binomial coefficient.

Draw 3 cards without replacement. A means at least one ace. C_i means exactly i aces, for $i=1,2,3$. F,S,T mean respectively that the first, second or third card is an ace. Which representation of $P(A)$ is easier, and why?

- A. Use C_1,C_2,C_3 : they are independent and their intersection is A, so their probabilities can be multiplied.
- B. Use F,S,T: they are independent and their intersection is A, so their probabilities can be multiplied.
- C. Use F,S,T: they are mutually exclusive and their union is A, so their probabilities can be added.
- D. Use C_1,C_2,C_3 : they are mutually exclusive and their union is A, so their probabilities can be added.

REFERENCE ANSWER

D. Use C_1,C_2,C_3 : they are mutually exclusive and their union is A, so their probabilities can be added.

JEV / CORRECT

D. Use C_1,C_2,C_3 : they are mutually exclusive and their union is A, so their probabilities can be added.

API confidence: 0.99
Option probabilities:
{ $"D"$: 1.0, $"B"$: 0.0, $"C"$: 0.0, $"A"$: 0.0}

Section batch: 317 ms
Not per-question latency

QUESTION + OPTIONS

Answers may be unsimplified (binomial coefficients, factorials, exponents), but do not use summation or product notation. $C(n,k)$ denotes a binomial coefficient.

Agnes distributes all 40 indistinguishable cookies among three distinct minions: Bob, Kevin and Stuart. Each has a carrying limit of 15 cookies.

With no carrying limit, how many distributions of the 40 cookies are possible?

- A. $C(40,2)$
- B. 3^{40}
- C. $C(42,2)$
- D. $C(42,3)$

REFERENCE ANSWER

C. $C(42,2)$

JEV / CORRECT

C. $C(42,2)$

API confidence: 0.98
Option probabilities:
{ $"C"$: 0.99, $"B"$: 0.0, $"A"$: 0.01, $"D"$: 0.0}

Section batch: 317 ms
Not per-question latency

QUESTION + OPTIONS

Answers may be unsimplified (binomial coefficients, factorials, exponents), but do not use summation or product notation. $C(n,k)$ denotes a binomial coefficient.

Agnes distributes all 40 indistinguishable cookies among three distinct minions: Bob, Kevin and Stuart. Each has a carrying limit of 15 cookies.

How many distributions exceed Bob's limit? Other minions may also exceed their limits.

- A. $C(26,2)$
- B. $C(27,2)$
- C. $C(42,2)-C(26,2)$
- D. $C(24,2)$

REFERENCE ANSWER

A. $C(26,2)$

JEV / CORRECT

A. $C(26,2)$

API confidence: 0.37
Option probabilities:
{ $"D"$: 0.16, $"A"$: 0.53, $"B"$: 0.27, $"C"$: 0.04}

Section batch: 317 ms
Not per-question latency

QUESTION + OPTIONS

Answers may be unsimplified (binomial coefficients, factorials, exponents), but do not use summation or product notation. $C(n,k)$ denotes a binomial coefficient.

Agnes distributes all 40 indistinguishable cookies among three distinct minions: Bob, Kevin and Stuart. Each has a carrying limit of 15 cookies.

How many distributions exceed both Bob's and Kevin's limits?

- A. $C(12,2)$
- B. $C(10,2)$
- C. $C(8,2)$
- D. $C(26,2)^2$

REFERENCE ANSWER

B. $C(10,2)$

JEV / CORRECT

B. $C(10,2)$

API confidence: 0.28
Option probabilities:
{ $"C"$: 0.29, $"A"$: 0.24, $"D"$: 0.02, $"B"$: 0.45}

Section batch: 317 ms
Not per-question latency

QUESTION + OPTIONS

Answers may be unsimplified (binomial coefficients, factorials, exponents), but do not use summation or product notation. $C(n,k)$ denotes a binomial coefficient.

Agnes distributes all 40 indistinguishable cookies among three distinct minions: Bob, Kevin and Stuart. Each has a carrying limit of 15 cookies. Here a counts unrestricted distributions; b counts distributions exceeding one specified limit; c counts distributions exceeding two specified limits.

Let a,b,c denote the answers to Q7.3,Q7.4,Q7.5 respectively. Express the number of distributions respecting all three limits in terms of a,b,c .

- A. $a-b+c$
- B. $a-3b+6c$
- C. $a-3b+3c$
- D. $a-3b-3c$

REFERENCE ANSWER

C. $a-3b+3c$

JEV / CORRECT

C. $a-3b+3c$

API confidence: 0.96
Option probabilities:
{ $"C"$: 0.97, $"B"$: 0.02, $"A"$: 0.01, $"D"$: 0.0}

Section batch: 317 ms
Not per-question latency

QUESTION + OPTIONS

In a town, $\frac{3}{4}$ of residents have black hair and $\frac{2}{3}$ are female, independently. Two people are selected randomly with replacement. Given that at least one is a black-haired female, what is the probability both have black hair? Select the answer with valid supporting work. Hint: the answer is not $\frac{9}{16}$.

- A. $\frac{1}{2}$: a randomly selected person is a black-haired female with probability $(\frac{3}{4}) * (\frac{2}{3}) = \frac{1}{2}$; replacement makes the requested conditional probability the same.
- B. $\frac{8}{9}$: conditional on both people having black hair, the chance at least one is female is $1 - (\frac{1}{3})^2 = \frac{8}{9}$; this is the requested conditional probability.
- C. $\frac{3}{4}$: if A means at least one black-haired female and B means both have black hair, then $P(B|A) = \frac{P(B)}{P(A)} = \frac{(9/16)}{(1 - (\frac{1}{2})^2)} = \frac{3}{4}$.
- D. $\frac{2}{3}$: if A means at least one black-haired female and B means both have black hair, then $P(B|A) = \frac{(9/16) * (1 - (\frac{1}{3})^2)}{(1 - (\frac{1}{2})^2)} = \frac{2}{3}$.

REFERENCE ANSWER

D. $\frac{2}{3}$: if A means at least one black-haired female and B means both have black hair, then $P(B|A) = \frac{(9/16) * (1 - (\frac{1}{3})^2)}{(1 - (\frac{1}{2})^2)} = \frac{2}{3}$.

JEV / INCORRECT

C. $\frac{3}{4}$: if A means at least one black-haired female and B means both have black hair, then $P(B|A) = \frac{P(B)}{P(A)} = \frac{(9/16)}{(1 - (\frac{1}{2})^2)} = \frac{3}{4}$.

API confidence: 0.56
Option probabilities:
{ "B": 0.07, "C": 0.67, "D": 0.23, "A": 0.03 }

Section batch: 341 ms
Not per-question latency

QUESTION + OPTIONS

Flip a biased coin independently infinitely many times, with heads probability p and tails probability $1-p$. Give the distribution and parameters. The common discrete distributions named on the exam are Bernoulli, Binomial, Geometric, Uniform and Poisson. Original worked example Q9.1 (0 points): the indicator that the first three flips are heads is Bernoulli(p^3). Geometric(q) counts trials up to and including the first success (support $1,2,\dots$).

Distribution of the number of heads in the first 70 flips?

A. Poisson($70 \cdot p$)

B. Geometric(p)

C. Binomial($70, 1-p$)

D. Binomial($70, p$)

REFERENCE ANSWER

D. Binomial($70, p$)

JEV / CORRECT

D. Binomial($70, p$)

API confidence: 1.00
Option probabilities:
{`"D"`: 1.0, `"C"`: 0.0, `"B"`: 0.0, `"A"`: 0.0}

Section batch: 448 ms
Not per-question latency

QUESTION + OPTIONS

Flip a biased coin independently infinitely many times, with heads probability p and tails probability $1-p$. Give the distribution and parameters. The common discrete distributions named on the exam are Bernoulli, Binomial, Geometric, Uniform and Poisson. Original worked example Q9.1 (0 points): the indicator that the first three flips are heads is $\text{Bernoulli}(p^3)$. $\text{Geometric}(q)$ counts trials up to and including the first success (support $1,2,\dots$).

Conditional on exactly one head in the first 20 flips, what is the distribution of the flip number on which the first head occurs?

- A. $\text{Geometric}(p)$
- B. $\text{Uniform}(\{1,2,\dots,20\})$
- C. $\text{Binomial}(20,p)$
- D. $\text{Uniform}(\{0,1,\dots,19\})$

REFERENCE ANSWER

B. $\text{Uniform}(\{1,2,\dots,20\})$

JEV / CORRECT

B. $\text{Uniform}(\{1,2,\dots,20\})$

API confidence: 0.96
Option probabilities:
 $\{ \text{"D"}: 0.02, \text{"C"}: 0.0, \text{"B"}: 0.98, \text{"A"}: 0.0 \}$

Section batch: 448 ms
Not per-question latency

QUESTION + OPTIONS

Flip a biased coin independently infinitely many times, with heads probability p and tails probability $1-p$. Give the distribution and parameters. The common discrete distributions named on the exam are Bernoulli, Binomial, Geometric, Uniform and Poisson. Original worked example Q9.1 (0 points): the indicator that the first three flips are heads is $\text{Bernoulli}(p^3)$. $\text{Geometric}(q)$ counts trials up to and including the first success (support $1,2,\dots$).

Distribution of the gap between the first two tails, counting intervening heads? THHHT has gap 3. Hint: a standard random variable minus 1.

- A. $\text{Geometric}(p)-1$
- B. $\text{Geometric}(1-p)-1$
- C. $\text{Binomial}(2,p)-1$
- D. $\text{Geometric}(1-p)$

REFERENCE ANSWER

B. $\text{Geometric}(1-p)-1$

JEV / CORRECT

B. $\text{Geometric}(1-p)-1$

API confidence: 0.62
Option probabilities:
{`"D": 0.01, "B": 0.71, "A": 0.28, "C": 0.0`}

Section batch: 448 ms
Not per-question latency

QUESTION + OPTIONS

Flip a biased coin independently infinitely many times, with heads probability p and tails probability $1-p$. Give the distribution and parameters. The common discrete distributions named on the exam are Bernoulli, Binomial, Geometric, Uniform and Poisson. Original worked example Q9.1 (0 points): the indicator that the first three flips are heads is $\text{Bernoulli}(p^3)$. $\text{Geometric}(q)$ counts trials up to and including the first success (support $1,2,\dots$).

Let $p=1/2$. Distribution of the number of flips until the same outcome occurs twice consecutively? Hint: 1 plus a standard random variable.

- A. $1+\text{Geometric}(1/2)$
- B. $1+\text{Binomial}(2,1/2)$
- C. $\text{Geometric}(1/2)$
- D. $1+\text{Geometric}(1/4)$

REFERENCE ANSWER

A. $1+\text{Geometric}(1/2)$

JEV / CORRECT

A. $1+\text{Geometric}(1/2)$

API confidence: 0.73
Option probabilities:
{`"D": 0.09, "C": 0.11, "B": 0.0, "A": 0.8`}

Section batch: 448 ms
Not per-question latency

QUESTION + OPTIONS

Flip a biased coin independently infinitely many times, with heads probability p and tails probability $1-p$. Give the distribution and parameters. The common discrete distributions named on the exam are Bernoulli, Binomial, Geometric, Uniform and Poisson. Original worked example Q9.1 (0 points): the indicator that the first three flips are heads is $\text{Bernoulli}(p^3)$. $\text{Geometric}(q)$ counts trials up to and including the first success (support $1,2,\dots$).

Let $p=1/2$. Distribution of the number of runs in the first 50 flips? A run is an uninterrupted sequence of identical outcomes, e.g. HHHHHTTTHTTH begins with runs HHHHH, TTT, H, TT. Hint: 1 plus a standard random variable.

A. 1+Geometric($1/2$)

B. 1+Binomial($50,1/2$)

C. 1+Binomial($49,1/4$)

D. 1+Binomial($49,1/2$)

REFERENCE ANSWER

D. 1+Binomial($49,1/2$)

JEV / CORRECT

D. 1+Binomial($49,1/2$)

API confidence: 0.89
Option probabilities:
{`"D": 0.92, "C": 0.01, "B": 0.0, "A": 0.07`}

Section batch: 448 ms
Not per-question latency

QUESTION + OPTIONS

Each spin has four equally likely outcomes: alpha earns 1 point; beta earns 2 points; gamma gives two additional spins; delta loses 1 point and gives one additional spin. Start with one spin. Additional spins use the same rules. The score is the sum of points earned or lost. Example: alpha gives score 1. Example sequence delta,gamma,gamma,alpha,beta,alpha gives score $-1+1+2+1=3$.

Let X be the final score. What is $E[X]$?

- A. 0
- B. 1
- C. 2
- D. 3
- E. 4
- F. infinity

REFERENCE ANSWER

C. 2

JEV / INCORRECT

B. 1

API confidence: 0.19
Option probabilities:
{`"E"`: 0.04, `"F"`: 0.16, `"A"`: 0.31, `"B"`: 0.32, `"C"`: 0.12, `"D"`: 0.05}

Section batch: 410 ms
Not per-question latency

QUESTION + OPTIONS

Normal(μ, ν) denotes a normal distribution with mean μ and variance ν . Poisson parameters are positive.

Independent $X \sim \text{Normal}(1, 2)$ and $Y \sim \text{Normal}(2, 1)$. What is the distribution of $Z = 2X - Y + 1$?

- A. Normal(1,5)
- B. Normal(1,9)
- C. Normal(1,3)
- D. Normal(5,9)

REFERENCE ANSWER

B. Normal(1,9)

JEV / CORRECT

B. Normal(1,9)

API confidence: 0.23
Option probabilities:
{`"C"`: 0.0, `"A"`: 0.41, `"B"`: 0.42, `"D"`: 0.17}

Section batch: 401 ms
Not per-question latency

QUESTION + OPTIONS

Normal(μ, ν) denotes a normal distribution with mean μ and variance ν . Poisson parameters are positive.

Independent $X, Y \sim \text{Poisson}(\lambda)$. Let $Z = X + Y$. Select all true statements.

- A. $Z \sim \text{Poisson}(2 \cdot \lambda)$
- B. Z has the distribution of $2P$, where $P \sim \text{Poisson}(\lambda)$
- C. None of the above

REFERENCE ANSWER

A. $Z \sim \text{Poisson}(2 \cdot \lambda)$

JEV / CORRECT

A. $Z \sim \text{Poisson}(2 \cdot \lambda)$

Original select-all item.
Noul threshold ≥ 0.5 ;
exact set correctness.

Section batch: 401 ms
Not per-question latency

QUESTION + OPTIONS

Normal(μ, ν) denotes a normal distribution with mean μ and variance ν . Poisson parameters are positive.

Let $X_1, \dots, X_n$ be independent Poisson(λ) variables and $S = \sum_i X_i$. Select all true statements.

- A. For every n , $S \sim \text{Poisson}(\lambda * n)$
- B. As n tends to infinity, $(S - \lambda * n) / \sqrt{\lambda * n}$ converges in distribution to Normal(0,1)
- C. None of the above

REFERENCE ANSWER

- A. For every n ,
 $S \sim \text{Poisson}(\lambda * n)$
- B. As n tends to infinity,
 $(S - \lambda * n) / \sqrt{\lambda * n}$ converges in distribution to Normal(0,1)

Pre-run repair:
Positive rate specified for CLT normalization.

JEV / CORRECT

- A. For every n ,
 $S \sim \text{Poisson}(\lambda * n)$
- B. As n tends to infinity,
 $(S - \lambda * n) / \sqrt{\lambda * n}$ converges in distribution to Normal(0,1)

Original select-all item.
Noul threshold ≥ 0.5 ;
exact set correctness.

Section batch: 401 ms
Not per-question latency

QUESTION + OPTIONS

Student arrivals are modeled as a homogeneous Poisson process at a rate of one student per 30 minutes.

Nobody arrives during the first 50 minutes. What is the probability at least one student arrives during the final 10 minutes of the hour?

- A. $1 - \exp(-5/3)$
- B. $1 - \exp(-1/3)$
- C. $\exp(-1/3)$
- D. $1 - \exp(-2)$

REFERENCE ANSWER

B. $1 - \exp(-1/3)$

Pre-run repair:
Homogeneous Poisson arrival process specified.

JEV / CORRECT

B. $1 - \exp(-1/3)$

API confidence: 0.75
Option probabilities:
{ "D": 0.01, "B": 0.81, "A": 0.17, "C": 0.0 }

Section batch: 321 ms
Not per-question latency

QUESTION + OPTIONS

Student arrivals are modeled as a homogeneous Poisson process at a rate of one student per 30 minutes.

At the same arrival rate, students never leave once they arrive. Starting from an empty room, what is the expected number at the end of one hour?

- A. 30
- B. 2
- C. 1/2
- D. $1 - \exp(-2)$

REFERENCE ANSWER

B. 2

Pre-run repair:
Homogeneous Poisson arrival process specified.

JEV / CORRECT

B. 2

API confidence: 0.99
Option probabilities:
{`"D"`: 0.0, `"B"`: 1.0, `"A"`: 0.0, `"C"`: 0.0}

Section batch: 321 ms
Not per-question latency

QUESTION + OPTIONS

Time between BART train departures is exponential, with a mean of 15 minutes.

Ishan arrives at a random time. What is his expected wait until a train departs?

- A. 1/15 minute
- B. 15 minutes
- C. 7.5 minutes
- D. 30 minutes

REFERENCE ANSWER

B. 15 minutes

JEV / CORRECT

B. 15 minutes

API confidence: 0.87
Option probabilities:
{**"B"**: 0.91, "C": 0.09, "A": 0.0, "D": 0.0}

Section batch: 321 ms
Not per-question latency

QUESTION + OPTIONS

Time between BART train departures is exponential, with a mean of 15 minutes.

The station agent says the last train left 5 minutes ago. What is Ishan's expected remaining wait?

- A. 15 minutes
- B. 20 minutes
- C. 10 minutes
- D. 5 minutes

REFERENCE ANSWER

A. 15 minutes

JEV / CORRECT

A. 15 minutes

API confidence: 0.74
Option probabilities:
{ "D": 0.0, "B": 0.01, "A": 0.81, "C": 0.18 }

Section batch: 321 ms
Not per-question latency

QUESTION + OPTIONS

Trains and passengers have first arrival times A_t and A_p . The joint PDF is $f(a_p, a_t) = \lambda_p \lambda_t \exp(-\lambda_p a_p - \lambda_t a_t)$ for $a_p, a_t \geq 0$ and zero otherwise. Give an integral for $P(A_t < A_p)$, without evaluating it.

- A. Integral $t=0..infinity$ of [Integral $u=0..infinity$ of $\lambda_p \lambda_t \exp(-\lambda_p u - \lambda_t t)$ du] dt
- B. Integral $t=0..infinity$ of [Integral $u=t..infinity$ of $\lambda_p \lambda_t \exp(-\lambda_p u - \lambda_t t)$ du] dt
- C. Integral $t=0..infinity$ of $\lambda_p \lambda_t \exp(-(\lambda_p + \lambda_t)t)$ dt
- D. Integral $t=0..infinity$ of [Integral $u=0..t$ of $\lambda_p \lambda_t \exp(-\lambda_p u - \lambda_t t)$ du] dt

REFERENCE ANSWER

B. Integral $t=0..infinity$ of [Integral $u=t..infinity$ of $\lambda_p \lambda_t \exp(-\lambda_p u - \lambda_t t)$ du] dt

JEV / CORRECT

B. Integral $t=0..infinity$ of [Integral $u=t..infinity$ of $\lambda_p \lambda_t \exp(-\lambda_p u - \lambda_t t)$ du] dt

API confidence: 0.68
Option probabilities:
{"B": 0.75, "C": 0.01, "A": 0.01, "D": 0.23}

Section batch: 321 ms
Not per-question latency

QUESTION + OPTIONS

A 5 by 5 bingo card represents 25 booths. Melody visits each booth independently with probability p ; its square is marked exactly when visited. There is no free square. The 12 possible bingo lines are 5 rows, 5 columns and 2 diagonals. X is the number of completely marked lines.

Compute $E[X]$.

- A. p^{25}
- B. $12 \cdot p^5$
- C. $12 \cdot p$
- D. $25 \cdot p$

REFERENCE ANSWER

B. $12 \cdot p^5$

JEV / CORRECT

B. $12 \cdot p^5$

API confidence: 1.00
Option probabilities:
{**"C"**: 0.0, "A": 0.0, "B": 1.0, "D": 0.0}

Section batch: 440 ms
Not per-question latency

QUESTION + OPTIONS

A 5 by 5 bingo card represents 25 booths. Melody visits each booth independently with probability p ; its square is marked exactly when visited. There is no free square. The 12 possible bingo lines are 5 rows, 5 columns and 2 diagonals. X is the number of completely marked lines.

Two distinct bingo lines share exactly one square. What is the probability both are completely marked?

- A. p^9
- B. p^5
- C. p^8
- D. p^{10}

REFERENCE ANSWER

A. p^9

JEV / CORRECT

A. p^9

API confidence: 0.99
Option probabilities:
{**"C"**: 0.0, **"A"**: 1.0, "B": 0.0, "D": 0.0}

Section batch: 440 ms
Not per-question latency

QUESTION + OPTIONS

A 5 by 5 bingo card represents 25 booths. Melody visits each booth independently with probability p ; its square is marked exactly when visited. There is no free square. The 12 possible bingo lines are 5 rows, 5 columns and 2 diagonals. X is the number of completely marked lines.

Two distinct bingo lines share no squares. What is the probability both are completely marked?

- A. p^{10}
- B. p^9
- C. p^{25}
- D. $2 \cdot p^5$

REFERENCE ANSWER

A. p^{10}

JEV / CORRECT

A. p^{10}

API confidence: 0.99
Option probabilities:
{`"C": 0.0, "A": 0.99, "B": 0.01, "D": 0.0`}

Section batch: 440 ms
Not per-question latency

QUESTION + OPTIONS

A 5 by 5 bingo card represents 25 booths. Melody visits each booth independently with probability p ; its square is marked exactly when visited. There is no free square. The 12 possible bingo lines are 5 rows, 5 columns and 2 diagonals. X is the number of completely marked lines.

b refers to two lines sharing one square; c refers to two lines sharing no squares.

Let $a = E[X]$ from Q13.1, b be the probability in Q13.2, and c be the probability in Q13.3. Compute $\text{Var}(X)$ in terms of a, b, c .

- A. $a + 40 \cdot b + 92 \cdot c - a^2$
- B. $a + 46 \cdot b + 20 \cdot c - a^2$
- C. $a + 92 \cdot b + 40 \cdot c$
- D. $a + 92 \cdot b + 40 \cdot c - a^2$

REFERENCE ANSWER

D. $a + 92 \cdot b + 40 \cdot c - a^2$

JEV / CORRECT

D. $a + 92 \cdot b + 40 \cdot c - a^2$

API confidence: 0.82
Option probabilities:
{ "C": 0.0, "A": 0.1, "B": 0.03, "D": 0.87 }

Section batch: 440 ms
Not per-question latency

QUESTION + OPTIONS

A 5 by 5 bingo card represents 25 booths. Melody visits each booth independently with probability p ; its square is marked exactly when visited. There is no free square. The 12 possible bingo lines are 5 rows, 5 columns and 2 diagonals. X is the number of completely marked lines.

Which expression is the standard union bound on $P(X \geq 1)$, clipped at 1?

A. $1 - (1 - p^5)^{12}$

B. $\min(1, 12 \cdot p^5)$

C. $\min(1, 12 \cdot p^{10})$

D. $\min(1, p^5)$

REFERENCE ANSWER

B. $\min(1, 12 \cdot p^5)$

JEV / CORRECT

B. $\min(1, 12 \cdot p^5)$

API confidence: 1.00
Option probabilities:
{`"C"`: 0.0, `"A"`: 0.0, `"B"`: 1.0, `"D"`: 0.0}

Section batch: 440 ms
Not per-question latency

QUESTION + OPTIONS

A 5 by 5 bingo card represents 25 booths. Melody visits each booth independently with probability p ; its square is marked exactly when visited. There is no free square. The 12 possible bingo lines are 5 rows, 5 columns and 2 diagonals. X is the number of completely marked lines.

Assume $E[X] < 2$. Which is the standard two-sided Chebyshev upper-bound expression applied to $P(X \geq 2)$, in terms of $E[X]$ and $\text{Var}(X)$, clipped at 1?

A. $\min(1, (2 - E[X])^2 / \text{Var}(X))$

B. $\min(1, \text{Var}(X) / (2 - E[X]))$

C. $\min(1, \text{Var}(X) / (2 - E[X])^2)$

D. $\min(1, \text{Var}(X) / (2 + E[X])^2)$

REFERENCE ANSWER

C. $\min(1, \text{Var}(X) / (2 - E[X])^2)$

Pre-run repair:
Mean below 2 required for this upper-tail bound.

JEV / CORRECT

C. $\min(1, \text{Var}(X) / (2 - E[X])^2)$

API confidence: 0.97
Option probabilities:
{"C": 0.98, "A": 0.01, "B": 0.01, "D": 0.0}

Section batch: 440 ms
Not per-question latency

QUESTION + OPTIONS

Events A,B have nonzero probability and indicators I_A, I_B . Which argument proves that $\text{Cov}(I_A, I_B) > 0$ implies $P(A|B) > P(A)$?

- A. $\text{Cov}(I_A, I_B) = P(A \cup B) - P(A)P(B) = P(B)[P(A|B) - P(A)]$. Because $P(B) > 0$, positive covariance forces the bracket to be positive.
- B. $\text{Cov}(I_A, I_B) = P(A \cap B) - P(A)P(B) = P(A)[P(A|B) - P(A)]$. Because $P(A) > 0$, positive covariance forces the bracket to be positive.
- C. $\text{Cov}(I_A, I_B) = P(A \cap B) - P(A)P(B) = P(B)[P(A|B) - P(A)]$. Because $P(B) > 0$, positive covariance forces the bracket to be positive.
- D. $\text{Cov}(I_A, I_B) = P(A)P(B) - P(A \cap B) = P(B)[P(A|B) - P(A)]$. Because $P(B) > 0$, positive covariance forces the bracket to be positive.

REFERENCE ANSWER

C. $\text{Cov}(I_A, I_B) = P(A \cap B) - P(A)P(B) = P(B)[P(A|B) - P(A)]$. Because $P(B) > 0$, positive covariance forces the bracket to be positive.

JEV / CORRECT

C. $\text{Cov}(I_A, I_B) = P(A \cap B) - P(A)P(B) = P(B)[P(A|B) - P(A)]$. Because $P(B) > 0$, positive covariance forces the bracket to be positive.

API confidence: 0.97
Option probabilities:
{ "A": 0.02, "B": 0.0, "C": 0.98, "D": 0.0 }

Section batch: 385 ms
Not per-question latency

QUESTION + OPTIONS

Gaussian(μ, ν) denotes a Gaussian distribution with mean μ and variance ν .

Let $X \sim \text{Gaussian}(3, 6)$ and $Y \sim \text{Exponential}(3)$ be independent. What is $P(X=Y)$?

- A. 0
- B. Cannot be determined from the stated information
- C. 1
- D. $1/2$

REFERENCE ANSWER

A. 0

Pre-run repair:
Independence added; marginals alone are insufficient.

JEV / CORRECT

A. 0

API confidence: 0.99
Option probabilities:
{**"B"**: 0.0, "D": 0.0, "A": 1.0, "C": 0.0}

Section batch: 378 ms
Not per-question latency

QUESTION + OPTIONS

Gaussian(μ, σ^2) denotes a Gaussian distribution with mean μ and variance σ^2 .

For $X \sim \text{Gaussian}(3, 6)$, which statement is true about $P(X < 4)$?

- A. < 0.5
- B. $= 0.5$
- C. > 0.5
- D. Not enough information

REFERENCE ANSWER

C. > 0.5

JEV / CORRECT

C. > 0.5

API confidence: 0.38
Option probabilities:
{ $"B"$: 0.02, $"D"$: 0.02, $"C"$: 0.54, $"A"$: 0.42}

Section batch: 378 ms
Not per-question latency

QUESTION + OPTIONS

Gaussian(μ, ν) denotes a Gaussian distribution with mean μ and variance ν .

A, B and C are independent Uniform(0,12) random variables. X indicates that C lies between A and B.

What is $P(X=1 \mid A,B)$, in terms of A and B?

A. $1-\text{abs}(A-B)/12$

B. $\text{abs}(A-B)/12$

C. $(A-B)/12$

D. $\text{abs}(A-B)/144$

REFERENCE ANSWER

B. $\text{abs}(A-B)/12$

JEV / CORRECT

B. $\text{abs}(A-B)/12$

API confidence: 0.96
Option probabilities:
{ "B": 0.97, "D": 0.0, "C": 0.0, "A": 0.03 }

Section batch: 378 ms
Not per-question latency

QUESTION + OPTIONS

Gaussian(μ, ν) denotes a Gaussian distribution with mean μ and variance ν .

A, B and C are independent Uniform(0,12) random variables. X indicates that C lies between A and B.

Without conditioning on A,B, what is $P(X=1)$? Hint: there is a way without integrals.

A. 1/2

B. 1/6

C. 2/3

D. 1/3

REFERENCE ANSWER

D. 1/3

JEV / CORRECT

D. 1/3

API confidence: 0.96
Option probabilities:
{ "B": 0.01, "D": 0.96, "C": 0.01, "A": 0.02 }

Section batch: 378 ms
Not per-question latency

QUESTION + OPTIONS

Gaussian(μ, ν) denotes a Gaussian distribution with mean μ and variance ν .

A, B and C are independent Uniform(0,12) random variables. X indicates that C lies between A and B. Q15.3 asks for $P(X=1 \mid A, B)$; Q15.4 asks for $P(X=1)$.

What is $E[abs(A-B)]$? Hint: use the previous two parts to avoid integrals. The original exam labels this particularly challenging.

- A. 0
- B. 4
- C. 8
- D. 6

REFERENCE ANSWER

B. 4

JEV / INCORRECT

C. 8

API confidence: 0.35
Option probabilities:
{ "B": 0.45, "D": 0.03, "C": 0.52, "A": 0.0 }

Section batch: 378 ms
Not per-question latency

QUESTION + OPTIONS

Tom travels from Chicago (CHI) to Miami (MIA). Each outgoing train route is equally likely. The diagram, transcribed without solving: CHI -> SFO (1/3), DC (1/3), NYC (1/3); SFO -> CHI (1); DC -> SFO (1/3), NYC (1/3), MIA (1/3); NYC -> CHI (1/2), DC (1/2); MIA -> MIA (1).

Find the probability of reaching MIA from CHI before visiting NYC. Select a system of equations, without solving it. $h(s)$ denotes the probability of reaching MIA before NYC starting at s ; the requested probability is $h(\text{CHI})$.

- A. $h(\text{MIA})=1$; $h(\text{NYC})=0$; $h(\text{SFO})=h(\text{CHI})$; $h(\text{DC})=(h(\text{SFO})+h(\text{NYC})+h(\text{MIA}))/3$; $h(\text{CHI})=(h(\text{SFO})+h(\text{DC}))/2$.
- B. $h(\text{MIA})=1$; $h(\text{NYC})=0$; $h(\text{SFO})=h(\text{CHI})$; $h(\text{DC})=(h(\text{NYC})+h(\text{MIA}))/2$; $h(\text{CHI})=(h(\text{SFO})+h(\text{DC})+h(\text{NYC}))/3$.
- C. $h(\text{MIA})=0$; $h(\text{NYC})=1$; $h(\text{SFO})=h(\text{CHI})$; $h(\text{DC})=(h(\text{SFO})+h(\text{NYC})+h(\text{MIA}))/3$; $h(\text{CHI})=(h(\text{SFO})+h(\text{DC})+h(\text{NYC}))/3$.
- D. $h(\text{MIA})=1$; $h(\text{NYC})=0$; $h(\text{SFO})=h(\text{CHI})$; $h(\text{DC})=(h(\text{SFO})+h(\text{NYC})+h(\text{MIA}))/3$; $h(\text{CHI})=(h(\text{SFO})+h(\text{DC})+h(\text{NYC}))/3$.

REFERENCE ANSWER

D. $h(\text{MIA})=1$; $h(\text{NYC})=0$;
 $h(\text{SFO})=h(\text{CHI})$; $h(\text{DC})=(h(\text{SFO})+h(\text{NYC})+h(\text{MIA}))/3$; $h(\text{CHI})=(h(\text{SFO})+h(\text{DC})+h(\text{NYC}))/3$.

JEV / CORRECT

D. $h(\text{MIA})=1$; $h(\text{NYC})=0$;
 $h(\text{SFO})=h(\text{CHI})$; $h(\text{DC})=(h(\text{SFO})+h(\text{NYC})+h(\text{MIA}))/3$; $h(\text{CHI})=(h(\text{SFO})+h(\text{DC})+h(\text{NYC}))/3$.

API confidence: 0.98
Option probabilities:
{**"B"**: 0.0, **"D"**: 0.99, **"C"**: 0.0, **"A"**: 0.01}

Section batch: 336 ms
Not per-question latency

QUESTION + OPTIONS

Tom travels from Chicago (CHI) to Miami (MIA). Each outgoing train route is equally likely. The diagram, transcribed without solving: CHI -> SFO (1/3), DC (1/3), NYC (1/3); SFO -> CHI (1); DC -> SFO (1/3), NYC (1/3), MIA (1/3); NYC -> CHI (1/2), DC (1/2); MIA -> MIA (1).

Tom spends 3 days on each visit to NYC and 1 day in every other city before departing. Travel takes zero days. Select equations for the expected days to first arrival at MIA, starting in CHI and including its initial day. Do not solve. $t(s)$ denotes the remaining expected days starting at s .

A. $t(\text{MIA})=0$; $t(\text{SFO})=1+t(\text{CHI})$; $t(\text{CHI})=1+(t(\text{SFO})+t(\text{DC})+t(\text{NYC}))/3$; $t(\text{DC})=1+(t(\text{NYC})+t(\text{MIA}))/3$; $t(\text{NYC})=3+(t(\text{CHI})+t(\text{DC}))/2$.

B. $t(\text{MIA})=0$; $t(\text{SFO})=1+t(\text{CHI})$; $t(\text{CHI})=1+(t(\text{SFO})+t(\text{DC})+t(\text{NYC}))/3$; $t(\text{DC})=1+(t(\text{SFO})+t(\text{NYC})+t(\text{MIA}))/3$; $t(\text{NYC})=3+(t(\text{CHI})+t(\text{DC}))/2$.

C. $t(\text{MIA})=0$; $t(\text{SFO})=1+t(\text{CHI})$; $t(\text{CHI})=1+(t(\text{SFO})+t(\text{DC})+t(\text{NYC}))/3$; $t(\text{DC})=1+(t(\text{SFO})+t(\text{NYC})+t(\text{MIA}))/3$; $t(\text{NYC})=1+(t(\text{CHI})+t(\text{DC}))/2$.

D. $t(\text{MIA})=1$; $t(\text{SFO})=1+t(\text{CHI})$; $t(\text{CHI})=1+(t(\text{SFO})+t(\text{DC})+t(\text{NYC}))/3$; $t(\text{DC})=1+(t(\text{SFO})+t(\text{NYC})+t(\text{MIA}))/3$; $t(\text{NYC})=3+(t(\text{CHI})+t(\text{DC}))/2$.

REFERENCE ANSWER

B. $t(\text{MIA})=0$; $t(\text{SFO})=1+t(\text{CHI})$; $t(\text{CHI})=1+(t(\text{SFO})+t(\text{DC})+t(\text{NYC}))/3$; $t(\text{DC})=1+(t(\text{SFO})+t(\text{NYC})+t(\text{MIA}))/3$; $t(\text{NYC})=3+(t(\text{CHI})+t(\text{DC}))/2$.

Pre-run repair:
Reference includes DC-to-SFO edge from source diagram.

JEV / CORRECT

B. $t(\text{MIA})=0$; $t(\text{SFO})=1+t(\text{CHI})$; $t(\text{CHI})=1+(t(\text{SFO})+t(\text{DC})+t(\text{NYC}))/3$; $t(\text{DC})=1+(t(\text{SFO})+t(\text{NYC})+t(\text{MIA}))/3$; $t(\text{NYC})=3+(t(\text{CHI})+t(\text{DC}))/2$.

API confidence: 0.97
Option probabilities:
{ "B": 0.97, "D": 0.02, "A": 0.01, "C": 0.0 }

Section batch: 336 ms
Not per-question latency

QUESTION + OPTIONS

P AND NOT P is equivalent to True.

A. False

B. True

REFERENCE ANSWER

A. False

JEV / CORRECT

A. False

API confidence: 0.99
Option probabilities:
{ "B": 0.0, "A": 1.0 }

Section batch: 519 ms
Not per-question latency

QUESTION + OPTIONS

Simplify (P implies R) AND (P implies NOT R).

- A. P
- B. NOT R
- C. NOT P
- D. True

REFERENCE ANSWER

C. NOT P

JEV / CORRECT

C. NOT P

API confidence: 1.00
Option probabilities:
{ "D": 0.0, "C": 1.0, "B": 0.0, "A": 0.0 }

Section batch: 519 ms
Not per-question latency

QUESTION + OPTIONS

(P AND Q implies NOT R) is equivalent to NOT R OR NOT P OR NOT Q.

A. True

B. False

REFERENCE ANSWER

A. True

JEV / CORRECT

A. True

API confidence: 0.99
Option probabilities:
{ "B": 0.0, "A": 1.0 }

Section batch: 519 ms
Not per-question latency

QUESTION + OPTIONS

NOT forall x exists y Q(x,y) is equivalent to exists x forall y NOT Q(x,y).

A. False

B. True

REFERENCE ANSWER

B. True

JEV / INCORRECT

A. False

API confidence: 0.18
Option probabilities:
{ "B": 0.41, "A": 0.59 }

Section batch: 519 ms
Not per-question latency

QUESTION + OPTIONS

Suppose $[\text{forall } x \text{ exists } y \ Q(x,y)]$ implies $[\text{forall } x \text{ forall } y \ P(x,y)]$, and some $P(a,b)$ is false. There exists x for which every $Q(x,y)$ is ____.

- A. True
- B. Undetermined
- C. False

REFERENCE ANSWER

C. False

JEV / CORRECT

C. False

API confidence: 0.84
Option probabilities:
{ "C": 0.89, "B": 0.07, "A": 0.04 }

Section batch: 519 ms
Not per-question latency

QUESTION + OPTIONS

For natural a, b, c , prove $a|b$ and $b|c$ imply $a|c$.

- A. The product abc is divisible by a , which implies c is divisible by a .
- B. Divisibility is symmetric, so $c|a$ implies $a|c$.
- C. Write $b=ka$ and $c=lb$ for integers k, l ; then $c=(lk)a$.
- D. Since $a \leq b \leq c$, a must divide c .

REFERENCE ANSWER

C. Write $b=ka$ and $c=lb$ for integers k, l ; then $c=(lk)a$.

JEV / CORRECT

C. Write $b=ka$ and $c=lb$ for integers k, l ; then $c=(lk)a$.

API confidence: 1.00
Option probabilities:
{`"D": 0.0, "A": 0.0, "C": 1.0, "B": 0.0`}

Section batch: 402 ms
Not per-question latency

QUESTION + OPTIONS

Prove an integer whose decimal digit sum is divisible by nine is divisible by nine.

- A. Since n and its digit sum have the same parity, they have the same residue modulo nine.
- B. A decimal expansion has nine possible digits, so the pigeonhole principle proves divisibility.
- C. Each decimal digit is separately divisible by nine whenever their sum is.
- D. Write $n = \sum a_k \cdot 10^k$. Since $10 = 1 \pmod{9}$, $n = \sum a_k \pmod{9}$; zero residue of the digit sum therefore gives zero residue of n .

REFERENCE ANSWER

D. Write $n = \sum a_k \cdot 10^k$.
Since $10 = 1 \pmod{9}$, $n = \sum a_k \pmod{9}$; zero residue of the digit sum therefore gives zero residue of n .

JEV / CORRECT

D. Write $n = \sum a_k \cdot 10^k$.
Since $10 = 1 \pmod{9}$, $n = \sum a_k \pmod{9}$; zero residue of the digit sum therefore gives zero residue of n .

API confidence: 1.00
Option probabilities:
{`"D": 1.0, "A": 0.0, "C": 0.0, "B": 0.0`}

Section batch: 402 ms
Not per-question latency

QUESTION + OPTIONS

A job receiving its first-choice candidate in some stable matching must receive that candidate in every stable matching.

A. False

B. True

REFERENCE ANSWER

A. False

JEV / CORRECT

A. False

API confidence: 0.13
Option probabilities:
{ "A": 0.56, "B": 0.44 }

Section batch: 374 ms
Not per-question latency

QUESTION + OPTIONS

A job ranked last by every candidate must be rejected $n-1$ times in job-proposing deferred acceptance.

A. True

B. False

REFERENCE ANSWER

B. False

JEV / INCORRECT

A. True

API confidence: 0.50
Option probabilities:
{ "A": 0.75, "B": 0.25 }

Section batch: 374 ms
Not per-question latency

QUESTION + OPTIONS

If some job proposes to its final-ranked candidate during synchronous job-proposing deferred acceptance, the algorithm terminates that day.

A. False

B. True

REFERENCE ANSWER

B. True

JEV / INCORRECT

A. False

API confidence: 0.62
Option probabilities:
{ "A": 0.81, "B": 0.19 }

Section batch: 374 ms
Not per-question latency

QUESTION + OPTIONS

Adding a new edge either creates a cycle containing that edge or reduces the component count.

A. False

B. True

REFERENCE ANSWER

B. True

JEV / CORRECT

B. True

API confidence: 0.94
Option probabilities:
{ "A": 0.03, "B": 0.97 }

Section batch: 337 ms
Not per-question latency

QUESTION + OPTIONS

Edges in a tree on $n > 0$ vertices?

- A. $2n-2$
- B. $n+1$
- C. n
- D. $n-1$

REFERENCE ANSWER

D. $n-1$

JEV / CORRECT

D. $n-1$

API confidence: 1.00
Option probabilities:
{**"D"**: 1.0, "A": 0.0, "B": 0.0, "C": 0.0}

Section batch: 337 ms
Not per-question latency

QUESTION + OPTIONS

Delete k edges from a tree, keeping all vertices. Component count?

- A. k
- B. $k-1$
- C. $2k$
- D. $k+1$

REFERENCE ANSWER

D. $k+1$

JEV / CORRECT

D. $k+1$

API confidence: 1.00
Option probabilities:
{`"D"`: 1.0, `"A"`: 0.0, `"B"`: 0.0, `"C"`: 0.0}

Section batch: 337 ms
Not per-question latency

QUESTION + OPTIONS

A tree has exactly two degree-five vertices. Sharp minimum number of leaves?

- A. 10
- B. 6
- C. 5
- D. 8

REFERENCE ANSWER

D. 8

JEV / CORRECT

D. 8

API confidence: 0.69
Option probabilities:
{ "A": 0.07, "D": 0.77, "B": 0.14, "C": 0.02 }

Section batch: 337 ms
Not per-question latency

QUESTION + OPTIONS

After removing a simple cycle’s edges from a connected Eulerian graph, every component is Eulerian, allowing the trivial zero-edge tour at an isolated vertex.

- A. True
- B. False

REFERENCE ANSWER

A. True

JEV / CORRECT

A. True

API confidence: 0.82
Option probabilities:
{ "A": 0.91, "B": 0.09 }

Section batch: 337 ms
Not per-question latency

QUESTION + OPTIONS

After removing a simple cycle’s edges from a connected Eulerian simple graph, c components remain. Sharp universal lower bound on removed cycle length?

- A. c
- B. $c+1$
- C. $\max(3,c)$
- D. $2c$

REFERENCE ANSWER

C. $\max(3,c)$

Pre-run repair:
Include minimum length three of a simple cycle;
source c alone is not tight for $c=1$ or 2 .

JEV / CORRECT

C. $\max(3,c)$

API confidence: 0.33
Option probabilities:
{ $"D"$: 0.07, $"A"$: 0.18, $"B"$: 0.25, $"C"$: 0.5}

Section batch: 337 ms
Not per-question latency

QUESTION + OPTIONS

The four-dimensional hypercube has an Eulerian tour.

A. False

B. True

REFERENCE ANSWER

B. True

JEV / CORRECT

B. True

API confidence: 0.66
Option probabilities:
{ "A": 0.17, "B": 0.83 }

Section batch: 337 ms
Not per-question latency

QUESTION + OPTIONS

G is k -colorable and H is bipartite on the same vertices. Sharp universal color bound for their edge union, in terms of k alone?

- A. k
- B. $2k$
- C. $k+1$
- D. k^2

REFERENCE ANSWER

B. $2k$

JEV / CORRECT

B. $2k$

API confidence: 0.56
Option probabilities:
{`"D"`: 0.16, `"A"`: 0.05, `"B"`: 0.68, `"C"`: 0.11}

Section batch: 337 ms
Not per-question latency

QUESTION + OPTIONS

Connected planar embedding: n vertices, $2n$ edges. Faces?

- A. n
- B. $2n$
- C. $n-2$
- D. $n+2$

REFERENCE ANSWER

D. $n+2$

JEV / INCORRECT

C. $n-2$

API confidence: 0.25
Option probabilities:
{`"D"`: 0.18, `"A"`: 0.37, `"B"`: 0.01, `"C"`: 0.44}

Section batch: 337 ms
Not per-question latency

QUESTION + OPTIONS

Connected planar embedding: n vertices, average face boundary length five. Edges?

- A. $2n-4$
- B. $3n-6$
- C. $5(n-2)/3$
- D. $5n/2$

REFERENCE ANSWER

C. $5(n-2)/3$

JEV / CORRECT

C. $5(n-2)/3$

API confidence: 0.68
Option probabilities:
{`"D"`: 0.06, `"A"`: 0.16, `"B"`: 0.02, `"C"`: 0.76}

Section batch: 337 ms
Not per-question latency

QUESTION + OPTIONS

Choose integers (a,b) solving $47a+49b=1$.

- A. (-24,23)
- B. (24,-23)
- C. (23,-22)
- D. (49,-47)

REFERENCE ANSWER

B. (24,-23)

JEV / CORRECT

B. (24,-23)

API confidence: 0.38
Option probabilities:
{"B": 0.53, "D": 0.02, "A": 0.34, "C": 0.11}

Section batch: 420 ms
Not per-question latency

QUESTION + OPTIONS

2^30 modulo 35?

A. 8

B. 29

C. 1

D. 16

REFERENCE ANSWER

B. 29

JEV / CORRECT

B. 29

API confidence: 0.21
Option probabilities:
{"B": 0.41, "D": 0.34, "A": 0.17, "C": 0.08}

Section batch: 420 ms
Not per-question latency

QUESTION + OPTIONS

Distinct primes p, q . Simplify $q^p \bmod pq$.

- A. p
- B. 1
- C. q
- D. 0

REFERENCE ANSWER

C. q

JEV / INCORRECT

D. 0

API confidence: 0.34
Option probabilities:
{ $"C"$: 0.36, $"B"$: 0.04, $"A"$: 0.09, $"D"$: 0.51}

Section batch: 420 ms
Not per-question latency

QUESTION + OPTIONS

There are pq -__ invertible residues modulo pq for distinct primes p,q . Fill the blank.

- A. $p+q-1$
- B. $p+q$
- C. $p+q+1$
- D. $pq-1$

REFERENCE ANSWER

A. $p+q-1$

JEV / CORRECT

A. $p+q-1$

API confidence: 0.93
Option probabilities:
{**"B"**: 0.03, **"D"**: 0.0, **"A"**: 0.95, **"C"**: 0.02}

Section batch: 420 ms
Not per-question latency

QUESTION + OPTIONS

Prime p : why is no a in $2..p-2$ its own inverse?

- A. The inverse operation has no fixed points in any field.
- B. $a=a^{-1}$ would imply $(a-1)(a+1)=0 \bmod p$. A field has no zero divisors, forcing $a=1$ or -1 , outside the range.
- C. All nonzero residues have inverse one.
- D. Every inverse is larger than its original residue.

REFERENCE ANSWER

B. $a=a^{-1}$ would imply $(a-1)(a+1)=0 \bmod p$. A field has no zero divisors, forcing $a=1$ or -1 , outside the range.

JEV / CORRECT

B. $a=a^{-1}$ would imply $(a-1)(a+1)=0 \bmod p$. A field has no zero divisors, forcing $a=1$ or -1 , outside the range.

API confidence: 1.00
Option probabilities:
{`"D"`: 0.0, `"A"`: 0.0, `"B"`: 1.0, `"C"`: 0.0}

Section batch: 428 ms
Not per-question latency

QUESTION + OPTIONS

Product of all residues $1, \dots, p-1$ modulo prime p ?

- A. 0
- B. $p-2$
- C. $p-1$
- D. 1

REFERENCE ANSWER

C. $p-1$

JEV / CORRECT

C. $p-1$

API confidence: 0.98
Option probabilities:
{ "C": 0.99, "A": 0.0, "B": 0.0, "D": 0.01 }

Section batch: 428 ms
Not per-question latency

QUESTION + OPTIONS

Distinct odd primes p, q : construct a nontrivial self-inverse unit modulo pq .

- A. Set $a=p$, since any prime is its own inverse.
- B. Set $a=0$, whose inverse equals itself.
- C. CRT choose $a=1 \bmod p$ and $a=-1 \bmod q$. Then $a^2=1$ modulo both primes, but a is neither 1 nor -1 modulo pq .
- D. Use $a=pq-1$, which lies in the required nontrivial range $2..pq-2$.

REFERENCE ANSWER

C. CRT choose $a=1 \bmod p$ and $a=-1 \bmod q$. Then $a^2=1$ modulo both primes, but a is neither 1 nor -1 modulo pq .

JEV / CORRECT

C. CRT choose $a=1 \bmod p$ and $a=-1 \bmod q$. Then $a^2=1$ modulo both primes, but a is neither 1 nor -1 modulo pq .

API confidence: 1.00
Option probabilities:
{ $"D"$: 0.0, $"A"$: 0.0, $"B"$: 0.0, $"C"$: 1.0}

Section batch: 428 ms
Not per-question latency

QUESTION + OPTIONS

Give a degree-two polynomial over $\text{GF}(5)$ with roots 0 and 1.

- A. $x(x-1)$
- B. $(x-1)^2$
- C. x^2+1
- D. $x(x+1)$

REFERENCE ANSWER

A. $x(x-1)$

JEV / CORRECT

A. $x(x-1)$

API confidence: 1.00
Option probabilities:
{**"B"**: 0.0, **"D"**: 0.0, **"A"**: 1.0, **"C"**: 0.0}

Section batch: 386 ms
Not per-question latency

QUESTION + OPTIONS

Distinct formal P, Q have degrees d_P, d_Q over $\text{GF}(p), p > \max(d_P, d_Q)$. General tight upper bound on coordinates where $P=Q$?

- A. $\min(d_P, d_Q)$
- B. $d_P + d_Q$
- C. $\max(d_P, d_Q)$
- D. p

REFERENCE ANSWER

C. $\max(d_P, d_Q)$

Pre-run repair:
Specify field and size for a sharp degree-based bound.

JEV / INCORRECT

A. $\min(d_P, d_Q)$

API confidence: 0.33
Option probabilities:
{ $"B"$: 0.21, $"D"$: 0.01, $"A"$: 0.49, $"C"$: 0.29}

Section batch: 386 ms
Not per-question latency

QUESTION + OPTIONS

$P(x)=mx+b$ over $GF(p)$, prime $p>2$. One child receives $P(1)$, another $P(2)$, a third m ; b is secret.

Any two children can reconstruct b .

A. True

B. False

REFERENCE ANSWER

A. True

JEV / CORRECT

A. True

API confidence: 0.43
Option probabilities:
{"B": 0.28, "A": 0.72}

Section batch: 386 ms
Not per-question latency

QUESTION + OPTIONS

$P(x)=mx+b$ over $GF(p)$, prime $p>2$. One child receives $P(1)$, another $P(2)$, a third m ; b is secret.

Recover b given m and $P(1)$.

- A. $P(1)+m \bmod p$
- B. $P(1)-m \bmod p$
- C. $P(1)/m \bmod p$
- D. $m-P(1) \bmod p$

REFERENCE ANSWER

B. $P(1)-m \bmod p$

JEV / CORRECT

B. $P(1)-m \bmod p$

API confidence: 1.00
Option probabilities:
{**"B"**: 1.0, "D": 0.0, "A": 0.0, "C": 0.0}

Section batch: 386 ms
Not per-question latency

QUESTION + OPTIONS

The set of all subsets of the primes is countable.

A. True

B. False

REFERENCE ANSWER

B. False

JEV / CORRECT

B. False

API confidence: 0.93
Option probabilities:
{**"B"**: 0.97, "A": 0.03}

Section batch: 328 ms
Not per-question latency

QUESTION + OPTIONS

For sets $A_1, \dots, A_n$, let $D = \{i \text{ in } 1..n: i \text{ is not in } A_i\}$. Then D differs from every A_i .

A. True

B. False

REFERENCE ANSWER

A. True

JEV / CORRECT

A. True

API confidence: 0.93
Option probabilities:
{**"B"**: 0.03, **"A"**: 0.97}

Section batch: 328 ms
Not per-question latency

QUESTION + OPTIONS

Programs that halt on input1 form a countable set.

A. False

B. True

REFERENCE ANSWER

B. True

JEV / CORRECT

B. True

API confidence: 0.90
Option probabilities:
{ "B": 0.95, "A": 0.05 }

Section batch: 328 ms
Not per-question latency

QUESTION + OPTIONS

A total algorithm can decide for any P, x and natural n whether $P(x)$ runs for more than n steps.

A. True

B. False

REFERENCE ANSWER

A. True

JEV / INCORRECT

B. False

API confidence: 0.85
Option probabilities:
{`"B"`: 0.93, `"A"`: 0.07}

Section batch: 328 ms
Not per-question latency

QUESTION + OPTIONS

Distinct arrangements of CAT?

- A. 6
- B. 1
- C. 9
- D. 3

REFERENCE ANSWER

A. 6

JEV / CORRECT

A. 6

API confidence: 1.00
Option probabilities:
{ "C": 0.0, "A": 1.0, "D": 0.0, "B": 0.0 }

Section batch: 344 ms
Not per-question latency

QUESTION + OPTIONS

Histograms with k named bins and n observations: nonnegative counts sum to n .
Count?

- A. k^n
- B. $C(n+k-1,k-1)$
- C. $C(n-1,k-1)$
- D. $C(n,k)$

REFERENCE ANSWER

B. $C(n+k-1,k-1)$

JEV / CORRECT

B. $C(n+k-1,k-1)$

API confidence: 0.99
Option probabilities:
{**"C"**: 0.0, "A": 0.0, "D": 0.0, "B": 1.0}

Section batch: 344 ms
Not per-question latency

QUESTION + OPTIONS

A staircase has k steps of heights one or two and total height $n, k \leq n \leq 2k$. Number of height-two steps?

- A. $n-k$
- B. $2k-n$
- C. k
- D. $n-2k$

REFERENCE ANSWER

A. $n-k$

JEV / CORRECT

A. $n-k$

API confidence: 0.98
Option probabilities:
{**"C"**: 0.0, **"A"**: 0.99, **"D"**: 0.0, **"B"**: 0.01}

Section batch: 344 ms
Not per-question latency

QUESTION + OPTIONS

Number of ordered staircases of k steps, each height one or two, total n ?

- A. $C(k,n-k)$
- B. $C(n-k,k)$
- C. $C(n,k)$
- D. 2^k

REFERENCE ANSWER

A. $C(k,n-k)$

JEV / CORRECT

A. $C(k,n-k)$

API confidence: 0.53
Option probabilities:
{**"C"**: 0.01, **"A"**: 0.64, **"D"**: 0.0, **"B"**: 0.35}

Section batch: 344 ms
Not per-question latency

QUESTION + OPTIONS

Uniformly choose bag A:4 red,4 blue or bag B:3 red,5 blue. Draw two marbles without replacement. E:both blue.

P(E given A)?

A. 1/2

B. 5/14

C. 3/14

D. 1/4

REFERENCE ANSWER

C. 3/14

JEV / CORRECT

C. 3/14

API confidence: 0.77
Option probabilities:
{ "D": 0.02, "B": 0.15, "A": 0.01, "C": 0.82 }

Section batch: 374 ms
Not per-question latency

QUESTION + OPTIONS

Uniformly choose bag A:4 red,4 blue or bag B:3 red,5 blue. Draw two marbles without replacement. E:both blue.

P(A given E)?

A. 3/8

B. 5/8

C. 1/2

D. 3/14

REFERENCE ANSWER

A. 3/8

JEV / CORRECT

A. 3/8

API confidence: 0.30
Option probabilities:
{ "B": 0.37, "C": 0.03, "A": 0.48, "D": 0.12 }

Section batch: 374 ms
Not per-question latency

QUESTION + OPTIONS

Roll two independent fair six-sided dice. $X = \text{sum modulo } 3, Y = \text{sum modulo } 4$.

$P(X=1)$?

A. $1/4$

B. $1/3$

C. $5/18$

D. $1/6$

REFERENCE ANSWER

B. $1/3$

JEV / CORRECT

B. $1/3$

API confidence: 0.63
Option probabilities:
{ "B": 0.72, "C": 0.24, "A": 0.02, "D": 0.02 }

Section batch: 374 ms
Not per-question latency

QUESTION + OPTIONS

Roll two independent fair six-sided dice. $X = \text{sum modulo } 3, Y = \text{sum modulo } 4$.

$P(Y=3)$?

A. $1/4$

B. $1/6$

C. $5/18$

D. $1/3$

REFERENCE ANSWER

C. $5/18$

JEV / CORRECT

C. $5/18$

API confidence: 0.23
Option probabilities:
{ $"C"$: 0.43, $"D"$: 0.04, $"A"$: 0.35, $"B"$: 0.18}

Section batch: 374 ms
Not per-question latency

QUESTION + OPTIONS

Roll two independent fair six-sided dice. $X = \text{sum modulo } 3, Y = \text{sum modulo } 4$.

$P(X=1 \text{ and } Y=3)$?

- A. $1/3$
- B. $1/6$
- C. $5/54$
- D. $1/12$

REFERENCE ANSWER

B. $1/6$

JEV / INCORRECT

C. $5/54$

API confidence: 0.36
Option probabilities:
{ $"B"$: 0.12, $"C"$: 0.51, $"A"$: 0.01, $"D"$: 0.36}

Section batch: 374 ms
Not per-question latency

QUESTION + OPTIONS

Roll two independent fair six-sided dice. $X = \text{sum modulo } 3, Y = \text{sum modulo } 4$.

$P(X=1 \text{ or } Y=3)$?

A. $11/18$

B. $4/9$

C. $5/54$

D. $1/2$

REFERENCE ANSWER

B. $4/9$

JEV / INCORRECT

A. $11/18$

API confidence: 0.43
Option probabilities:
{ $"B"$: 0.23, $"C"$: 0.01, $"A"$: 0.57, $"D"$: 0.19}

Section batch: 374 ms
Not per-question latency

QUESTION + OPTIONS

Prize uniformly behind one of three doors. You choose door1. Host, unaware of prize, uniformly opens door2 or3; if prize revealed you lose. A:host reveals no prize; B:prize is behind door1.

P(A)?

A. 2/3

B. 1/2

C. 1

D. 1/3

REFERENCE ANSWER

A. 2/3

JEV / CORRECT

A. 2/3

API confidence: 0.89
Option probabilities:
{"B": 0.04, "C": 0.03, "A": 0.91, "D": 0.02}

Section batch: 374 ms
Not per-question latency

QUESTION + OPTIONS

Prize uniformly behind one of three doors. You choose door1. Host, unaware of prize, uniformly opens door2 or3; if prize revealed you lose. A:host reveals no prize; B:prize is behind door1.

P(B given A)?

A. 1/3

B. 2/3

C. 1

D. 1/2

REFERENCE ANSWER

D. 1/2

JEV / CORRECT

D. 1/2

API confidence: 0.26
Option probabilities:
{"B": 0.24, "C": 0.01, "A": 0.3, "D": 0.45}

Section batch: 374 ms
Not per-question latency

QUESTION + OPTIONS

n distinct balls independently choose uniform bins among n named bins. X counts balls in bin1.

P(X=0)?

A. $\exp(-n)$

B. $(1-1/n)^n$

C. $(1/n)^n$

D. $1-1/n$

REFERENCE ANSWER

B. $(1-1/n)^n$

JEV / CORRECT

B. $(1-1/n)^n$

API confidence: 1.00
Option probabilities:
{ "D": 0.0, "B": 1.0, "A": 0.0, "C": 0.0 }

Section batch: 330 ms
Not per-question latency

QUESTION + OPTIONS

n distinct balls independently choose uniform bins among n named bins. X counts balls in bin1.

Distribution of X?

A. Poisson(n)

B. Uniform{0,...,n}

C. Geom(1/n)

D. Bin(n,1/n)

REFERENCE ANSWER

D. Bin(n,1/n)

JEV / CORRECT

D. Bin(n,1/n)

API confidence: 1.00
Option probabilities:
{ "B": 0.0, "D": 1.0, "A": 0.0, "C": 0.0 }

Section batch: 330 ms
Not per-question latency

QUESTION + OPTIONS

n distinct balls independently choose uniform bins among n named bins. X counts balls in bin1.

Limit of $P(X=10)$ as n grows?

- A. $1/10$
- B. 0
- C. $\exp(-1)/10!$
- D. $\exp(-10)$

REFERENCE ANSWER

C. $\exp(-1)/10!$

JEV / CORRECT

C. $\exp(-1)/10!$

API confidence: 0.52
Option probabilities:
{`"D"`: 0.0, `"B"`: 0.36, `"A"`: 0.0, `"C"`: 0.64}

Section batch: 330 ms
Not per-question latency

QUESTION + OPTIONS

100 independent fair flips. X =number of heads minus number of tails; $Y=X^2$.

$P(X=0)$?

- A. $1/2$
- B. $C(100,0)/2^{100}$
- C. $1/101$
- D. $C(100,50)/2^{100}$

REFERENCE ANSWER

D. $C(100,50)/2^{100}$

JEV / CORRECT

D. $C(100,50)/2^{100}$

API confidence: 1.00
Option probabilities:
{ $"D"$: 1.0, $"B"$: 0.0, $"A"$: 0.0, $"C"$: 0.0}

Section batch: 330 ms
Not per-question latency

QUESTION + OPTIONS

100 independent fair flips. X =number of heads minus number of tails; $Y=X^2$.

$E[X]$?

A. 50

B. 0

C. $1/2$

D. 100

REFERENCE ANSWER

B. 0

JEV / CORRECT

B. 0

API confidence: 1.00
Option probabilities:
{**"B"**: 1.0, "D": 0.0, "A": 0.0, "C": 0.0}

Section batch: 330 ms
Not per-question latency

QUESTION + OPTIONS

100 independent fair flips. X =number of heads minus number of tails; $Y=X^2$.

Are X,Y independent? Justify.

A. Yes; their covariance is zero.

B. No; $E[Y]$ is negative.

C. Yes; independent flips imply any functions of them are independent.

D. No; $Y=0$ forces $X=0$, whereas $P(X=0)<1$.

REFERENCE ANSWER

D. No; $Y=0$ forces $X=0$,
whereas $P(X=0)<1$.

JEV / CORRECT

D. No; $Y=0$ forces $X=0$,
whereas $P(X=0)<1$.

API confidence: 1.00
Option probabilities:
{ $"D"$: 1.0, $"B"$: 0.0, $"A"$: 0.0, $"C"$: 0.0}

Section batch: 330 ms
Not per-question latency

QUESTION + OPTIONS

100 independent fair flips. X =number of heads minus number of tails; $Y=X^2$.

$\text{Cov}(X,Y)$?

- A. 0
- B. 100
- C. -100
- D. 10000

REFERENCE ANSWER

A. 0

JEV / CORRECT

A. 0

API confidence: 0.83
Option probabilities:
{ $"D"$: 0.01, $"B"$: 0.11, $"A"$: 0.87, $"C"$: 0.01}

Section batch: 330 ms
Not per-question latency

QUESTION + OPTIONS

Uniform random linear permutation of $2n$ distinct socks, $n \geq 2$ labeled left-right matching pairs. X counts pairs whose two socks are adjacent.

Probability pair1 is adjacent?

- A. $1/n$
- B. $1/(2n-1)$
- C. $2/n$
- D. $2/(2n-1)$

REFERENCE ANSWER

A. $1/n$

JEV / INCORRECT

D. $2/(2n-1)$

API confidence: 0.53
Option probabilities:
{ "D": 0.64, "A": 0.03, "B": 0.32, "C": 0.01 }

Section batch: 419 ms
Not per-question latency

QUESTION + OPTIONS

Uniform random linear permutation of $2n$ distinct socks, $n \geq 2$ labeled left-right matching pairs. X counts pairs whose two socks are adjacent.

$E[X]$?

- A. 1
- B. n
- C. $n/2$
- D. 2

REFERENCE ANSWER

A. 1

JEV / CORRECT

A. 1

API confidence: 0.50
Option probabilities:
{`"D"`: 0.05, `"A"`: 0.62, `"B"`: 0.11, `"C"`: 0.22}

Section batch: 419 ms
Not per-question latency

QUESTION + OPTIONS

Uniform random linear permutation of $2n$ distinct socks, $n \geq 2$ labeled left-right matching pairs. X counts pairs whose two socks are adjacent.

Probability both pairs 1 and 2 are adjacent?

- A. $2/((2n)(2n-1))$
- B. $4/((2n-1)(2n-2))$
- C. $1/n^2$
- D. $4/((2n)(2n-1))$

REFERENCE ANSWER

D. $4/((2n)(2n-1))$

JEV / INCORRECT

B. $4/((2n-1)(2n-2))$

API confidence: 0.34
Option probabilities:
{ "D": 0.25, "A": 0.23, "B": 0.51, "C": 0.01 }

Section batch: 419 ms
Not per-question latency

QUESTION + OPTIONS

Uniform random linear permutation of $2n$ distinct socks, $n \geq 2$ labeled left-right matching pairs. X counts pairs whose two socks are adjacent.

Let $p = P(\text{pair 1 adjacent})$, $q = P(\text{pairs 1, 2 adjacent})$. $\text{Var}(X)$?

- A. $nq - n^2p^2$
- B. $np(1-p)$
- C. $np + n(n-1)q - n^2p^2$
- D. $np + n(n-1)q$

REFERENCE ANSWER

C. $np + n(n-1)q - n^2p^2$

JEV / CORRECT

C. $np + n(n-1)q - n^2p^2$

API confidence: 0.98
Option probabilities:
{ "D": 0.0, "A": 0.0, "B": 0.01, "C": 0.99 }

Section batch: 419 ms
Not per-question latency

QUESTION + OPTIONS

k students have independent uniform birthdays on 365 days.

Expected unordered pairs sharing a birthday?

A. $C(k,2)/365$

B. $C(k,2)/365^2$

C. $365/C(k,2)$

D. $k/365$

REFERENCE ANSWER

A. $C(k,2)/365$

JEV / CORRECT

A. $C(k,2)/365$

API confidence: 1.00
Option probabilities:
{ "D": 0.0, "A": 1.0, "B": 0.0, "C": 0.0 }

Section batch: 419 ms
Not per-question latency

QUESTION + OPTIONS

k students have independent uniform birthdays on 365 days.

Expected unordered triples sharing a birthday?

- A. $C(k,3)/365^3$
- B. $C(k,3)/365^2$
- C. $k/365^2$
- D. $C(k,3)/365$

REFERENCE ANSWER

B. $C(k,3)/365^2$

JEV / CORRECT

B. $C(k,3)/365^2$

API confidence: 0.85
Option probabilities:
{ "D": 0.04, "A": 0.07, "B": 0.89, "C": 0.0 }

Section batch: 419 ms
Not per-question latency

QUESTION + OPTIONS

k students have independent uniform birthdays on 365 days.

Variance of number of matching-birthday pairs?

A. $C(k,2) \cdot (1/365) \cdot (364/365)$

B. $C(k,2)/365^2$

C. $C(k,2)/365$

D. $C(k,2)^2 \cdot (1/365) \cdot (364/365)$

REFERENCE ANSWER

A. $C(k,2) \cdot (1/365) \cdot (364/365)$

JEV / CORRECT

A. $C(k,2) \cdot (1/365) \cdot (364/365)$

API confidence: 0.66
Option probabilities:
{ "D": 0.11, "A": 0.75, "B": 0.02, "C": 0.12 }

Section batch: 419 ms
Not per-question latency

QUESTION + OPTIONS

Independent biased coin flips with heads probability $p > 0$. X counts flips through the k th head, $k \geq 1$; $Y = X/k$.

Why is Y unbiased for $1/p$?

- A. The inverse of any unbiased estimator of p is unbiased for $1/p$.
- B. X is geometric with parameter kp , so dividing by k yields $1/p$.
- C. X always equals k/p , so Y has no sampling variability.
- D. Split X into k independent geometric waiting times, each mean $1/p$; $E[X] = k/p$ and $E[Y] = 1/p$.

REFERENCE ANSWER

D. Split X into k independent geometric waiting times, each mean $1/p$; $E[X] = k/p$ and $E[Y] = 1/p$.

JEV / CORRECT

D. Split X into k independent geometric waiting times, each mean $1/p$; $E[X] = k/p$ and $E[Y] = 1/p$.

API confidence: 1.00
Option probabilities:
{ "C": 0.0, "A": 0.0, "D": 1.0, "B": 0.0 }

Section batch: 309 ms
Not per-question latency

QUESTION + OPTIONS

Independent biased coin flips with heads probability $p > 0$. X counts flips through the k th head, $k \geq 1$; $Y = X/k$.

$\text{Var}(Y)$?

A. $k \cdot (1-p)/p^2$

B. $(1-p)/(k^2 \cdot p^2)$

C. $(1-p)/p^2$

D. $(1-p)/(k \cdot p^2)$

REFERENCE ANSWER

D. $(1-p)/(k \cdot p^2)$

JEV / CORRECT

D. $(1-p)/(k \cdot p^2)$

API confidence: 0.95
Option probabilities:
{ "C": 0.0, "B": 0.03, "A": 0.0, "D": 0.97 }

Section batch: 309 ms
Not per-question latency

QUESTION + OPTIONS

Independent biased coin flips with heads probability $p > 0$. X counts flips through the k th head, $k \geq 1$; $Y = X/k$.

Chebyshev bound for $P(|Y - 1/p| \geq \epsilon/p)$, clipped at 1?

- A. $\min(1, (1-p)/(\epsilon^2 k p^2))$
- B. $\min(1, (1-p)/(\epsilon k))$
- C. $\min(1, p/(\epsilon^2 k))$
- D. $\min(1, (1-p)/(\epsilon^2 k))$

REFERENCE ANSWER

D. $\min(1, (1-p)/(\epsilon^2 k))$

JEV / CORRECT

D. $\min(1, (1-p)/(\epsilon^2 k))$

API confidence: 0.92
Option probabilities:
{ "D": 0.95, "B": 0.0, "C": 0.0, "A": 0.05 }

Section batch: 309 ms
Not per-question latency

QUESTION + OPTIONS

Independent biased coin flips with heads probability $p > 0$. X counts flips through the k th head, $k \geq 1$; $Y = X/k$.

Only $p \geq 1/2$ is known. Smallest k certified by that Chebyshev bound for relative error strictly below 10% with probability at least 95%?

- A. 100
- B. 2000
- C. 500
- D. 1000

REFERENCE ANSWER

D. 1000

JEV / INCORRECT

B. 2000

API confidence: 0.10
Option probabilities:
{ "C": 0.23, "B": 0.33, "A": 0.15, "D": 0.29 }

Section batch: 309 ms
Not per-question latency

QUESTION + OPTIONS

Drive 360 miles at one speed S chosen uniformly in $[40,60]$ mph. Expected hours?
Give a valid integral and value.

- A. $E[S]/360=50/360$
- B. $(1/20)\text{integral}(40..60)360/s \text{ ds}=18\ln(3/2)$
- C. $360/E[S]=360/50$
- D. $\text{integral}(40..60)360/s \text{ ds}=360\ln(3/2)$

REFERENCE ANSWER

B. $(1/20)\text{integral}(40..60)360/s \text{ ds}=18\ln(3/2)$

JEV / CORRECT

B. $(1/20)\text{integral}(40..60)360/s \text{ ds}=18\ln(3/2)$

API confidence: 0.99
Option probabilities:
{ $"C"$: 0.0, $"B"$: 0.99, $"A"$: 0.0, $"D"$: 0.01}

Section batch: 312 ms
Not per-question latency

QUESTION + OPTIONS

Independent $X, Y, Z \sim \text{Uniform}[0, 1]$.

CDF of $\max(X, Y, Z)$ on $[0, 1]$?

- A. t^3
- B. $1-(1-t)^3$
- C. $3t^2$
- D. t

REFERENCE ANSWER

A. t^3

JEV / CORRECT

A. t^3

API confidence: 0.89
Option probabilities:
{`"D"`: 0.0, `"B"`: 0.08, `"C"`: 0.0, `"A"`: 0.92}

Section batch: 312 ms
Not per-question latency

QUESTION + OPTIONS

Independent $X, Y, Z \sim \text{Uniform}[0, 1]$.

PDF of $\max(X, Y, Z)$ on $[0, 1]$?

A. $3(1-t)^2$

B. $3t^2$

C. 1

D. t^3

REFERENCE ANSWER

B. $3t^2$

JEV / CORRECT

B. $3t^2$

API confidence: 1.00
Option probabilities:
{ $"D"$: 0.0, $"A"$: 0.0, $"C"$: 0.0, $"B"$: 1.0}

Section batch: 312 ms
Not per-question latency

QUESTION + OPTIONS

Independent $X, Y, Z \sim \text{Uniform}[0, 1]$.

$E[\max(X, Y, Z)]$?

A. $3/4$

B. $1/2$

C. $1/4$

D. $2/3$

REFERENCE ANSWER

A. $3/4$

JEV / CORRECT

A. $3/4$

API confidence: 0.99
Option probabilities:
{`"D": 0.0, "A": 1.0, "C": 0.0, "B": 0.0`}

Section batch: 312 ms
Not per-question latency

QUESTION + OPTIONS

Independent $X, Y, Z \sim \text{Uniform}[0, 1]$.

PDF of $\min(X, Y, Z)$ on $[0, 1]$?

- A. $3t^2$
- B. $1-t^3$
- C. $(1-t)^3$
- D. $3(1-t)^2$

REFERENCE ANSWER

D. $3(1-t)^2$

JEV / CORRECT

D. $3(1-t)^2$

API confidence: 0.99
Option probabilities:
{**"C"**: 0.0, "B": 0.0, "A": 0.01, "D": 0.99}

Section batch: 312 ms
Not per-question latency

QUESTION + OPTIONS

Independent $X,Y,Z \sim \text{Uniform}[0,1]$.

Expected median of X,Y,Z ?

A. $1/4$

B. $1/2$

C. $2/3$

D. $3/4$

REFERENCE ANSWER

B. $1/2$

JEV / CORRECT

B. $1/2$

API confidence: 0.99
Option probabilities:
{ $"D"$: 0.0, $"B"$: 1.0, $"C"$: 0.0, $"A"$: 0.0}

Section batch: 312 ms
Not per-question latency

QUESTION + OPTIONS

Independent $TS \sim N(\text{mean}4, \text{variance}0.2)$, $TJ \sim N(\text{mean}4, \text{variance}0.3)$.

Distribution of $TS+TJ$, second parameter variance?

- A. $N(8,0.13)$
- B. $N(4,0.5)$
- C. $N(8,0.1)$
- D. $N(8,0.5)$

REFERENCE ANSWER

D. $N(8,0.5)$

JEV / CORRECT

D. $N(8,0.5)$

API confidence: 1.00
Option probabilities:
{**"D"**: 1.0, "B": 0.0, "A": 0.0, "C": 0.0}

Section batch: 312 ms
Not per-question latency

QUESTION + OPTIONS

Independent $TS \sim N(\text{mean}4, \text{variance}0.2)$, $TJ \sim N(\text{mean}4, \text{variance}0.3)$.

Distribution of $TS - TJ$, second parameter variance?

- A. $N(0, 0.5)$
- B. $N(0, 0.1)$
- C. $N(8, 0.5)$
- D. $N(0, -0.1)$

REFERENCE ANSWER

A. $N(0, 0.5)$

JEV / CORRECT

A. $N(0, 0.5)$

API confidence: 0.91
Option probabilities:
{ $"D"$: 0.0, $"A"$: 0.93, $"C"$: 0.0, $"B"$: 0.07}

Section batch: 312 ms
Not per-question latency

QUESTION + OPTIONS

Independent $TS \sim N(\text{mean}4, \text{variance}0.2), TJ \sim N(\text{mean}4, \text{variance}0.3)$.

$P(TS > TJ)$?

A. 2/5

B. 0

C. 1/2

D. 3/5

REFERENCE ANSWER

C. 1/2

JEV / CORRECT

C. 1/2

API confidence: 0.76
Option probabilities:
{ "C": 0.82, "B": 0.01, "A": 0.11, "D": 0.06 }

Section batch: 312 ms
Not per-question latency

QUESTION + OPTIONS

Uniformly choose one of three circular boards with positive radii a, b, c , then throw a dart uniformly over the chosen board's area.

Expected distance to center?

- A. $(a+b+c)/6$
- B. $(a+b+c)/3$
- C. $2(a^2+b^2+c^2)/9$
- D. $2(a+b+c)/9$

REFERENCE ANSWER

D. $2(a+b+c)/9$

JEV / CORRECT

D. $2(a+b+c)/9$

API confidence: 0.97
Option probabilities:
{**"B"**: 0.01, **"D"**: 0.98, "A": 0.01, "C": 0.0}

Section batch: 354 ms
Not per-question latency

QUESTION + OPTIONS

Uniformly choose one of three circular boards with positive radii a, b, c , then throw a dart uniformly over the chosen board's area.

Justify the expected distance.

- A. The mean distance equals the radius by rotational symmetry.
- B. Boards must be weighted proportional to their area, despite uniform board selection.
- C. Distance is uniform on $[0, r]$, so each conditional mean is $r/2$.
- D. At fixed radius r , radial density $2x/r^2$ yields conditional mean $2r/3$. Average these means with weight $1/3$ over the three boards.

REFERENCE ANSWER

D. At fixed radius r , radial density $2x/r^2$ yields conditional mean $2r/3$. Average these means with weight $1/3$ over the three boards.

JEV / CORRECT

D. At fixed radius r , radial density $2x/r^2$ yields conditional mean $2r/3$. Average these means with weight $1/3$ over the three boards.

API confidence: 0.99
Option probabilities:
{ "B": 0.0, "D": 1.0, "C": 0.0, "A": 0.0 }

Section batch: 354 ms
Not per-question latency

QUESTION + OPTIONS

Y has mean7,variance2. Independent $Z \sim N(\text{mean}3, \text{variance}5)$. $X=Y+Z$.

Given $Y=y$, give the minimum-MSE estimate of X and its conditional MSE.

A. (y+3,7)

B. (y+7,2)

C. (y+3,5)

D. (10,7)

REFERENCE ANSWER

C. (y+3,5)

JEV / CORRECT

C. (y+3,5)

API confidence: 0.85
Option probabilities:
{ "B": 0.0, "D": 0.0, "C": 0.89, "A": 0.11 }

Section batch: 354 ms
Not per-question latency

QUESTION + OPTIONS

Y has mean7,variance2. Independent $Z \sim N(\text{mean}3,\text{variance}5)$. $X=Y+Z$.

Best affine estimator of X from Y?

- A. $(2/7)Y+8$
- B. $Y+7$
- C. 10
- D. $Y+3$

REFERENCE ANSWER

D. $Y+3$

JEV / CORRECT

D. $Y+3$

API confidence: 0.96
Option probabilities:
{**"B"**: 0.01, **"D"**: 0.97, "C": 0.0, "A": 0.02}

Section batch: 354 ms
Not per-question latency

QUESTION + OPTIONS

$X \sim N(69, 3), Y_1, Y_2 \sim N(0, 1)$ mutually independent, second parameters variances.
Twins have $Z_1 = X + Y_1, Z_2 = X + Y_2$. Best affine estimator of Z_2 given Z_1 ?

- A. Z_1
- B. $69 + (4/3)(Z_1 - 69)$
- C. $69 + (3/4)(Z_1 - 69)$
- D. $69 + (1/4)(Z_1 - 69)$

REFERENCE ANSWER

C. $69 + (3/4)(Z_1 - 69)$

JEV / CORRECT

C. $69 + (3/4)(Z_1 - 69)$

API confidence: 0.48
Option probabilities:
{ "B": 0.37, "D": 0.01, "C": 0.6, "A": 0.02 }

Section batch: 354 ms
Not per-question latency

QUESTION + OPTIONS

Chain states 0,1,2. Row0:[1-p,p,0]; row1:[1-p,0,p]; row2:[0,1-p,p].

p=1/3. Choose stationary equations plus normalization.

- A. $\pi_0=\pi_1=\pi_2=1/3$
- B. $\pi_0=2\pi_0/3$; $\pi_1=\pi_0/3$; $\pi_2=\pi_1/3+\pi_2$; sum $\pi=1$
- C. $\pi_0=2(\pi_0+\pi_1)/3$; $\pi_1=\pi_0/3+2\pi_2/3$; $\pi_2=(\pi_1+\pi_2)/3$; sum $\pi=1$
- D. $\pi_0=2\pi_0/3+\pi_1/3$; $\pi_1=2\pi_0/3+\pi_2/3$; $\pi_2=2\pi_1/3+\pi_2/3$; sum $\pi=1$

REFERENCE ANSWER

C. $\pi_0=2(\pi_0+\pi_1)/3$;
 $\pi_1=\pi_0/3+2\pi_2/3$;
 $\pi_2=(\pi_1+\pi_2)/3$; sum $\pi=1$

JEV / CORRECT

C. $\pi_0=2(\pi_0+\pi_1)/3$;
 $\pi_1=\pi_0/3+2\pi_2/3$;
 $\pi_2=(\pi_1+\pi_2)/3$; sum $\pi=1$

API confidence: 0.21
Option probabilities:
{ "C": 0.4, "B": 0.02, "D": 0.37, "A": 0.21 }

Section batch: 368 ms
Not per-question latency

QUESTION + OPTIONS

Chain states 0,1,2. Row0:[1-p,p,0]; row1:[1-p,0,p]; row2:[0,1-p,p]. Now choose p such that stationary masses are (1,3,9)/13. X has that stationary law and Y=0 for X=0 or 1, Y=1 for X=2.

E[X given Y]?

- A. 3/4 if Y=0;2 if Y=1
- B. 1/2 if Y=0;2 if Y=1
- C. 3/13 if Y=0;18/13 if Y=1
- D. 0 if Y=0;1 if Y=1

REFERENCE ANSWER

A. 3/4 if Y=0;2 if Y=1

JEV / CORRECT

A. 3/4 if Y=0;2 if Y=1

API confidence: 0.66
Option probabilities:
{ "C": 0.01, "D": 0.01, "B": 0.23, "A": 0.75 }

Section batch: 368 ms
Not per-question latency

QUESTION + OPTIONS

Chain states 0,1,2. Row0:[1-p,p,0]; row1:[1-p,0,p]; row2:[0,1-p,p]. Now choose p such that stationary masses are (1,3,9)/13. X has that stationary law and Y=0 for X=0 or1, Y=1 for X=2.

Best affine estimate of X as aY+b?

A. $(5/4)Y+3/4$

B. $(3/4)Y+5/4$

C. $(18/13)Y+3/13$

D. 2Y

REFERENCE ANSWER

A. $(5/4)Y+3/4$

JEV / CORRECT

A. $(5/4)Y+3/4$

API confidence: 0.23
Option probabilities:
{ "C": 0.32, "B": 0.16, "D": 0.09, "A": 0.43 }

Section batch: 368 ms
Not per-question latency

QUESTION + OPTIONS

Roll a fair six-sided die until the product of the last two rolls is 15. State A = start or previous roll in {1, 2, 4, 6}; B = previous in {3, 5} but target not hit; C = target hit, then stop and remain at C.

Give (PAA, PAB, PBA, PBB, PBC, PCC).

- A. (1/3, 2/3, 1/3, 1/3, 1/3, 1)
- B. (2/3, 1/3, 2/3, 0, 1/3, 1)
- C. (2/3, 1/3, 1/6, 2/3, 1/6, 1)
- D. (2/3, 1/3, 2/3, 1/6, 1/6, 1)

REFERENCE ANSWER

D. (2/3, 1/3, 2/3, 1/6, 1/6, 1)

JEV / CORRECT

D. (2/3, 1/3, 2/3, 1/6, 1/6, 1)

API confidence: 0.54
Option probabilities:
{ "C": 0.14, "B": 0.08, "D": 0.66, "A": 0.12 }

Section batch: 368 ms
Not per-question latency

QUESTION + OPTIONS

Roll a fair six-sided die until the product of the last two rolls is 15. State A = start or previous roll in $\{1, 2, 4, 6\}$; B = previous in $\{3, 5\}$ but target not hit; C = target hit, then stop and remain at C .

This stopped chain is irreducible.

A. True

B. False

REFERENCE ANSWER

B. False

JEV / CORRECT

B. False

API confidence: 0.98
Option probabilities:
{"B": 0.99, "A": 0.01}

Section batch: 368 ms
Not per-question latency

QUESTION + OPTIONS

Roll a fair six-sided die until the product of the last two rolls is 15. State A = start or previous roll in {1, 2, 4, 6}; B = previous in {3, 5} but target not hit; C = target hit, then stop and remain at C.

Every state of this chain has period one.

A. False

B. True

REFERENCE ANSWER

B. True

JEV / CORRECT

B. True

API confidence: 0.19
Option probabilities:
{ "B": 0.6, "A": 0.4 }

Section batch: 368 ms
Not per-question latency

QUESTION + OPTIONS

Roll a fair six-sided die until the product of the last two rolls is 15. State A = start or previous roll in {1, 2, 4, 6}; B = previous in {3, 5} but target not hit; C = target hit, then stop and remain at C.

Let $a_0 = P_{AA}$, $a_1 = P_{AB}$, $b_1 = P_{BA}$, $b_0 = P_{BB}$, $b_2 = P_{BC}$, $c_0 = P_{CC}$. Equations for expected remaining rolls beta to hit C?

- A. $\beta_A = a_0 \beta_A + a_1 \beta_B$; $\beta_B = b_1 \beta_A + b_0 \beta_B + b_2 \beta_C$; $\beta_C = 0$
- B. $\beta_A = 1 + a_0 \beta_A + b_1 \beta_B$; $\beta_B = 1 + a_1 \beta_A + b_0 \beta_B$; $\beta_C = 0$
- C. $\beta_A = 1 + a_0 \beta_A + a_1 \beta_B$; $\beta_B = 1 + b_1 \beta_A + b_0 \beta_B + b_2 \beta_C$; $\beta_C = 1 + c_0 \beta_C$
- D. $\beta_A = 1 + a_0 \beta_A + a_1 \beta_B$; $\beta_B = 1 + b_1 \beta_A + b_0 \beta_B + b_2 \beta_C$; $\beta_C = 0$

REFERENCE ANSWER

D.
 $\beta_A = 1 + a_0 \beta_A + a_1 \beta_B$;
 $\beta_B = 1 + b_1 \beta_A + b_0 \beta_B + b_2 \beta_C$; $\beta_C = 0$

JEV / CORRECT

D.
 $\beta_A = 1 + a_0 \beta_A + a_1 \beta_B$;
 $\beta_B = 1 + b_1 \beta_A + b_0 \beta_B + b_2 \beta_C$; $\beta_C = 0$

API confidence: 0.92
Option probabilities:
{ "C": 0.01, "B": 0.04, "D": 0.94, "A": 0.01 }

Section batch: 368 ms
Not per-question latency

QUESTION + OPTIONS

Truth status of P OR Q OR R OR NOT R?

- A. False
- B. Could be either
- C. True

REFERENCE ANSWER

C. True

JEV / CORRECT

C. True

API confidence: 0.99
Option probabilities:
{ "B": 0.01, "A": 0.0, "C": 0.99 }

Section batch: 351 ms
Not per-question latency

QUESTION + OPTIONS

Truth status of (NOT P implies (R AND NOT R)) implies P?

- A. True
- B. False
- C. Could be either

REFERENCE ANSWER

A. True

JEV / CORRECT

A. True

API confidence: 0.92
Option probabilities:
{ "B": 0.02, "A": 0.95, "C": 0.03 }

Section batch: 351 ms
Not per-question latency

QUESTION + OPTIONS

Truth status of (R AND NOT R) OR (Q AND P)?

- A. Could be either
- B. False
- C. True

REFERENCE ANSWER

A. Could be either

JEV / CORRECT

A. Could be either

API confidence: 0.88
Option probabilities:
{ "B": 0.07, "A": 0.93, "C": 0.0 }

Section batch: 351 ms
Not per-question latency

QUESTION + OPTIONS

For all x in nonempty U , $P(x)$ implies $[Q(x) \text{ OR exists } y \text{ } R(x,y)]$.

$P(x)$ is true and all $R(x,y)$ false. Truth status of $Q(x)$?

A. Could be either

B. True

C. False

REFERENCE ANSWER

B. True

JEV / CORRECT

B. True

API confidence: 0.99
Option probabilities:
{**"B"**: 0.99, "A": 0.01, "C": 0.0}

Section batch: 351 ms
Not per-question latency

QUESTION + OPTIONS

For all x in nonempty U , $P(x)$ implies $[Q(x) \text{ OR exists } y \text{ } R(x,y)]$.

$Q(x)$ is false and all $R(x,y)$ false. Truth status of $P(x)$?

- A. True
- B. Could be either
- C. False

REFERENCE ANSWER

C. False

JEV / CORRECT

C. False

API confidence: 0.98
Option probabilities:
{ $"B"$: 0.01, $"A"$: 0.0, $"C"$: 0.99}

Section batch: 351 ms
Not per-question latency

QUESTION + OPTIONS

For all x in nonempty U , $P(x)$ implies $[Q(x) \text{ OR exists } y R(x,y)]$.

$P(x)$ is true and some $R(x,y)$ true. Truth status of $Q(x)$?

- A. False
- B. True
- C. Could be either

REFERENCE ANSWER

C. Could be either

JEV / CORRECT

C. Could be either

API confidence: 1.00
Option probabilities:
{ "B": 0.0, "A": 0.0, "C": 1.0 }

Section batch: 351 ms
Not per-question latency

QUESTION + OPTIONS

Express $|a-b|$ using only $\min(a,b)$ and $\max(a,b)$.

- A. $\max(a,b)-\min(a,b)$
- B. $\max(a,b)*\min(a,b)$
- C. $\min(a,b)-\max(a,b)$
- D. $\max(a,b)+\min(a,b)$

REFERENCE ANSWER

A. $\max(a,b)-\min(a,b)$

JEV / CORRECT

A. $\max(a,b)-\min(a,b)$

API confidence: 1.00
Option probabilities:
{ $"D"$: 0.0, $"B"$: 0.0, $"A"$: 1.0, $"C"$: 0.0}

Section batch: 351 ms
Not per-question latency

QUESTION + OPTIONS

Complete: forall n $[P(n) \Rightarrow P(n+1)]$ is equivalent to NOT exists n $[P(n) \text{ AND } \underline{\hspace{1cm}}]$.

- A. NOT $P(n+1)$
- B. $P(n+1)$
- C. $P(n)$
- D. NOT $P(n)$

REFERENCE ANSWER

A. NOT $P(n+1)$

JEV / CORRECT

A. NOT $P(n+1)$

API confidence: 0.99
Option probabilities:
{ $"C"$: 0.0, $"A"$: 0.99, $"B"$: 0.0, $"D"$: 0.01}

Section batch: 382 ms
Not per-question latency

QUESTION + OPTIONS

$F_0=F_1=1$ and $F_i=F_{i-1}+F_{i-2}$.

Largest real $c \geq 1$ such that $F_i \geq c^{i-1}$ for every $i \geq 1$?

A. $3/2$

B. 2

C. $(1+\sqrt{5})/2$

D. $\sqrt{2}$

REFERENCE ANSWER

C. $(1+\sqrt{5})/2$

JEV / CORRECT

C. $(1+\sqrt{5})/2$

API confidence: 0.75
Option probabilities:
{**"C"**: 0.8099999999999999, **"B"**: 0.0, **"A"**: 0.04, **"D"**: 0.15}

Section batch: 382 ms
Not per-question latency

QUESTION + OPTIONS

$F_0=F_1=1$ and $F_i=F_{i-1}+F_{i-2}$.

Which proves the optimal exponential lower bound?

- A. Let $\phi=(1+\sqrt{5})/2$, so $\phi^2=\phi+1$. Bases $i=1,2$ hold, and adding inductive bounds gives $F_i\geq\phi^{i-1}$. Similarly $F_i\leq\phi^i$; any $c>\phi$ eventually has $c^{i-1}>\phi^i$, so cannot work for all i .
- B. A lower bound that works for one i must work for every later i .
- C. Since $F_2=2$, $c=2$ works for every i without checking the recurrence.
- D. The recurrence implies $F_i=\phi^{i-1}$ exactly for all i .

REFERENCE ANSWER

A. Let $\phi=(1+\sqrt{5})/2$, so $\phi^2=\phi+1$. Bases $i=1,2$ hold, and adding inductive bounds gives $F_i\geq\phi^{i-1}$. Similarly $F_i\leq\phi^i$; any $c>\phi$ eventually has $c^{i-1}>\phi^i$, so cannot work for all i .

JEV / CORRECT

A. Let $\phi=(1+\sqrt{5})/2$, so $\phi^2=\phi+1$. Bases $i=1,2$ hold, and adding inductive bounds gives $F_i\geq\phi^{i-1}$. Similarly $F_i\leq\phi^i$; any $c>\phi$ eventually has $c^{i-1}>\phi^i$, so cannot work for all i .

API confidence: 1.00
Option probabilities:
{ "C": 0.0, "B": 0.0, "A": 1.0, "D": 0.0 }

Section batch: 382 ms
Not per-question latency

QUESTION + OPTIONS

Jobs A:1>2,B:2>1; candidates 1:B>A,2:A>B.

Job-optimal matching?

A. A-2,B-1

B. A-1,B-2

REFERENCE ANSWER

B. A-1,B-2

JEV / INCORRECT

A. A-2,B-1

API confidence: 0.63
Option probabilities:
{"A": 0.81, "B": 0.19}

Section batch: 321 ms
Not per-question latency

QUESTION + OPTIONS

Jobs A:1>2,B:2>1; candidates 1:B>A,2:A>B.

Candidate-optimal matching?

A. A-1,B-2

B. A-2,B-1

REFERENCE ANSWER

B. A-2,B-1

JEV / CORRECT

B. A-2,B-1

API confidence: 0.35
Option probabilities:
{ "A": 0.32, "B": 0.68 }

Section batch: 321 ms
Not per-question latency

QUESTION + OPTIONS

Jobs A:1>2>3>4; B:2>1>4>3; C:3>4>1>2; D:4>3>2>1. Candidates 1:B>A>C>D; 2:A>B>D>C; 3:D>C>A>B; 4:C>D>B>A.

Number of stable matchings?

- A. 1
- B. 2
- C. 8
- D. 4

REFERENCE ANSWER

D. 4

JEV / CORRECT

D. 4

API confidence: 0.17
Option probabilities:
{ "D": 0.38, "B": 0.18, "A": 0.21, "C": 0.23 }

Section batch: 321 ms
Not per-question latency

QUESTION + OPTIONS

Jobs A:1>2>3>4; B:2>1>4>3; C:3>4>1>2; D:4>3>2>1. Candidates 1:B>A>C>D; 2:A>B>D>C; 3:D>C>A>B; 4:C>D>B>A.

Choose a stable matching optimal for neither entire side.

- A. A-2,B-1,C-4,D-3
- B. A-1,B-2,C-3,D-4
- C. A-1,B-2,C-4,D-3
- D. A-3,B-4,C-1,D-2

REFERENCE ANSWER

C. A-1,B-2,C-4,D-3

JEV / INCORRECT

D. A-3,B-4,C-1,D-2

API confidence: 0.33
Option probabilities:
{ "D": 0.49, "A": 0.24, "B": 0.16, "C": 0.11 }

Section batch: 321 ms
Not per-question latency

QUESTION + OPTIONS

Graph G has k connected components. Sum of vertex degrees?

- A. $2|V|$
- B. $|E|$
- C. $2|E|$
- D. $|V|-k$

REFERENCE ANSWER

C. $2|E|$

JEV / CORRECT

C. $2|E|$

API confidence: 1.00
Option probabilities:
{**"B"**: 0.0, **"D"**: 0.0, **"A"**: 0.0, **"C"**: 1.0}

Section batch: 364 ms
Not per-question latency

QUESTION + OPTIONS

Maximum edges in a simple graph with v vertices and k components, $1 \leq k \leq v$?

- A. $C(v,2)-k$
- B. $v-k$
- C. $C(v-k+1,2)$
- D. $k \cdot C(v/k,2)$

REFERENCE ANSWER

C. $C(v-k+1,2)$

JEV / CORRECT

C. $C(v-k+1,2)$

API confidence: 0.99
Option probabilities:
{`"B"`: 0.0, `"D"`: 0.0, `"A"`: 0.0, `"C"`: 1.0}

Section batch: 364 ms
Not per-question latency

QUESTION + OPTIONS

Minimum edges with v vertices and k components?

- A. $v+k$
- B. $k-1$
- C. $v-1$
- D. $v-k$

REFERENCE ANSWER

D. $v-k$

JEV / CORRECT

D. $v-k$

API confidence: 1.00
Option probabilities:
{`"D"`: 1.0, `"B"`: 0.0, `"A"`: 0.0, `"C"`: 0.0}

Section batch: 364 ms
Not per-question latency

QUESTION + OPTIONS

Minimum vertex colors for a positive-dimensional hypercube?

- A. $\log_2(|V|)$
- B. $\log_2(|V|)+1$
- C. 2
- D. 1

REFERENCE ANSWER

C. 2

JEV / CORRECT

C. 2

API confidence: 0.96
Option probabilities:
{ "B": 0.01, "D": 0.0, "A": 0.01, "C": 0.98 }

Section batch: 364 ms
Not per-question latency

QUESTION + OPTIONS

Minimum edge colors for a hypercube on $|V|$ vertices?

- A. 2
- B. $\log_2(|V|)+1$
- C. $\log_2(|V|)$
- D. $|V|/2$

REFERENCE ANSWER

C. $\log_2(|V|)$

JEV / CORRECT

C. $\log_2(|V|)$

API confidence: 0.94
Option probabilities:
{ "B": 0.03, "D": 0.0, "A": 0.01, "C": 0.96 }

Section batch: 364 ms
Not per-question latency

QUESTION + OPTIONS

Delete all edges of a simple k -cycle from a connected graph, retaining vertices.
Sharp upper bound on component count?

- A. k
- B. $2k$
- C. $k-1$
- D. $k+1$

REFERENCE ANSWER

A. k

JEV / CORRECT

A. k

API confidence: 0.48
Option probabilities:
{**"B"**: 0.04, "D": 0.29, "A": 0.62, "C": 0.05}

Section batch: 364 ms
Not per-question latency

QUESTION + OPTIONS

2^63 modulo 77?

- A. 8
- B. 2
- C. 16
- D. 1

REFERENCE ANSWER

A. 8

JEV / CORRECT

A. 8

API confidence: 0.17
Option probabilities:
{ "D": 0.13, "C": 0.35, "B": 0.14, "A": 0.38 }

Section batch: 400 ms
Not per-question latency

QUESTION + OPTIONS

1*2*3*4*5*6 modulo 7?

- A. 0
- B. 5
- C. 1
- D. 6

REFERENCE ANSWER

D. 6

JEV / CORRECT

D. 6

API confidence: 0.89
Option probabilities:
{ "D": 0.91, "C": 0.03, "B": 0.03, "A": 0.03 }

Section batch: 400 ms
Not per-question latency

QUESTION + OPTIONS

Inverse of 63 modulo 71 in 0..70?

- A. 62
- B. 8
- C. 63
- D. 9

REFERENCE ANSWER

A. 62

JEV / CORRECT

A. 62

API confidence: 0.22
Option probabilities:
{ "D": 0.18, "C": 0.02, "B": 0.38, "A": 0.42 }

Section batch: 400 ms
Not per-question latency

QUESTION + OPTIONS

p, q are distinct primes; a, b range independently over residues $0..pq-1$.

Number of a coprime to p ?

- A. $(p-1)q$
- B. $pq-p$
- C. $pq-1$
- D. $(p-1)(q-1)$

REFERENCE ANSWER

A. $(p-1)q$

JEV / CORRECT

A. $(p-1)q$

API confidence: 0.45
Option probabilities:
{ $"D"$: 0.0, $"C"$: 0.0, $"B"$: 0.41, $"A"$: 0.59}

Section batch: 400 ms
Not per-question latency

QUESTION + OPTIONS

p, q are distinct primes; a, b range independently over residues $0..pq-1$.

Number of a coprime to both p and q ?

- A. $(p-1)(q-1)$
- B. $pq-p-q$
- C. $pq-1$
- D. $p+q-2$

REFERENCE ANSWER

A. $(p-1)(q-1)$

JEV / CORRECT

A. $(p-1)(q-1)$

API confidence: 0.98
Option probabilities:
{ $"D"$: 0.0, $"C"$: 0.0, $"B"$: 0.01, $"A"$: 0.99}

Section batch: 400 ms
Not per-question latency

QUESTION + OPTIONS

p, q are distinct primes; a, b range independently over residues $0..pq-1$.

Number of pairs (a, b) for which $ax \equiv b \pmod{pq}$ has exactly one solution?

- A. $pq-1$
- B. $(pq)^2$
- C. $pq(p-1)(q-1)$
- D. $(p-1)(q-1)$

REFERENCE ANSWER

C. $pq(p-1)(q-1)$

JEV / CORRECT

C. $pq(p-1)(q-1)$

API confidence: 0.80
Option probabilities:
{ $"D"$: 0.05, $"C"$: 0.85, $"B"$: 0.05, $"A"$: 0.05}

Section batch: 400 ms
Not per-question latency

QUESTION + OPTIONS

p, q are distinct primes; a, b range independently over residues $0..pq-1$.
 $\gcd(a, pq)=p$ and x is a solution. Smallest positive shift t for which $x+t$ is another solution?

- A. pq
- B. 1
- C. q
- D. p

REFERENCE ANSWER

C. q

JEV / INCORRECT

A. pq

API confidence: 0.26
Option probabilities:
{ $"D"$: 0.17, $"C"$: 0.38, $"B"$: 0.01, $"A"$: 0.44}

Section batch: 400 ms
Not per-question latency

QUESTION + OPTIONS

p, q are distinct primes; a, b range independently over residues $0..pq-1$.

Number of pairs (a, b) with exactly p solutions?

A. $q(q-1)$

B. pq

C. $q(p-1)$

D. $p(p-1)$

REFERENCE ANSWER

A. $q(q-1)$

JEV / CORRECT

A. $q(q-1)$

API confidence: 0.30
Option probabilities:
{`"D": 0.07, "C": 0.36, "B": 0.1, "A": 0.47`}

Section batch: 400 ms
Not per-question latency

QUESTION + OPTIONS

p, q are distinct primes; a, b range independently over residues $0..pq-1$.

Number of pairs (a, b) with no solutions?

A. $(q-1)(pq-q)+(p-1)(pq-p)+(pq-1)$

B. $(pq-1)^2$

C. $(p-1)(q-1)pq$

D. $(q-1)(pq-q)+(p-1)(pq-p)$

REFERENCE ANSWER

A.
 $(q-1)(pq-q)+(p-1)(pq-p)+(pq-1)$

JEV / CORRECT

A.
 $(q-1)(pq-q)+(p-1)(pq-p)+(pq-1)$

API confidence: 0.33
Option probabilities:
{`"D"`: 0.18, `"C"`: 0.27, `"B"`: 0.05, `"A"`: 0.5}

Section batch: 400 ms
Not per-question latency

QUESTION + OPTIONS

For every $N \geq 2$, N is prime if and only if no a, b in $\{1, \dots, N-1\}$ have ab equal to ___ mod N . Choose the residue that makes this equivalence valid.

- A. 1
- B. 2
- C. 0
- D. $N-1$

REFERENCE ANSWER

C. 0

Pre-run repair:
Exclude $N=1$ and strengthen to iff: the original one-way implication also permits vacuously true distractors.

JEV / CORRECT

C. 0

API confidence: 0.90
Option probabilities:
{ $"D"$: 0.01, $"C"$: 0.93, $"B"$: 0.0, $"A"$: 0.06}

Section batch: 400 ms
Not per-question latency

QUESTION + OPTIONS

- Use CRT to count units modulo pq for distinct primes p, q .
- A. CRT bijects residues mod pq with pairs mod p and q ; a unit corresponds exactly to a pair with both coordinates nonzero, giving $(p-1)(q-1)$.
 - B. All nonzero residues modulo pq are units, giving $pq-1$.
 - C. CRT requires both coordinates to match as integers, giving $\min(p, q)-1$.
 - D. Exactly one coordinate must be nonzero, giving $p+q-2$.

REFERENCE ANSWER

A. CRT bijects residues mod pq with pairs mod p and q ; a unit corresponds exactly to a pair with both coordinates nonzero, giving $(p-1)(q-1)$.

JEV / CORRECT

A. CRT bijects residues mod pq with pairs mod p and q ; a unit corresponds exactly to a pair with both coordinates nonzero, giving $(p-1)(q-1)$.

API confidence: 1.00
Option probabilities:
{ "D": 0.0, "C": 0.0, "B": 0.0, "A": 1.0 }

Section batch: 400 ms
Not per-question latency

QUESTION + OPTIONS

GF(5): normalized Lagrange Delta0 for x-coordinates 0,1,4?

- A. $-x^2+4$
- B. $-x^2-4$
- C. x^2-1
- D. x^2+4

REFERENCE ANSWER

B. $-x^2-4$

JEV / INCORRECT

A. $-x^2+4$

API confidence: 0.50
Option probabilities:
{ "C": 0.05, "A": 0.63, "B": 0.13, "D": 0.19 }

Section batch: 315 ms
Not per-question latency

QUESTION + OPTIONS

GF(5), a constant message polynomial is encoded; at most one error. Received points (0,1),(2,1),(3,4).

Original polynomial?

A. 3

B. 1

C. x+1

D. 4

REFERENCE ANSWER

B. 1

JEV / CORRECT

B. 1

API confidence: 0.59
Option probabilities:
{ "C": 0.01, "A": 0.09, "B": 0.69, "D": 0.21 }

Section batch: 315 ms
Not per-question latency

QUESTION + OPTIONS

$GF(5)$, a constant message polynomial is encoded; at most one error. Received points $(0,1),(2,1),(3,4)$.

With $Q(x)=q_1x+q_0$ and $E(x)=x+b_0$, write the BW equation for received $(3,4)$.

- A. $q_1+q_0=4b_0 \bmod 5$
- B. $3q_1+q_0=4(3+b_0) \bmod 5$
- C. $3q_1+q_0=3+b_0 \bmod 5$
- D. $4q_1+q_0=3(4+b_0) \bmod 5$

REFERENCE ANSWER

B. $3q_1+q_0=4(3+b_0) \bmod 5$

JEV / CORRECT

B. $3q_1+q_0=4(3+b_0) \bmod 5$

API confidence: 0.93
Option probabilities:
{ $"C"$: 0.01, $"B"$: 0.94, $"A"$: 0.02, $"D"$: 0.03}

Section batch: 315 ms
Not per-question latency

QUESTION + OPTIONS

Normalized Lagrange basis on distinct field coordinates: $\Delta_i(i)$?

- A. 0
- B. i
- C. 1
- D. y_i

REFERENCE ANSWER

C. 1

JEV / CORRECT

C. 1

API confidence: 0.99
Option probabilities:
{**"C"**: 0.99, "A": 0.01, "B": 0.0, "D": 0.0}

Section batch: 315 ms
Not per-question latency

QUESTION + OPTIONS

Normalized Lagrange basis: $\Delta_i(j)$ for a different interpolation coordinate j ?

- A. $i-j$
- B. y_j
- C. 1
- D. 0

REFERENCE ANSWER

D. 0

JEV / CORRECT

D. 0

API confidence: 0.29
Option probabilities:
{**"C"**: 0.46, "A": 0.06, "B": 0.02, "D": 0.45999999999999996}

Section batch: 315 ms
Not per-question latency

QUESTION + OPTIONS

Interpolate $(0,y_0),(1,y_1),(2,y_2)$ using normalized basis D_0,D_1,D_2 .

- A. $D_0+D_1+D_2$
- B. $y_0*D_1+y_1*D_2+y_2*D_0$
- C. $y_0+y_1*x+y_2*x^2$
- D. $y_0*D_0+y_1*D_1+y_2*D_2$

REFERENCE ANSWER

D. $y_0*D_0+y_1*D_1+y_2*D_2$

JEV / CORRECT

D. $y_0*D_0+y_1*D_1+y_2*D_2$

API confidence: 0.99
Option probabilities:
{**"C"**: 0.0, "A": 0.01, "B": 0.0, "D": 0.99}

Section batch: 315 ms
Not per-question latency

QUESTION + OPTIONS

Distinct anagrams of BERKELEY?

- A. $7!/3!$
- B. $8!/(2!2!)$
- C. $8!$
- D. $8!/3!$

REFERENCE ANSWER

D. $8!/3!$

JEV / INCORRECT

B. $8!/(2!2!)$

API confidence: 0.32
Option probabilities:
{ "B": 0.48, "C": 0.01, "D": 0.43, "A": 0.08 }

Section batch: 323 ms
Not per-question latency

QUESTION + OPTIONS

Assign n labeled balls to m labeled bins without restrictions. Count?

- A. n^m
- B. m^n
- C. $C(n+m-1, m-1)$
- D. $n!$

REFERENCE ANSWER

B. m^n

JEV / CORRECT

B. m^n

API confidence: 0.99
Option probabilities:
{**"B"**: 0.99, "A": 0.01, "D": 0.0, "C": 0.0}

Section batch: 323 ms
Not per-question latency

QUESTION + OPTIONS

Number of unordered five-card hands all of one suit in a standard deck, including straight flushes?

- A. $4 \cdot 13^5$
- B. $C(52,5)$
- C. $4 \cdot C(13,5)$
- D. $C(13,5)$

REFERENCE ANSWER

C. $4 \cdot C(13,5)$

JEV / CORRECT

C. $4 \cdot C(13,5)$

API confidence: 1.00
Option probabilities:
{ "B": 0.0, "A": 0.0, "D": 0.0, "C": 1.0 }

Section batch: 323 ms
Not per-question latency

QUESTION + OPTIONS

You hold two hearts. Choose five unordered cards from the remaining 50. Count selections with at least three additional hearts.

- A. $C(13,3)C(39,2)$
- B. $C(11,3)C(47,2)$
- C. $C(11,3)C(39,2)$
- D. $C(11,3)C(39,2)+C(11,4)C(39,1)+C(11,5)$

REFERENCE ANSWER

D. $C(11,3)C(39,2)+C(11,4)C(39,1)+C(11,5)$

JEV / CORRECT

D. $C(11,3)C(39,2)+C(11,4)C(39,1)+C(11,5)$

API confidence: 0.96
Option probabilities:
{**"B"**: 0.01, **"A"**: 0.0, **"D"**: 0.97, **"C"**: 0.02}

Section batch: 323 ms
Not per-question latency

QUESTION + OPTIONS

Count integer solutions $\sum(x_i, i=1..k)=n$, each $x_i \geq -1$, $n \geq 0$.

- A. k^n
- B. $C(n+2k-1, k-1)$
- C. $C(n+k-1, k-1)$
- D. $C(n-1, k-1)$

REFERENCE ANSWER

B. $C(n+2k-1, k-1)$

JEV / CORRECT

B. $C(n+2k-1, k-1)$

API confidence: 0.96
Option probabilities:
{"B": 0.97, "C": 0.03, "D": 0.0, "A": 0.0}

Section batch: 323 ms
Not per-question latency

QUESTION + OPTIONS

Unit square grid from A=(0,0) to B=(7,5); only right and up steps. P=(3,2).

Number of paths A to B?

A. 2^{12}

B. $C(35,5)$

C. $C(12,5)$

D. $7! \cdot 5!$

REFERENCE ANSWER

C. $C(12,5)$

JEV / CORRECT

C. $C(12,5)$

API confidence: 0.98
Option probabilities:
{`"B": 0.01, "A": 0.0, "C": 0.99, "D": 0.0`}

Section batch: 409 ms
Not per-question latency

QUESTION + OPTIONS

Unit square grid from A=(0,0) to B=(7,5); only right and up steps. P=(3,2).

Number of paths A to B through P?

- A. $C(12,5)$
- B. $C(7,3)C(5,3)/2$
- C. $C(5,3)+C(7,4)$
- D. $C(5,2)C(7,3)$

REFERENCE ANSWER

D. $C(5,2)C(7,3)$

JEV / CORRECT

D. $C(5,2)C(7,3)$

API confidence: 0.89
Option probabilities:
{ "D": 0.91, "B": 0.05, "C": 0.01, "A": 0.03 }

Section batch: 409 ms
Not per-question latency

QUESTION + OPTIONS

Unit square grid from $A=(0,0)$ to $B=(7,5)$; only right and up steps. $P=(3,2)$.

Combinatorially prove $C(12,7)=\sum_{i=0..5}C(3+i,i)C(8-i,5-i)$.

- A. Choose any i vertical steps twice; this counts each path once.
- B. Classify by every vertex visited in column 3; each path visits exactly one such vertex.
- C. Each of the six possible heights gives equally many paths, so the answer is six times any summand.
- D. Classify each path by the unique right step from column 3 to 4 at height i . There are $C(3+i,i)$ prefixes to $(3,i)$, and $C(8-i,5-i)$ suffixes from $(4,i)$ to B .

REFERENCE ANSWER

D. Classify each path by the unique right step from column 3 to 4 at height i . There are $C(3+i,i)$ prefixes to $(3,i)$, and $C(8-i,5-i)$ suffixes from $(4,i)$ to B .

JEV / CORRECT

D. Classify each path by the unique right step from column 3 to 4 at height i . There are $C(3+i,i)$ prefixes to $(3,i)$, and $C(8-i,5-i)$ suffixes from $(4,i)$ to B .

API confidence: 0.89
Option probabilities:
{ $"C"$: 0.0, $"A"$: 0.0, $"D"$: 0.92, $"B"$: 0.08}

Section batch: 409 ms
Not per-question latency

QUESTION + OPTIONS

Distinct real-valued functions represented by finite integer-coefficient polynomials?

- A. Countably infinite
- B. Uncountably infinite
- C. Finite

REFERENCE ANSWER

A. Countably infinite

JEV / CORRECT

A. Countably infinite

API confidence: 0.98
Option probabilities:
{ "A": 0.99, "C": 0.0, "B": 0.01 }

Section batch: 317 ms
Not per-question latency

QUESTION + OPTIONS

Distinct real-valued functions represented by finite real-coefficient polynomials?

- A. Uncountably infinite
- B. Countably infinite
- C. Finite

REFERENCE ANSWER

A. Uncountably infinite

JEV / INCORRECT

B. Countably infinite

API confidence: 0.78
Option probabilities:
{ "A": 0.15, "C": 0.0, "B": 0.85 }

Section batch: 317 ms
Not per-question latency

QUESTION + OPTIONS

Distinct functions $\text{GF}(p) \rightarrow \text{GF}(p)$ represented by finite polynomials for fixed prime p ?

- A. Countably infinite
- B. Finite
- C. Uncountably infinite

REFERENCE ANSWER

B. Finite

JEV / CORRECT

B. Finite

API confidence: 0.61
Option probabilities:
{ "A": 0.22, "C": 0.04, "B": 0.74 }

Section batch: 317 ms
Not per-question latency

QUESTION + OPTIONS

Fill four blanks: TestHalt(F,a) defines fresh dummy():pass and inner(b): [1];[2], then returns TestCalls([3],[4],a), where TestCalls(P,Q,x) detects whether P(x) ever calls Q.

- A. (F(a); dummy(); dummy; inner)
- B. (F(b); dummy(); inner; dummy)
- C. (F(b); dummy(); F; dummy)
- D. (dummy(); F(b); inner; dummy)

REFERENCE ANSWER

B. (F(b); dummy(); inner; dummy)

JEV / CORRECT

B. (F(b); dummy(); inner; dummy)

API confidence: 0.25
Option probabilities:
{ "D": 0.17, "A": 0.27, "B": 0.43, "C": 0.13 }

Section batch: 357 ms
Not per-question latency

QUESTION + OPTIONS

$P(A)=1/2,P(B)=1/3,P(C)=1/6,P(A \text{ union } B)=2/3,P(A \text{ given } C)=2/3.$

$P(A \text{ intersection } B)?$

A. $1/6$

B. $1/3$

C. $2/3$

D. $1/9$

REFERENCE ANSWER

A. $1/6$

JEV / CORRECT

A. $1/6$

API confidence: 0.92
Option probabilities:
{"B": 0.05, "C": 0.01, "D": 0.01, "A": 0.9299999999999999}

Section batch: 326 ms
Not per-question latency

QUESTION + OPTIONS

$P(A)=1/2, P(B)=1/3, P(C)=1/6, P(A \cup B)=2/3, P(A \text{ given } C)=2/3.$

$P(B \text{ given } A)?$

A. $2/3$

B. $1/6$

C. $1/3$

D. $1/2$

REFERENCE ANSWER

C. $1/3$

JEV / CORRECT

C. $1/3$

API confidence: 0.15
Option probabilities:
{ "B": 0.29, "C": 0.37, "D": 0.22, "A": 0.12 }

Section batch: 326 ms
Not per-question latency

QUESTION + OPTIONS

$P(A)=1/2, P(B)=1/3, P(C)=1/6, P(A \cup B)=2/3, P(A \text{ given } C)=2/3.$

$P(C \cap A)?$

A. $2/9$

B. $1/3$

C. $1/9$

D. $1/6$

REFERENCE ANSWER

C. $1/9$

JEV / CORRECT

C. $1/9$

API confidence: 0.82
Option probabilities:
{`"B"`: 0.01, `"C"`: 0.86, `"D"`: 0.01, `"A"`: 0.12}

Section batch: 326 ms
Not per-question latency

QUESTION + OPTIONS

$P(A)=1/2, P(B)=1/3, P(C)=1/6, P(A \cup B)=2/3, P(A \text{ given } C)=2/3.$

$P(C \text{ given } A)?$

A. $2/9$

B. $1/9$

C. $1/3$

D. $2/3$

REFERENCE ANSWER

A. $2/9$

JEV / CORRECT

A. $2/9$

API confidence: 0.15
Option probabilities:
{ "B": 0.26, "A": 0.36, "D": 0.04, "C": 0.34 }

Section batch: 326 ms
Not per-question latency

QUESTION + OPTIONS

ID,IE indicate events D,E with $P(D)=1/3,P(E)=1/2,P(D \text{ intersection } E)=1/5$. The best affine estimate of ID from IE is $a(IE-E[IE])+b$.

Cov(ID,IE)?

- A. 1/6
- B. 1/5
- C. -1/30
- D. 1/30

REFERENCE ANSWER

D. 1/30

JEV / CORRECT

D. 1/30

API confidence: 0.72
Option probabilities:
{ "B": 0.01, "C": 0.19, "D": 0.79, "A": 0.01 }

Section batch: 326 ms
Not per-question latency

QUESTION + OPTIONS

ID,IE indicate events D,E with $P(D)=1/3,P(E)=1/2,P(D \text{ intersection } E)=1/5$. The best affine estimate of ID from IE is $a(IE-E[IE])+b$.

Sign of a?

A. Positive

B. Negative

C. Zero

REFERENCE ANSWER

A. Positive

JEV / CORRECT

A. Positive

API confidence: 0.92
Option probabilities:
{"B": 0.05, "C": 0.01, "A": 0.94}

Section batch: 326 ms
Not per-question latency

QUESTION + OPTIONS

ID,IE indicate events D,E with $P(D)=1/3,P(E)=1/2,P(D \text{ intersection } E)=1/5$. The best affine estimate of ID from IE is $a(IE-E[IE])+b$.

Value of a?

- A. 1/3
- B. 1/5
- C. 1/30
- D. 2/15

REFERENCE ANSWER

D. 2/15

JEV / CORRECT

D. 2/15

API confidence: 0.82
Option probabilities:
{"B": 0.02, "A": 0.02, "D": 0.86, "C": 0.1}

Section batch: 326 ms
Not per-question latency

QUESTION + OPTIONS

ID,IE indicate events D,E with $P(D)=1/3,P(E)=1/2,P(D \text{ intersection } E)=1/5$. The best affine estimate of ID from IE is $a(IE-E[IE])+b$.

Value of b?

- A. 0
- B. 1/5
- C. 1/3
- D. 1/2

REFERENCE ANSWER

C. 1/3

JEV / CORRECT

C. 1/3

API confidence: 0.77
Option probabilities:
{ "B": 0.06, "C": 0.84, "D": 0.05, "A": 0.05 }

Section batch: 326 ms
Not per-question latency

QUESTION + OPTIONS

Independent X, Y have $E[X]=2, E[Y]=3, \text{Var}(X)=1, \text{Var}(Y)=2$.

$E[XY]$?

A. 5

B. 6

C. 9

D. 1

REFERENCE ANSWER

B. 6

JEV / CORRECT

B. 6

API confidence: 1.00
Option probabilities:
{**"B"**: 1.0, "A": 0.0, "D": 0.0, "C": 0.0}

Section batch: 326 ms
Not per-question latency

QUESTION + OPTIONS

Independent X, Y have $E[X]=2, E[Y]=3, \text{Var}(X)=1, \text{Var}(Y)=2$.

$E[X^2]$?

A. 1

B. 4

C. 5

D. 3

REFERENCE ANSWER

C. 5

JEV / CORRECT

C. 5

API confidence: 1.00
Option probabilities:
{ $"B"$: 0.0, $"C"$: 1.0, $"D"$: 0.0, $"A"$: 0.0}

Section batch: 326 ms
Not per-question latency

QUESTION + OPTIONS

Independent X, Y have $E[X]=2, E[Y]=3, \text{Var}(X)=1, \text{Var}(Y)=2$.

$\text{Var}(XY)$?

A. 2

B. 36

C. 55

D. 19

REFERENCE ANSWER

D. 19

JEV / CORRECT

D. 19

API confidence: 0.91
Option probabilities:
{ $"B"$: 0.01, $"C"$: 0.05, $"D"$: 0.94, $"A"$: 0.0}

Section batch: 326 ms
Not per-question latency

QUESTION + OPTIONS

Density $f(x)=x$ on $[0,c]$, zero otherwise. What is $c>0$?

- A. 1/2
- B. 2
- C. $\sqrt{2}$
- D. 1

REFERENCE ANSWER

C. $\sqrt{2}$

JEV / CORRECT

C. $\sqrt{2}$

API confidence: 0.89
Option probabilities:
{ "B": 0.06, "C": 0.92, "D": 0.01, "A": 0.01 }

Section batch: 326 ms
Not per-question latency

QUESTION + OPTIONS

Density $f(x)=x$ on $[0,c]$, zero elsewhere, with $c>0$ chosen to normalize it. CDF on $[0,c]$?

- A. x
- B. x^2
- C. $x^2/2$
- D. $2x$

REFERENCE ANSWER

C. $x^2/2$

JEV / INCORRECT

B. x^2

API confidence: 0.46
Option probabilities:
{**"B"**: 0.6, "C": 0.36, "D": 0.03, "A": 0.01}

Section batch: 326 ms
Not per-question latency

QUESTION + OPTIONS

Independent $X \sim \text{Bin}(n, p), Y \sim \text{Bin}(n, q)$. $\text{Cov}(X, Y)$?

A. $n(p+q)$

B. $np(1-q)$

C. 0

D. npq

REFERENCE ANSWER

C. 0

JEV / CORRECT

C. 0

API confidence: 1.00
Option probabilities:
{**"B"**: 0.0, **"C"**: 1.0, **"A"**: 0.0, **"D"**: 0.0}

Section batch: 350 ms
Not per-question latency

QUESTION + OPTIONS

Independent $X \sim \text{Bin}(n, p), Y \sim \text{Bin}(n, q)$. $\text{Var}(X+Y)$?

- A. $n^2[p(1-p)+q(1-q)]$
- B. npq
- C. $n[p(1-p)+q(1-q)]$
- D. $n(p+q)(1-p-q)$

REFERENCE ANSWER

C. $n[p(1-p)+q(1-q)]$

JEV / CORRECT

C. $n[p(1-p)+q(1-q)]$

API confidence: 0.99
Option probabilities:
{**"B"**: 0.0, **"C"**: 1.0, "A": 0.0, "D": 0.0}

Section batch: 350 ms
Not per-question latency

QUESTION + OPTIONS

$X \sim \text{Geom}(p)$ counts trials in $\{1, 2, \dots\}$. For integer $x \geq 1$, compute $E[X - x \text{ given } X \geq x]$.

- A. x/p
- B. 0
- C. $(1-p)/p$
- D. $1/p$

REFERENCE ANSWER

C. $(1-p)/p$

Pre-run repair:
Correct official $1/p$ key: $\geq$ retains a possible zero residual; with this support the answer is $1/p-1$.

JEV / CORRECT

C. $(1-p)/p$

API confidence: 0.47
Option probabilities:
{"B": 0.02, "C": 0.61, "A": 0.01, "D": 0.36}

Section batch: 350 ms
Not per-question latency

QUESTION + OPTIONS

$X \sim \text{Poisson}(\lambda)$. $P(X > 0)$?

- A. $\lambda \cdot \exp(-\lambda)$
- B. $\exp(-\lambda)$
- C. $1/\lambda$
- D. $1 - \exp(-\lambda)$

REFERENCE ANSWER

D. $1 - \exp(-\lambda)$

JEV / CORRECT

D. $1 - \exp(-\lambda)$

API confidence: 1.00
Option probabilities:
{**"B"**: 0.0, "A": 0.0, "C": 0.0, "D": 1.0}

Section batch: 350 ms
Not per-question latency

QUESTION + OPTIONS

Independent Poisson(λ), Poisson(μ). $P(X+Y>0)$?

- A. $\exp(-\lambda-\mu)$
- B. $1-\exp(-\lambda)*\mu$
- C. $(1-\exp(-\lambda))(1-\exp(-\mu))$
- D. $1-\exp(-\lambda-\mu)$

REFERENCE ANSWER

D. $1-\exp(-\lambda-\mu)$

JEV / CORRECT

D. $1-\exp(-\lambda-\mu)$

API confidence: 1.00
Option probabilities:
{ $"B"$: 0.0, $"C"$: 0.0, $"A"$: 0.0, $"D"$: 1.0}

Section batch: 350 ms
Not per-question latency

QUESTION + OPTIONS

PDF of $\text{Exp}(\text{rate } \lambda > 0)$ on $x \geq 0$?

- A. $\exp(-x/\lambda)/\lambda^2$
- B. $\exp(-\lambda * x)$
- C. $\lambda * \exp(-\lambda * x)$
- D. $\lambda * \exp(\lambda * x)$

REFERENCE ANSWER

C. $\lambda * \exp(-\lambda * x)$

JEV / CORRECT

C. $\lambda * \exp(-\lambda * x)$

API confidence: 1.00
Option probabilities:
{**"B"**: 0.0, **"C"**: 1.0, **"A"**: 0.0, **"D"**: 0.0}

Section batch: 350 ms
Not per-question latency

QUESTION + OPTIONS

PDF of $\min(X,Y)$ for independent $\text{Exp}(\text{rate } \lambda)$ variables, $z \geq 0$?

- A. $2\lambda \exp(-\lambda z)$
- B. $\lambda^2 \exp(-2\lambda z)$
- C. $2\lambda \exp(-2\lambda z)$
- D. $\lambda \exp(-\lambda z)$

REFERENCE ANSWER

C. $2\lambda \exp(-2\lambda z)$

JEV / CORRECT

C. $2\lambda \exp(-2\lambda z)$

API confidence: 0.97
Option probabilities:
{ "B": 0.0, "A": 0.01, "C": 0.98, "D": 0.01 }

Section batch: 350 ms
Not per-question latency

QUESTION + OPTIONS

A dart is uniform over a disk of radius $r > 0$. Density of distance x to center?

- A. $1/r$ on $[0,r]$, zero elsewhere
- B. x^2/r^2 on $[0,r]$, zero elsewhere
- C. $2x/r^2$ on $[0,r]$, zero elsewhere
- D. $2\pi x$ on $[0,r]$, zero elsewhere

REFERENCE ANSWER

C. $2x/r^2$ on $[0,r]$, zero elsewhere

JEV / CORRECT

C. $2x/r^2$ on $[0,r]$, zero elsewhere

API confidence: 0.99
Option probabilities:
{ "B": 0.0, "C": 1.0, "A": 0.0, "D": 0.0 }

Section batch: 350 ms
Not per-question latency

QUESTION + OPTIONS

Independent $X, Y \sim \text{Uniform}[0, r], r > 0$.

CDF of $\max(X, Y)$?

- A. 0 below 0; $1 - (1 - z/r)^2$ on $[0, r]$; 1 above r
- B. 0 below 0; z/r on $[0, r]$; 1 above r
- C. 0 below 0; $(z/r)^2$ on $[0, r]$; 1 above r
- D. 0 below 0; $2z/r$ on $[0, r]$; 1 above r

REFERENCE ANSWER

C. 0 below 0; $(z/r)^2$ on $[0, r]$; 1 above r

JEV / CORRECT

C. 0 below 0; $(z/r)^2$ on $[0, r]$; 1 above r

API confidence: 0.97
Option probabilities:
{ "D": 0.0, "B": 0.0, "A": 0.02, "C": 0.98 }

Section batch: 297 ms
Not per-question latency

QUESTION + OPTIONS

Independent $X, Y \sim \text{Uniform}[0, r], r > 0$.

PDF of $\max(X, Y)$ on $[0, r]$, zero elsewhere?

A. $2(r - z)/r^2$

B. $2z/r^2$

C. z^2/r^2

D. $1/r$

REFERENCE ANSWER

B. $2z/r^2$

JEV / CORRECT

B. $2z/r^2$

API confidence: 1.00
Option probabilities:
{ "D": 0.0, "B": 1.0, "A": 0.0, "C": 0.0 }

Section batch: 297 ms
Not per-question latency

QUESTION + OPTIONS

Independent $X, Y \sim \text{Uniform}[0, r], r > 0$.

$E[\max(X, Y)]$?

A. $2r/3$

B. r

C. $r/2$

D. $r/3$

REFERENCE ANSWER

A. $2r/3$

JEV / CORRECT

A. $2r/3$

API confidence: 1.00
Option probabilities:
{ $"D"$: 0.0, $"B"$: 0.0, $"A"$: 1.0, $"C"$: 0.0}

Section batch: 297 ms
Not per-question latency

QUESTION + OPTIONS

Independent $X, Y \sim \text{Uniform}[0, r], r > 0$.

$E[\min(X, Y)]$? Hint: avoid integration.

A. $r/4$

B. $2r/3$

C. $r/3$

D. $r/2$

REFERENCE ANSWER

C. $r/3$

JEV / CORRECT

C. $r/3$

API confidence: 0.91
Option probabilities:
{ $"D"$: 0.0, $"B"$: 0.0, $"A"$: 0.06, $"C"$: 0.9400000000000001}

Section batch: 297 ms
Not per-question latency

QUESTION + OPTIONS

Independent $X, Y \sim \text{Uniform}[0, r], r > 0$.

$E[|X - Y|]$? Hint: use min, max and linearity.

A. $2r/3$

B. 0

C. $r/3$

D. $r/2$

REFERENCE ANSWER

C. $r/3$

JEV / CORRECT

C. $r/3$

API confidence: 0.88
Option probabilities:
{`"D"`: 0.0, `"B"`: 0.0, `"A"`: 0.09, `"C"`: 0.91}

Section batch: 297 ms
Not per-question latency

QUESTION + OPTIONS

A uniform random permutation assigns balls 1..100 to bins 1..100, one each. li indicates ball i lands within distance one of bin i , without wraparound.

Expected number close to their original bin?

- A. 2
- B. 3
- C. 2.98
- D. 1

REFERENCE ANSWER

C. 2.98

JEV / CORRECT

C. 2.98

API confidence: 0.58
Option probabilities:
{**"D"**: 0.02, **"C"**: 0.690000000000000001, **"A"**: 0.18, **"B"**: 0.11}

Section batch: 359 ms
Not per-question latency

QUESTION + OPTIONS

A uniform random permutation assigns balls 1..100 to bins 1..100, one each. I_i indicates ball i lands within distance one of bin i , without wraparound.

$E[I_2 \cdot I_5]$?

A. $6/(100 \cdot 99)$

B. $3/100$

C. $9/10000$

D. $9/(100 \cdot 99)$

REFERENCE ANSWER

D. $9/(100 \cdot 99)$

JEV / CORRECT

D. $9/(100 \cdot 99)$

API confidence: 0.66
Option probabilities:
{ $"D"$: 0.74, $"C"$: 0.11, $"A"$: 0.13, $"B"$: 0.02}

Section batch: 359 ms
Not per-question latency

QUESTION + OPTIONS

A uniform random permutation assigns balls 1..100 to bins 1..100, one each. I_i indicates ball i lands within distance one of bin i , without wraparound.

$E[I_2 \cdot I_4]$?

A. $8/(100 \cdot 99)$

B. $9/10000$

C. $9/(100 \cdot 99)$

D. $6/(100 \cdot 99)$

REFERENCE ANSWER

A. $8/(100 \cdot 99)$

JEV / INCORRECT

C. $9/(100 \cdot 99)$

API confidence: 0.40
Option probabilities:
{ $"D"$: 0.2, $"C"$: 0.55, $"A"$: 0.19, $"B"$: 0.06}

Section batch: 359 ms
Not per-question latency

QUESTION + OPTIONS

A uniform random permutation assigns balls 1..100 to bins 1..100, one each. l_i indicates ball i lands within distance one of bin i , without wraparound.

Do there exist distinct i,j for which l_i,l_j are independent?

A. Yes

B. No

REFERENCE ANSWER

B. No

JEV / INCORRECT

A. Yes

API confidence: 0.58
Option probabilities:
{**"A"**: 0.79, "B": 0.21}

Section batch: 359 ms
Not per-question latency

QUESTION + OPTIONS

Choose one of two 52-card decks with equal probability. Loaded deck:39 red,13 black. Fair deck:26 red,26 black. Draw uniformly without replacement.

Given first card red, probability the chosen deck is fair?

- A. 1/2
- B. 3/5
- C. 2/5
- D. 1/4

REFERENCE ANSWER

C. 2/5

JEV / CORRECT

C. 2/5

API confidence: 0.67
Option probabilities:
{ "D": 0.04, "B": 0.18, "A": 0.02, "C": 0.76 }

Section batch: 356 ms
Not per-question latency

QUESTION + OPTIONS

Choose one of two 52-card decks with equal probability. Loaded deck:39 red,13 black. Fair deck:26 red,26 black. Draw uniformly without replacement.

Given first card red, probability the second is red?

A. $(1/2)(38/51)+(1/2)(25/51)$

B. $38/51$

C. $(3/5)(38/51)+(2/5)(25/51)$

D. $(3/5)(39/52)+(2/5)(26/52)$

REFERENCE ANSWER

C. $(3/5)(38/51)+(2/5)(25/51)$

JEV / CORRECT

C. $(3/5)(38/51)+(2/5)(25/51)$

API confidence: 0.45
Option probabilities:
{ "D": 0.0, "B": 0.0, "A": 0.41, "C": 0.59 }

Section batch: 356 ms
Not per-question latency

QUESTION + OPTIONS

- X is a sum of indicators, and $p = P(X \geq 1)$. Prove $p \leq E[X]$.
- A. Every probability is at most one, and every expectation is at least one.
 - B. X is always either zero or one, so equality must hold.
 - C. Indicators are always independent, so multiply their probabilities.
 - D. The union bound gives $P(\text{any indicator is one}) \leq \text{sum of their success probabilities} = \text{sum of their expectations} = E[X]$. No independence needed.

REFERENCE ANSWER

D. The union bound gives $P(\text{any indicator is one}) \leq \text{sum of their success probabilities} = \text{sum of their expectations} = E[X]$. No independence needed.

JEV / CORRECT

D. The union bound gives $P(\text{any indicator is one}) \leq \text{sum of their success probabilities} = \text{sum of their expectations} = E[X]$. No independence needed.

API confidence: 1.00
Option probabilities:
{ "A": 0.0, "D": 1.0, "B": 0.0, "C": 0.0 }

Section batch: 296 ms
Not per-question latency

QUESTION + OPTIONS

W counts successes in n independent Bernoulli(p) trials. For $k > 0$, prove $P(W \geq k) \leq np/k$.

- A. Chebyshev gives $P(W \geq k) = \text{Var}(W)/k$, which equals np/k .
- B. W is nonnegative and $E[W] = np$, so apply Markov's inequality.
- C. W is at most np in every outcome.
- D. Independence makes W deterministic with value np .

REFERENCE ANSWER

B. W is nonnegative and $E[W] = np$, so apply Markov's inequality.

JEV / CORRECT

B. W is nonnegative and $E[W] = np$, so apply Markov's inequality.

API confidence: 1.00
Option probabilities:
{ "A": 0.0, "D": 0.0, "B": 1.0, "C": 0.0 }

Section batch: 296 ms
Not per-question latency

QUESTION + OPTIONS

- $Y \sim \text{Poisson}(\lambda), \lambda > 0$. Prove $P(Y \geq 10\lambda) \leq 1/(81\lambda)$.
- A. The event equals $|Y - \lambda| \geq 10\lambda$, giving the stated bound.
 - B. The event implies $|Y - \lambda| \geq 9\lambda$. Chebyshev and $\text{Var}(Y) = \lambda$ give $\lambda/(9\lambda)^2 = 1/(81\lambda)$.
 - C. Markov gives $\lambda/(10\lambda) = 1/(81\lambda)$.
 - D. Poisson variables cannot exceed ten times their means.

REFERENCE ANSWER

B. The event implies $|Y - \lambda| \geq 9\lambda$. Chebyshev and $\text{Var}(Y) = \lambda$ give $\lambda/(9\lambda)^2 = 1/(81\lambda)$.

JEV / CORRECT

B. The event implies $|Y - \lambda| \geq 9\lambda$. Chebyshev and $\text{Var}(Y) = \lambda$ give $\lambda/(9\lambda)^2 = 1/(81\lambda)$.

API confidence: 0.99
Option probabilities:
{ "A": 0.0, "D": 0.0, "B": 1.0, "C": 0.0 }

Section batch: 296 ms
Not per-question latency

QUESTION + OPTIONS

For arbitrary A,B,C with positive conditioning probabilities, $P(C \text{ given } A \cup B) = P(C \text{ given } A) + P(C \text{ given } B) - P(C \text{ given } A \cap B)$.

A. False

B. True

REFERENCE ANSWER

A. False

JEV / CORRECT

A. False

API confidence: 0.89
Option probabilities:
{ "A": 0.95, "B": 0.05 }

Section batch: 360 ms
Not per-question latency

QUESTION + OPTIONS

Choose a counterexample and its four probabilities in the order: $C|A \cup B$, $C|A$, $C|B$, $C|A \cap B$.

- A. Two fair independent flips: A =first H, B =second H, C =HH. Values (0,1/2,1/2,1).
- B. Two fair independent flips: A =first H, B =second H, C =HH. Values (1/3,1/2,1/2,1).
- C. Set $A=B=C$ to the same positive event; values (1,1,1,1).
- D. Set C to the empty event; values (0,0,0,0).

REFERENCE ANSWER

B. Two fair independent flips:
 A =first H, B =second H, C =HH.
Values (1/3,1/2,1/2,1).

JEV / CORRECT

B. Two fair independent flips:
 A =first H, B =second H, C =HH.
Values (1/3,1/2,1/2,1).

API confidence: 0.68
Option probabilities:
{ C : 0.01, A : 0.21, D : 0.01, B : 0.77}

Section batch: 360 ms
Not per-question latency

QUESTION + OPTIONS

Independent $X_i \sim \text{Poisson}(\lambda), \lambda > 0$; $A_n = (X_1 + \dots + X_n)/n$.

$E[A_n]$?

- A. λ
- B. $n \cdot \lambda$
- C. λ/n
- D. $1/\lambda$

REFERENCE ANSWER

A. λ

JEV / CORRECT

A. λ

API confidence: 1.00
Option probabilities:
{`"D": 0.0, "A": 1.0, "C": 0.0, "B": 0.0`}

Section batch: 388 ms
Not per-question latency

QUESTION + OPTIONS

Independent $X_i \sim \text{Poisson}(\lambda), \lambda > 0$; $A_n = (X_1 + \dots + X_n)/n$.

Smallest integer sample size guaranteed by Chebyshev to make $P(|A_n - E[A_n]| \geq 0.1 E[A_n]) \leq 0.05$?

- A. $\text{ceil}(2000 * \lambda)$
- B. $\text{ceil}(400 / \lambda)$
- C. $\text{ceil}(2000 / \lambda)$
- D. $\text{ceil}(200 / \lambda)$

REFERENCE ANSWER

C. $\text{ceil}(2000 / \lambda)$

JEV / CORRECT

C. $\text{ceil}(2000 / \lambda)$

API confidence: 0.33
Option probabilities:
{ "D": 0.44, "A": 0.02, "C": 0.49, "B": 0.05 }

Section batch: 388 ms
Not per-question latency

QUESTION + OPTIONS

Independent $X_i \sim \text{Poisson}(\lambda), \lambda > 0$; $A_n = (X_1 + \dots + X_n)/n$.

Instead suppose A_n is exactly normal with its actual mean and variance, and use $P(|Z| \geq 2) \leq 0.05$. Sufficient integer n from this rule?

- A. $\text{ceil}(400 \cdot \lambda)$
- B. $\text{ceil}(40/\lambda)$
- C. $\text{ceil}(2000/\lambda)$
- D. $\text{ceil}(400/\lambda)$

REFERENCE ANSWER

D. $\text{ceil}(400/\lambda)$

JEV / CORRECT

D. $\text{ceil}(400/\lambda)$

API confidence: 0.83
Option probabilities:
{ "D": 0.87, "A": 0.08, "C": 0.01, "B": 0.04 }

Section batch: 388 ms
Not per-question latency

QUESTION + OPTIONS

Repeated independent fair four-sided die rolls. State0:last roll not 1 (also start); state1:one trailing 1; state2:at least two trailing 1s.

Let b_i be expected future even rolls before first reaching state2 from state i. Choose the first-step equations.

- A. $b_0=1/2+3b_0/4+b_1/4$; $b_1=1/2+3b_0/4+b_2/4$; $b_2=0$
- B. $b_0=1/4+3b_0/4+b_1/4$; $b_1=1/4+3b_0/4$; $b_2=0$
- C. $b_0=1+3b_0/4+b_1/4$; $b_1=1+3b_0/4$; $b_2=0$
- D. $b_0=1/2+b_1/4$; $b_1=1/2+b_2/4$; $b_2=0$

REFERENCE ANSWER

A. $b_0=1/2+3b_0/4+b_1/4$;
 $b_1=1/2+3b_0/4+b_2/4$; $b_2=0$

JEV / CORRECT

A. $b_0=1/2+3b_0/4+b_1/4$;
 $b_1=1/2+3b_0/4+b_2/4$; $b_2=0$

API confidence: 0.67
Option probabilities:
{ "B": 0.2, "A": 0.75, "D": 0.01, "C": 0.04 }

Section batch: 310 ms
Not per-question latency

QUESTION + OPTIONS

Repeated independent fair four-sided die rolls. State0:last roll not 1 (also start); state1:one trailing 1; state2:at least two trailing 1s.

Continue rolling even after reaching state2. Is there a unique stationary distribution?

A. No

B. Yes

REFERENCE ANSWER

B. Yes

JEV / CORRECT

B. Yes

API confidence: 0.65
Option probabilities:
{ "B": 0.83, "A": 0.17 }

Section batch: 310 ms
Not per-question latency

QUESTION + OPTIONS

Repeated independent fair four-sided die rolls. State0:last roll not 1 (also start); state1:one trailing 1; state2:at least two trailing 1s.

For the continuing chain, choose stationary equations plus normalization.

- A. $p_0=3p_0/4$; $p_1=p_0/4$; $p_2=p_1/4+p_2$; sum $p=1$
- B. $p_0=3(p_0+p_1)/4$; $p_1=(p_0+p_2)/4$; $p_2=p_1/4$; sum $p=1$
- C. $p_0=3(p_0+p_1+p_2)/4$; $p_1=p_0/4$; $p_2=(p_1+p_2)/4$; sum $p=1$
- D. $p_0=p_1=p_2=1/3$

REFERENCE ANSWER

C. $p_0=3(p_0+p_1+p_2)/4$;
 $p_1=p_0/4$; $p_2=(p_1+p_2)/4$; sum
 $p=1$

JEV / INCORRECT

B. $p_0=3(p_0+p_1)/4$;
 $p_1=(p_0+p_2)/4$; $p_2=p_1/4$; sum
 $p=1$

API confidence: 0.63
Option probabilities:
{**"B"**: 0.72, "A": 0.02, "D": 0.0, "C": 0.26}

Section batch: 310 ms
Not per-question latency

QUESTION + OPTIONS

Two players start ready and shoot independently with success probability $\frac{2}{3}$. Both make: win; both miss: loss. If exactly one misses, next turn that player retrieves while the other shoots. A lone shooter's success makes both ready next turn; a miss leaves one retrieving. State0=both ready,1=one retrieving,2=win,3=loss. Arrows A:0->2,B:0->1,C:1->0,D:0->3,E:1->1.

Give (A,B,C,D,E).

- A. $(\frac{4}{9},\frac{4}{9},\frac{2}{3},\frac{1}{9},\frac{1}{3})$
- B. $(\frac{4}{9},\frac{4}{9},\frac{1}{3},\frac{1}{9},\frac{2}{3})$
- C. $(\frac{2}{3},\frac{2}{9},\frac{1}{3},\frac{1}{3},\frac{2}{3})$
- D. $(\frac{4}{9},\frac{2}{9},\frac{2}{3},\frac{1}{9},\frac{1}{3})$

REFERENCE ANSWER

A. $(\frac{4}{9},\frac{4}{9},\frac{2}{3},\frac{1}{9},\frac{1}{3})$

JEV / CORRECT

A. $(\frac{4}{9},\frac{4}{9},\frac{2}{3},\frac{1}{9},\frac{1}{3})$

API confidence: 0.95
Option probabilities:
{ "A": 0.96, "B": 0.02, "C": 0.0, "D": 0.02 }

Section batch: 378 ms
Not per-question latency

QUESTION + OPTIONS

Two players start ready and shoot independently with success probability $\frac{2}{3}$. Both make: win; both miss: loss. If exactly one misses, next turn that player retrieves while the other shoots. A lone shooter's success makes both ready next turn; a miss leaves one retrieving. State0=both ready,1=one retrieving,2=win,3=loss. Arrows A:0->2,B:0->1,C:1->0,D:0->3,E:1->1.

Probability of winning from both ready?

- A. $\frac{8}{9}$
- B. $\frac{2}{3}$
- C. $\frac{4}{9}$
- D. $\frac{4}{5}$

REFERENCE ANSWER

D. $\frac{4}{5}$

JEV / INCORRECT

A. $\frac{8}{9}$

API confidence: 0.55
Option probabilities:
{ "A": 0.66, "B": 0.07, "C": 0.14, "D": 0.13 }

Section batch: 378 ms
Not per-question latency

QUESTION + OPTIONS

Two players start ready and shoot independently with success probability $\frac{2}{3}$. Both make: win; both miss: loss. If exactly one misses, next turn that player retrieves while the other shoots. A lone shooter's success makes both ready next turn; a miss leaves one retrieving. State0=both ready,1=one retrieving,2=win,3=loss. Arrows A:0->2,B:0->1,C:1->0,D:0->3,E:1->1.

Expected turns until win or loss from both ready?

- A. 4
- B. $\frac{9}{5}$
- C. 5
- D. 3

REFERENCE ANSWER

D. 3

JEV / INCORRECT

B. $\frac{9}{5}$

API confidence: 0.66
Option probabilities:
{ "A": 0.09, "B": 0.74, "C": 0.04, "D": 0.13 }

Section batch: 378 ms
Not per-question latency

QUESTION + OPTIONS

False implies False.

A. True

B. False

REFERENCE ANSWER

A. True

JEV / CORRECT

A. True

API confidence: 1.00
Option probabilities:
{ "B": 0.0, "A": 1.0 }

Section batch: 355 ms
Not per-question latency

QUESTION + OPTIONS

False implies True.

A. True

B. False

REFERENCE ANSWER

A. True

JEV / CORRECT

A. True

API confidence: 1.00
Option probabilities:
{"B": 0.0, "A": 1.0}

Section batch: 355 ms
Not per-question latency

QUESTION + OPTIONS

[NOT exists x P(x)] implies [forall x (P(x) implies Q(x))].

A. False

B. True

REFERENCE ANSWER

B. True

JEV / CORRECT

B. True

API confidence: 0.98
Option probabilities:
{ "B": 0.99, "A": 0.01 }

Section batch: 355 ms
Not per-question latency

QUESTION + OPTIONS

[forall x exists y (Q(x,y) implies P(x))] is equivalent to [forall x (NOT P(x) implies NOT forall y Q(x,y))].

A. False

B. True

REFERENCE ANSWER

B. True

JEV / CORRECT

B. True

API confidence: 0.48
Option probabilities:
{ "B": 0.74, "A": 0.26 }

Section batch: 355 ms
Not per-question latency

QUESTION + OPTIONS

No stable matching can give every job its least-preferred candidate.

A. True

B. False

REFERENCE ANSWER

B. False

JEV / INCORRECT

A. True

API confidence: 0.41
Option probabilities:
{ "B": 0.29, "A": 0.71 }

Section batch: 355 ms
Not per-question latency

QUESTION + OPTIONS

If job-proposing deferred acceptance finishes on day one, the result is optimal for both jobs and candidates.

A. False

B. True

REFERENCE ANSWER

A. False

JEV / CORRECT

A. False

API confidence: 0.68
Option probabilities:
{ "B": 0.16, "A": 0.84 }

Section batch: 355 ms
Not per-question latency

QUESTION + OPTIONS

For natural $x \leq y$, choose a valid proof that $x \leq y/2$ or $y-x \leq y/2$.

- A. Since $x \leq y$, necessarily $x \leq y/2$.
- B. Every natural y is even, so one term equals $y/2$.
- C. If both inequalities fail, adding $x > y/2$ and $y-x > y/2$ gives $y > y$, a contradiction.
- D. Since $y-x \geq 0$, necessarily $y-x \leq y/2$.

REFERENCE ANSWER

C. If both inequalities fail, adding $x > y/2$ and $y-x > y/2$ gives $y > y$, a contradiction.

JEV / CORRECT

C. If both inequalities fail, adding $x > y/2$ and $y-x > y/2$ gives $y > y$, a contradiction.

API confidence: 1.00
Option probabilities:
{ "D": 0.0, "B": 0.0, "C": 1.0, "A": 0.0 }

Section batch: 618 ms
Not per-question latency

QUESTION + OPTIONS

How many ordered natural pairs (a,b) satisfy $b^2=3a^2$? Here zero is natural.

- A. 2
- B. 1
- C. 0
- D. Infinitely many

REFERENCE ANSWER

B. 1

JEV / CORRECT

B. 1

API confidence: 0.65
Option probabilities:
{**"B"**: 0.74, "A": 0.21, "D": 0.03, "C": 0.02}

Section batch: 618 ms
Not per-question latency

QUESTION + OPTIONS

Choose a valid argument determining all natural solutions of $b^2=3a^2$, allowing zero.

- A. Squares are always even, whereas three times a square is always odd.
- B. A nonzero square has even exponent of prime3, but $3a^2$ has odd exponent; thus no nonzero solution exists and (0,0) is the only solution.
- C. Dividing by three implies $b=a$, hence all pairs with $a=b$ are solutions.
- D. For $a=3k$, $b=3k$ also satisfies the equation for every natural k .

REFERENCE ANSWER

B. A nonzero square has even exponent of prime3, but $3a^2$ has odd exponent; thus no nonzero solution exists and (0,0) is the only solution.

JEV / CORRECT

B. A nonzero square has even exponent of prime3, but $3a^2$ has odd exponent; thus no nonzero solution exists and (0,0) is the only solution.

API confidence: 1.00
Option probabilities:
{ "B": 1.0, "A": 0.0, "D": 0.0, "C": 0.0 }

Section batch: 618 ms
Not per-question latency

QUESTION + OPTIONS

Prime p and nonzero a modulo p : how many distinct residues ax arise as x ranges over $0..p-1$?

- A. $p-1$
- B. p
- C. 1
- D. $\gcd(a,p)$

REFERENCE ANSWER

B. p

JEV / CORRECT

B. p

API confidence: 0.78
Option probabilities:
{ $"A"$: 0.16, $"D"$: 0.0, $"B"$: 0.84, $"C"$: 0.0}

Section batch: 293 ms
Not per-question latency

QUESTION + OPTIONS

Let $\gcd(a,N)=d$. How many distinct residues $ax \bmod N$ arise for $x=0..N-1$?

- A. N
- B. d
- C. N/d
- D. $N-d$

REFERENCE ANSWER

C. N/d

JEV / CORRECT

C. N/d

API confidence: 0.98
Option probabilities:
{`"D"`: 0.0, `"A"`: 0.0, `"B"`: 0.01, `"C"`: 0.99}

Section batch: 293 ms
Not per-question latency

QUESTION + OPTIONS

For prime p , evaluate $1^2 \cdot 2^2 \cdots (p-1)^2$ modulo p .

- A. 1
- B. 2
- C. 0
- D. $p-1$

REFERENCE ANSWER

A. 1

JEV / CORRECT

A. 1

API confidence: 0.77
Option probabilities:
{ "A": 0.83, "D": 0.17, "B": 0.0, "C": 0.0 }

Section batch: 293 ms
Not per-question latency

QUESTION + OPTIONS

Choose a fair four-sided or fair six-sided die with equal probability. Roll and observe3. Probability it was the four-sided die?

- A. 3/5
- B. 1/4
- C. 1/2
- D. 2/5

REFERENCE ANSWER

A. 3/5

JEV / INCORRECT

D. 2/5

API confidence: 0.51
Option probabilities:
{ "D": 0.64, "A": 0.25, "C": 0.07, "B": 0.04 }

Section batch: 365 ms
Not per-question latency

QUESTION + OPTIONS

People indexed $0, \dots, n-1$ arrive in order, $n \geq 8$. Person i chooses $\min(i, 7)$ distinct earlier people as friends. Friendship is undirected.

How many friendship edges result?

- A. $C(n, 2)$
- B. $7n-21$
- C. $7n$
- D. $7n-28$

REFERENCE ANSWER

D. $7n-28$

Pre-run repair:
Use $n \geq 8$ rather than $n \geq 7$ consistently with Q6.3 intended answer.

JEV / INCORRECT

B. $7n-21$

API confidence: 0.86
Option probabilities:
{ "C": 0.0, "B": 0.91, "A": 0.0, "D": 0.09 }

Section batch: 335 ms
Not per-question latency

QUESTION + OPTIONS

People indexed $0, \dots, n-1$ arrive in order, $n \geq 8$. Person i chooses $\min(i, 7)$ distinct earlier people as friends. Friendship is undirected.

Maximum possible degree of a person?

- A. 14
- B. 7
- C. $n-7$
- D. $n-1$

REFERENCE ANSWER

D. $n-1$

JEV / INCORRECT

B. 7

API confidence: 0.38
Option probabilities:
{**"C"**: 0.18, "A": 0.16, "B": 0.54, "D": 0.12}

Section batch: 335 ms
Not per-question latency

QUESTION + OPTIONS

People indexed $0, \dots, n-1$ arrive in order, $n \geq 8$. Person i chooses $\min(i, 7)$ distinct earlier people as friends. Friendship is undirected.

Smallest number of colors sufficient for every possible resulting graph?

- A. n
- B. 9
- C. 7
- D. 8

REFERENCE ANSWER

D. 8

Pre-run repair:
At $n=7$ the source answer8 is not minimal;
restrict $n \geq 8$.

JEV / CORRECT

D. 8

API confidence: 0.62
Option probabilities:
{ "C": 0.17, "B": 0.09, "A": 0.02, "D": 0.72 }

Section batch: 335 ms
Not per-question latency

QUESTION + OPTIONS

People indexed $0, \dots, n-1$ arrive in order, $n \geq 8$. Person i chooses $\min(i, 7)$ distinct earlier people as friends. Friendship is undirected.

Which proves the optimal universal coloring bound?

- A. The first eight vertices form K_8 . Color in arrival order; each later vertex has seven earlier neighbors, so eight colors suffice.
- B. Every new vertex requires a fresh color because it has earlier neighbors.
- C. All vertices have degree seven, so seven colors always suffice.
- D. The graph is a tree, so two colors suffice.

REFERENCE ANSWER

A. The first eight vertices form K_8 . Color in arrival order; each later vertex has seven earlier neighbors, so eight colors suffice.

JEV / CORRECT

A. The first eight vertices form K_8 . Color in arrival order; each later vertex has seven earlier neighbors, so eight colors suffice.

API confidence: 0.99
Option probabilities:
{`"C"`: 0.0, `"A"`: 1.0, `"B"`: 0.0, `"D"`: 0.0}

Section batch: 335 ms
Not per-question latency

QUESTION + OPTIONS

People indexed $0, \dots, n-1$ arrive in order, $n \geq 8$. Person i chooses $\min(i, 7)$ distinct earlier people as friends. Friendship is undirected.

If each person uniformly chooses the prescribed-size subset of earlier people, expected degree of person 0 ?

- A. $\sum_{i=1}^n \min(i, 7)/i$
- B. $\sum_{i=1}^{n-1} \min(i, 7)/i$
- C. 7
- D. $7(n-1)$

REFERENCE ANSWER

B. $\sum_{i=1}^{n-1} \min(i, 7)/i$

Pre-run repair:
Correct source summation endpoint: n people indexed $0..n-1$, not $0..n$.

JEV / CORRECT

B. $\sum_{i=1}^{n-1} \min(i, 7)/i$

API confidence: 0.96
Option probabilities:
{ "C": 0.01, "A": 0.02, "B": 0.97, "D": 0.0 }

Section batch: 335 ms
Not per-question latency

QUESTION + OPTIONS

The three-dimensional cube has more edges than K4.

A. False

B. True

REFERENCE ANSWER

B. True

JEV / CORRECT

B. True

API confidence: 0.83
Option probabilities:
{ "B": 0.91, "A": 0.09 }

Section batch: 480 ms
Not per-question latency

QUESTION + OPTIONS

Sharp maximum number of vertices in a graph with e edges and c connected components?

- A. $2e+c$
- B. $e-c$
- C. $e+c-1$
- D. $e+c$

REFERENCE ANSWER

D. $e+c$

JEV / INCORRECT

A. $2e+c$

API confidence: 0.41
Option probabilities:
{**"B"**: 0.01, "C": 0.03, "D": 0.41, "A": 0.55}

Section batch: 480 ms
Not per-question latency

QUESTION + OPTIONS

A finite undirected graph can have an odd number of odd-degree vertices.

A. False

B. True

REFERENCE ANSWER

A. False

JEV / CORRECT

A. False

API confidence: 0.99
Option probabilities:
{ "B": 0.01, "A": 0.99 }

Section batch: 480 ms
Not per-question latency

QUESTION + OPTIONS

Average vertex degree in a tree with n vertices?

- A. 2
- B. $n-1$
- C. $1-1/n$
- D. $2-2/n$

REFERENCE ANSWER

D. $2-2/n$

JEV / CORRECT

D. $2-2/n$

API confidence: 0.99
Option probabilities:
{`"B": 0.0, "C": 0.0, "D": 1.0, "A": 0.0`}

Section batch: 480 ms
Not per-question latency

QUESTION + OPTIONS

Connected planar embedding has v vertices and average face boundary length $s > 2$. Choose edge count with valid justification.

- A. $e = (s-2)(v-2)/s$, by reversing the ratio in the face-count identity.
- B. $e = sv/2$, since face length equals average vertex degree.
- C. $e = s(v-2)/(s-2)$, since $sf = 2e$ and $v - e + f = 2$.
- D. $e = s(v-2)/2$, since every face contributes two vertices.

REFERENCE ANSWER

C. $e = s(v-2)/(s-2)$, since $sf = 2e$ and $v - e + f = 2$.

JEV / CORRECT

C. $e = s(v-2)/(s-2)$, since $sf = 2e$ and $v - e + f = 2$.

API confidence: 0.99
Option probabilities:
{"B": 0.0, "C": 1.0, "D": 0.0, "A": 0.0}

Section batch: 480 ms
Not per-question latency

QUESTION + OPTIONS

Over $\text{GF}(7)$, degree-at-most-two P satisfies $P(0)=0$ and $P(1)=P(6)=2$.

Remainder when P is divided by $x-6$?

- A. 2
- B. 6
- C. 1
- D. 0

REFERENCE ANSWER

A. 2

JEV / CORRECT

A. 2

API confidence: 0.99
Option probabilities:
{`"D"`: 0.0, `"B"`: 0.0, `"A"`: 1.0, `"C"`: 0.0}

Section batch: 289 ms
Not per-question latency

QUESTION + OPTIONS

Over $\text{GF}(7)$, degree-at-most-two P satisfies $P(0)=0$ and $P(1)=P(6)=2$.

Find $P(x)$.

- A. x^2+1
- B. $2x^2+2$
- C. $2x^2$
- D. $2x$

REFERENCE ANSWER

C. $2x^2$

JEV / INCORRECT

D. $2x$

API confidence: 0.22
Option probabilities:
{ $"D"$: 0.42, $"B"$: 0.09, $"A"$: 0.14, $"C"$: 0.35}

Section batch: 289 ms
Not per-question latency

QUESTION + OPTIONS

Over $\text{GF}(7)$, degree-at-most-two P satisfies $P(0)=0$ and $P(1)=P(6)=2$.

Which constant polynomial disagrees with exactly one of these three given values?

A. 0

B. 1

C. 2

D. 6

REFERENCE ANSWER

C. 2

JEV / CORRECT

C. 2

API confidence: 0.27
Option probabilities:
{ "D": 0.06, "B": 0.2, "A": 0.28, "C": 0.46 }

Section batch: 289 ms
Not per-question latency

QUESTION + OPTIONS

Over the reals, degree-at-most-two P has $P(0)=0$ and $P(1)=P(-1)=A$. Find P .

- A. Ax
- B. Ax^2
- C. $A(x^2+1)$
- D. A

REFERENCE ANSWER

B. Ax^2

Pre-run repair:
Specify real coefficients to avoid
characteristic-two coincidence of coordinates.

JEV / CORRECT

B. Ax^2

API confidence: 0.98
Option probabilities:
{ $"D"$: 0.01, $"B"$: 0.99, $"A"$: 0.0, $"C"$: 0.0}

Section batch: 289 ms
Not per-question latency

QUESTION + OPTIONS

Over $\text{GF}(p)$, $p \geq d+1$, fixed degree-at-most- d P . How many degree-at-most- d Q agree with P at coordinates $1, \dots, k$, where $0 \leq k \leq d$?

- A. $p^{(d-k)}$
- B. $p^{(d+1-k)}$
- C. 1
- D. p^k

REFERENCE ANSWER

B. $p^{(d+1-k)}$

JEV / INCORRECT

A. $p^{(d-k)}$

API confidence: 0.35
Option probabilities:
{ $"D"$: 0.0, $"B"$: 0.49, $"A"$: 0.51, $"C"$: 0.0}

Section batch: 289 ms
Not per-question latency

QUESTION + OPTIONS

Between any two distinct reals in $[0,1]$ there is a rational.

A. False

B. True

REFERENCE ANSWER

B. True

JEV / CORRECT

B. True

API confidence: 0.97
Option probabilities:
{`"B"`: 0.99, `"A"`: 0.01}

Section batch: 384 ms
Not per-question latency

QUESTION + OPTIONS

The rationals and $[0,1] \times [0,1]$ have the same cardinality.

A. True

B. False

REFERENCE ANSWER

B. False

JEV / CORRECT

B. False

API confidence: 0.28
Option probabilities:
{ "B": 0.64, "A": 0.36 }

Section batch: 384 ms
Not per-question latency

QUESTION + OPTIONS

The set of finite programs is countable.

A. False

B. True

REFERENCE ANSWER

B. True

JEV / CORRECT

B. True

API confidence: 0.97
Option probabilities:
{ "B": 0.98, "A": 0.02 }

Section batch: 384 ms
Not per-question latency

QUESTION + OPTIONS

All outputs generated by finite programs on finite inputs form a countable set, even allowing infinite output sequences.

A. False

B. True

REFERENCE ANSWER

B. True

JEV / CORRECT

B. True

API confidence: 0.63
Option probabilities:
{ "B": 0.82, "A": 0.18 }

Section batch: 384 ms
Not per-question latency

QUESTION + OPTIONS

There exists a program $P(Q,x)$ that halts exactly when $Q(x)$ does not halt.

A. False

B. True

REFERENCE ANSWER

A. False

JEV / CORRECT

A. False

API confidence: 0.92
Option probabilities:
{**"B"**: 0.04, **"A"**: 0.96}

Section batch: 384 ms
Not per-question latency

QUESTION + OPTIONS

Number of two-element subsets of an n -element set?

A. $C(n,2)$

B. n^2

C. 2^n

D. $n(n-1)$

REFERENCE ANSWER

A. $C(n,2)$

JEV / CORRECT

A. $C(n,2)$

API confidence: 1.00
Option probabilities:
{`"B": 0.0, "A": 1.0, "D": 0.0, "C": 0.0`}

Section batch: 428 ms
Not per-question latency

QUESTION + OPTIONS

Number of nonempty subsets of an n -element set?

- A. $n!$
- B. 2^n
- C. 2^{n-1}
- D. $n-1$

REFERENCE ANSWER

C. 2^{n-1}

JEV / CORRECT

C. 2^{n-1}

API confidence: 1.00
Option probabilities:
{`"B": 0.0, "A": 0.0, "D": 0.0, "C": 1.0`}

Section batch: 428 ms
Not per-question latency

QUESTION + OPTIONS

Orderings of k distinct elements?

- A. k^k
- B. 2^k
- C. k
- D. $k!$

REFERENCE ANSWER

D. $k!$

JEV / CORRECT

D. $k!$

API confidence: 1.00
Option probabilities:
{`"B": 0.0, "A": 0.0, "D": 1.0, "C": 0.0`}

Section batch: 428 ms
Not per-question latency

QUESTION + OPTIONS

Hamiltonian paths in K_n , counted as ordered vertex sequences (reversals distinct), $n \geq 3$?

- A. $C(n,2)$
- B. $(n-1)!$
- C. $n!$
- D. $n!/2$

REFERENCE ANSWER

C. $n!$

Pre-run repair:
State orientation convention used by source answer.

JEV / CORRECT

C. $n!$

API confidence: 0.94
Option probabilities:
{**"B"**: 0.02, "A": 0.0, "D": 0.02, "C": 0.96}

Section batch: 428 ms
Not per-question latency

QUESTION + OPTIONS

Hamiltonian cycles in K_n , rotations identified but reverse orientations distinct, $n \geq 3$?

A. $(n-1)!/2$

B. $(n-1)!$

C. $n!$

D. 2^n

REFERENCE ANSWER

B. $(n-1)!$

Pre-run repair:
State orientation convention used by source answer.

JEV / CORRECT

B. $(n-1)!$

API confidence: 0.55
Option probabilities:
{ "A": 0.34, "B": 0.66, "C": 0.0, "D": 0.0 }

Section batch: 428 ms
Not per-question latency

QUESTION + OPTIONS

$S(n,k)$ counts partitions of n labeled objects into k nonempty unlabeled blocks.

$S(n,n-1)$, $n \geq 2$?

- A. $n!$
- B. $n-1$
- C. $C(n,2)$
- D. $2^{(n-1)}$

REFERENCE ANSWER

C. $C(n,2)$

JEV / CORRECT

C. $C(n,2)$

API confidence: 1.00
Option probabilities:
{ $"D"$: 0.0, $"C"$: 1.0, $"B"$: 0.0, $"A"$: 0.0}

Section batch: 357 ms
Not per-question latency

QUESTION + OPTIONS

$S(n,k)$ counts partitions of n labeled objects into k nonempty unlabeled blocks.

$S(n,2)$, $n \geq 2$?

A. $2^n - 1$

B. $C(n,2)$

C. $2^{(n-1)} - 1$

D. $2^{(n-1)}$

REFERENCE ANSWER

C. $2^{(n-1)} - 1$

JEV / CORRECT

C. $2^{(n-1)} - 1$

API confidence: 0.93
Option probabilities:
{ "D": 0.05, "C": 0.95, "B": 0.0, "A": 0.0 }

Section batch: 357 ms
Not per-question latency

QUESTION + OPTIONS

$S(n,k)$ counts partitions of n labeled objects into k nonempty unlabeled blocks.

Choose the correct recurrence with combinatorial justification.

- A. $S(n+1,k)=kS(n,k)+S(n,k-1)$: the new object joins one of k old blocks or forms a singleton.
- B. $S(n+1,k)=S(n,k)+kS(n,k-1)$: a singleton has k distinct labels.
- C. $S(n+1,k)=(k+1)S(n,k)$: every partition can place the object in $k+1$ existing blocks.
- D. $S(n+1,k)=nS(n,k)$: distinguish which existing object the newcomer follows.

REFERENCE ANSWER

A. $S(n+1,k)=kS(n,k)+S(n,k-1)$:
the new object joins one of k
old blocks or forms a
singleton.

JEV / CORRECT

A. $S(n+1,k)=kS(n,k)+S(n,k-1)$:
the new object joins one of k
old blocks or forms a
singleton.

API confidence: 1.00
Option probabilities:
{ "D": 0.0, "C": 0.0, "B": 0.0, "A": 1.0 }

Section batch: 357 ms
Not per-question latency

QUESTION + OPTIONS

$S(n,k)$ counts partitions of n labeled objects into k nonempty unlabeled blocks.

Multisets of size n from values $1..m$ containing exactly k distinct values, $1 \leq k \leq \min(n,m)$?

A. $C(n-1,k-1)C(m,k)$

B. m^n

C. $C(n+k-1,k-1)C(m,k)$

D. $S(n,k)C(m,k)$

REFERENCE ANSWER

A. $C(n-1,k-1)C(m,k)$

JEV / INCORRECT

D. $S(n,k)C(m,k)$

API confidence: 0.48
Option probabilities:
{ "D": 0.61, "C": 0.09, "B": 0.0, "A": 0.3 }

Section batch: 357 ms
Not per-question latency

QUESTION + OPTIONS

$S(n,k)$ counts partitions of n labeled objects into k nonempty unlabeled blocks.

Ordered length- n sequences from $1..m$ using exactly k distinct values?

A. $S(n,k)C(m,k)$

B. $S(n,k)k!C(m,k)$

C. $k^n C(m,k)$

D. $C(n-1,k-1)C(m,k)$

REFERENCE ANSWER

B. $S(n,k)k!C(m,k)$

JEV / CORRECT

B. $S(n,k)k!C(m,k)$

API confidence: 0.90
Option probabilities:
{`"D": 0.0, "C": 0.01, "B": 0.92, "A": 0.07`}

Section batch: 357 ms
Not per-question latency

QUESTION + OPTIONS

Flip a fair coin independently 100 times. S = number of heads minus number of tails.

Exact $P(S \geq 20)$?

- A. $2^{-100} \sum_{h=20}^{100} C(100, h)$
- B. $2^{-100} C(100, 60)$
- C. $2^{-100} \sum_{h=60}^{100} C(100, h)$
- D. $2^{-100} \sum_{h=70}^{100} C(100, h)$

REFERENCE ANSWER

C. $2^{-100} \sum_{h=60}^{100} C(100, h)$

JEV / CORRECT

C. $2^{-100} \sum_{h=60}^{100} C(100, h)$

API confidence: 0.86
Option probabilities:
{ "B": 0.0, "D": 0.08, "A": 0.02, "C": 0.9 }

Section batch: 357 ms
Not per-question latency

QUESTION + OPTIONS

Flip a fair coin independently100 times. S =number of heads minus number of tails.

Apply Markov to the nonnegative number of heads to bound $P(S \geq 20)$.

A. 0

B. 1/2

C. 1/5

D. 5/6

REFERENCE ANSWER

D. 5/6

JEV / INCORRECT

C. 1/5

API confidence: 0.34
Option probabilities:
{**"B"**: 0.25, "D": 0.07, "A": 0.17, "C": 0.51}

Section batch: 357 ms
Not per-question latency

QUESTION + OPTIONS

Flip a fair coin independently 100 times. S = number of heads minus number of tails.

What bound comes from $P(S \geq 20) \leq P(|S| \geq 20)$ followed directly by two-sided Chebyshev, without symmetry refinement?

- A. 1/2
- B. 1/20
- C. 1/4
- D. 1/8

REFERENCE ANSWER

C. 1/4

Pre-run repair:
Specify requested Chebyshev application;
source also accepts symmetry-refined 1/8,
avoiding two valid alternatives.

JEV / INCORRECT

B. 1/20

API confidence: 0.16
Option probabilities:
{ "B": 0.37, "D": 0.27, "A": 0.28, "C": 0.08 }

Section batch: 357 ms
Not per-question latency

QUESTION + OPTIONS

Flip a fair coin independently 100 times. S = number of heads minus number of tails.

Use the CLT without continuity correction to approximate $P(S \geq 20)$, writing Φ for standard Normal CDF.

- A. $\Phi(2)$
- B. $1 - \Phi(2)$
- C. $1 - \Phi(0.2)$
- D. $1 - \Phi(20)$

REFERENCE ANSWER

B. $1 - \Phi(2)$

Pre-run repair:
Replace source wording upper bound with approximation: CLT is not a finite-sample guaranteed bound.

JEV / CORRECT

B. $1 - \Phi(2)$

API confidence: 0.96
Option probabilities:
{ $"B"$: 0.97, $"D"$: 0.0, $"A"$: 0.01, $"C"$: 0.02}

Section batch: 357 ms
Not per-question latency

QUESTION + OPTIONS

R is uniform on $[1/4, 3/4]$. Conditional on $R=r$, flip independently with heads probability r until first heads. J counts flips including the final heads.

$E[R]$?

A. $1/4$

B. $1/2$

C. $3/4$

D. 1

REFERENCE ANSWER

B. $1/2$

JEV / CORRECT

B. $1/2$

API confidence: 0.99
Option probabilities:
{`"D": 0.0, "A": 0.0, "C": 0.0, "B": 1.0`}

Section batch: 473 ms
Not per-question latency

QUESTION + OPTIONS

R is uniform on $[1/4, 3/4]$. Conditional on $R=r$, flip independently with heads probability r until first heads. J counts flips including the final heads.

$E[J]$?

A. $4 \ln(3)$

B. 2

C. $2 \ln(3)$

D. $\ln(3)$

REFERENCE ANSWER

C. $2 \ln(3)$

JEV / CORRECT

C. $2 \ln(3)$

API confidence: 0.60
Option probabilities:
{`"D"`: 0.07, `"A"`: 0.12, `"C"`: 0.7, `"B"`: 0.11}

Section batch: 473 ms
Not per-question latency

QUESTION + OPTIONS

R is uniform on $[1/4, 3/4]$. Conditional on $R=r$, flip independently with heads probability r until first heads. J counts flips including the final heads.

$P(J > 70 \text{ given } R=r)$?

A. $(1-r)^{70}$

B. r^{70}

C. $(1-r)^{69}$

D. $1-(1-r)^{70}$

REFERENCE ANSWER

A. $(1-r)^{70}$

JEV / CORRECT

A. $(1-r)^{70}$

API confidence: 0.80
Option probabilities:
{ "D": 0.0, "A": 0.85, "C": 0.15, "B": 0.0 }

Section batch: 473 ms
Not per-question latency

QUESTION + OPTIONS

R is uniform on $[1/4, 3/4]$. Conditional on $R=r$, flip independently with heads probability r until first heads. J counts flips including the final heads.

$P(J > 70)$?

A. $2[(3/4)^{71} - (1/4)^{71}]/71$

B. $(1/2)^{70}$

C. $[(3/4)^{71} - (1/4)^{71}]/71$

D. $2[(3/4)^{70} - (1/4)^{70}]/70$

REFERENCE ANSWER

A. $2[(3/4)^{71} - (1/4)^{71}]/71$

JEV / INCORRECT

C. $[(3/4)^{71} - (1/4)^{71}]/71$

API confidence: 0.26
Option probabilities:
{ "D": 0.08, "A": 0.4, "C": 0.45, "B": 0.07 }

Section batch: 473 ms
Not per-question latency

QUESTION + OPTIONS

$N \sim \text{Poisson}(\mu)$ is independent of iid lifetimes $X_i \sim \text{Exponential}(\text{rate } \lambda)$.
 $T = \sum_{i=1..N} X_i$, empty sum zero. $E[T]$?

- A. $\mu * \lambda$
- B. λ / μ
- C. μ / λ
- D. $1 / \lambda$

REFERENCE ANSWER

C. μ / λ

Pre-run repair:
Explicit independence between bulb count and lifetimes needed for the source solution.

JEV / CORRECT

C. μ / λ

API confidence: 0.99
Option probabilities:
{**"B"**: 0.0, **"C"**: 1.0, **"A"**: 0.0, **"D"**: 0.0}

Section batch: 367 ms
Not per-question latency

QUESTION + OPTIONS

$X \sim \text{Normal}(\mu, \sigma^2)$, where σ^2 denotes the variance.

$E[X]$?

A. μ^2

B. μ

C. 0

D. σ

REFERENCE ANSWER

B. μ

JEV / CORRECT

B. μ

API confidence: 1.00
Option probabilities:
{ $"D"$: 0.0, $"A"$: 0.0, $"B"$: 1.0, $"C"$: 0.0}

Section batch: 302 ms
Not per-question latency

QUESTION + OPTIONS

$X \sim \text{Normal}(\mu, \sigma^2)$, where σ^2 denotes the variance.

$E[X^2]$?

A. σ^2

B. $\mu^2 + \sigma^2$

C. μ^2

D. $\mu + \sigma^2$

REFERENCE ANSWER

B. $\mu^2 + \sigma^2$

JEV / CORRECT

B. $\mu^2 + \sigma^2$

API confidence: 1.00
Option probabilities:
{`"D": 0.0, "A": 0.0, "B": 1.0, "C": 0.0`}

Section batch: 302 ms
Not per-question latency

QUESTION + OPTIONS

$X \sim \text{Normal}(\mu, \sigma^2)$, where σ^2 denotes the variance.

$E[X^3]$?

A. $\mu^3 + 3\mu^2 \cdot \sigma$

B. $\mu^3 + \sigma^3$

C. $\mu^3 + 3\mu \cdot \sigma^2$

D. μ^3

REFERENCE ANSWER

C. $\mu^3 + 3\mu \cdot \sigma^2$

JEV / CORRECT

C. $\mu^3 + 3\mu \cdot \sigma^2$

API confidence: 0.99
Option probabilities:
{ "D": 0.0, "B": 0.0, "A": 0.0, "C": 1.0 }

Section batch: 302 ms
Not per-question latency

QUESTION + OPTIONS

Joint probabilities, columns S=1,2,3: row P=1:(.05,.10,0); row P=2:(.10,.05,.15); row P=3:(.05,.10,.40).

Marginals (S=1,2,3) and (P=1,2,3)?

A. S:(1/3,1/3,1/3); P:(1/3,1/3,1/3)

B. S:(.25,.20,.55); P:(.30,.15,.55)

C. S:(.20,.25,.55); P:(.15,.30,.55)

D. S:(.15,.30,.55); P:(.20,.25,.55)

REFERENCE ANSWER

C. S:(.20,.25,.55);
P:(.15,.30,.55)

JEV / CORRECT

C. S:(.20,.25,.55);
P:(.15,.30,.55)

API confidence: 0.95
Option probabilities:
{"C": 0.97, "B": 0.0, "A": 0.0, "D": 0.03}

Section batch: 321 ms
Not per-question latency

QUESTION + OPTIONS

Joint probabilities, columns S=1,2,3: row P=1:(.05,.10,0); row P=2:(.10,.05,.15); row P=3:(.05,.10,.40).

(E[S],E[P])?

A. (2.40,2.35)

B. (.55,.55)

C. (2.35,2.40)

D. (2,2)

REFERENCE ANSWER

C. (2.35,2.40)

JEV / INCORRECT

A. (2.40,2.35)

API confidence: 0.46
Option probabilities:
{ "C": 0.36, "A": 0.59, "B": 0.0, "D": 0.05 }

Section batch: 321 ms
Not per-question latency

QUESTION + OPTIONS

Joint probabilities, columns S=1,2,3: row P=1:(.05,.10,0); row P=2:(.10,.05,.15); row P=3:(.05,.10,.40).

P(S=P)?

A. 1/3

B. 2/5

C. 1/2

D. 3/4

REFERENCE ANSWER

C. 1/2

JEV / CORRECT

C. 1/2

API confidence: 0.36
Option probabilities:
{ "C": 0.52, "B": 0.38, "A": 0.05, "D": 0.05 }

Section batch: 321 ms
Not per-question latency

QUESTION + OPTIONS

Joint probabilities, columns S=1,2,3: row P=1:(.05,.10,0); row P=2:(.10,.05,.15); row P=3:(.05,.10,.40).

P(S=3 given S>=P)?

A. 4/5

B. 11/20

C. 3/5

D. 11/15

REFERENCE ANSWER

D. 11/15

JEV / INCORRECT

A. 4/5

API confidence: 0.32
Option probabilities:
{ "C": 0.21, "B": 0.11, "A": 0.49, "D": 0.19 }

Section batch: 321 ms
Not per-question latency

QUESTION + OPTIONS

I_A is 1 when event A occurs and 0 otherwise. Events need not be independent.

Why does $E[I_A]=P(A)$?

- A. The expectation is $1 \cdot P(A) + 0 \cdot P(\text{not } A)$.
- B. All indicators are fair Bernoulli variables.
- C. The expectation of every indicator equals its variance.
- D. The expectation sums $P(A)$ and $P(\text{not } A)$.

REFERENCE ANSWER

A. The expectation is $1 \cdot P(A) + 0 \cdot P(\text{not } A)$.

JEV / CORRECT

A. The expectation is $1 \cdot P(A) + 0 \cdot P(\text{not } A)$.

API confidence: 1.00
Option probabilities:
{ "C": 0.0, "B": 0.0, "D": 0.0, "A": 1.0 }

Section batch: 381 ms
Not per-question latency

QUESTION + OPTIONS

I_A is 1 when event A occurs and 0 otherwise. Events need not be independent.

Choose the valid pointwise identity and justification.

- A. $I_A I_B = I_A + I_B$, because indicators only take 0 and 1.
- B. $\min(I_A, I_B) = I_{(A \cup B)}$, because minimum detects either event.
- C. $I_A I_B = I_{(A \cap B)} = \min(I_A, I_B)$, since all three are 1 exactly when both events occur.
- D. $I_A I_B = I_{(A \cup B)}$, since multiplication represents either event.

REFERENCE ANSWER

C. $I_A I_B = I_{(A \cap B)} = \min(I_A, I_B)$, since all three are 1 exactly when both events occur.

JEV / CORRECT

C. $I_A I_B = I_{(A \cap B)} = \min(I_A, I_B)$, since all three are 1 exactly when both events occur.

API confidence: 1.00
Option probabilities:
{ "C": 1.0, "D": 0.0, "B": 0.0, "A": 0.0 }

Section batch: 381 ms
Not per-question latency

QUESTION + OPTIONS

I_A is 1 when event A occurs and 0 otherwise. Events need not be independent.

Choose the valid union identity and justification.

- A. $I_{(A \text{ union } B)} = I_A I_B$ because the events are independent.
- B. $I_{(A \text{ union } B)} = I_A + I_B$ without any subtraction because indicators are disjoint.
- C. $I_{(A \text{ union } B)} = I_A + I_B - I_{(A \text{ intersection } B)} = \max(I_A, I_B)$; the overlap term corrects double counting.
- D. $I_{(A \text{ union } B)} = \min(I_A, I_B)$ because a union requires both events.

REFERENCE ANSWER

C. $I_{(A \text{ union } B)} = I_A + I_B - I_{(A \text{ intersection } B)} = \max(I_A, I_B)$; the overlap term corrects double counting.

JEV / CORRECT

C. $I_{(A \text{ union } B)} = I_A + I_B - I_{(A \text{ intersection } B)} = \max(I_A, I_B)$; the overlap term corrects double counting.

API confidence: 1.00
Option probabilities:
{ "C": 1.0, "D": 0.0, "B": 0.0, "A": 0.0 }

Section batch: 381 ms
Not per-question latency

QUESTION + OPTIONS

I_A is 1 when event A occurs and 0 otherwise. Events need not be independent.

Why are I_A, I_B uncorrelated exactly when A,B are independent?

- A. Every pair of indicators has zero covariance.
- B. All uncorrelated random variables are independent, regardless of their distributions.
- C. Zero covariance means A and B cannot both occur.
- D. $\text{Cov}(I_A, I_B) = P(A \cap B) - P(A)P(B)$; zero covariance is exactly the independence criterion for two events.

REFERENCE ANSWER

D. $\text{Cov}(I_A, I_B) = P(A \cap B) - P(A)P(B)$; zero covariance is exactly the independence criterion for two events.

JEV / CORRECT

D. $\text{Cov}(I_A, I_B) = P(A \cap B) - P(A)P(B)$; zero covariance is exactly the independence criterion for two events.

API confidence: 1.00
Option probabilities:
{ "C": 0.0, "D": 1.0, "B": 0.0, "A": 0.0 }

Section batch: 381 ms
Not per-question latency

QUESTION + OPTIONS

I_A is 1 when event A occurs and 0 otherwise. Events need not be independent.

For real α_i of either sign and arbitrary events A_i , why is $\sum_{i,j} \alpha_i \alpha_j P(A_i \text{ intersection } A_j) \geq 0$? Hint: consider the square of $\sum_i \alpha_i I_{A_i}$.

- A. Each summand is nonnegative because every product $\alpha_i \alpha_j$ is nonnegative.
- B. The sum equals $E[(\sum_i \alpha_i I_{A_i})^2]$, an expectation of a nonnegative quantity.
- C. The sum equals $(\sum_i \alpha_i P(A_i))^2$ for all events.
- D. Distinct indicators are independent, so every cross term vanishes.

REFERENCE ANSWER

B. The sum equals $E[(\sum_i \alpha_i I_{A_i})^2]$, an expectation of a nonnegative quantity.

JEV / CORRECT

B. The sum equals $E[(\sum_i \alpha_i I_{A_i})^2]$, an expectation of a nonnegative quantity.

API confidence: 1.00
Option probabilities:
{ "C": 0.0, "D": 0.0, "B": 1.0, "A": 0.0 }

Section batch: 381 ms
Not per-question latency

QUESTION + OPTIONS

$P(M=m)=\alpha \cdot m$ for integers $1 \leq m \leq n$, zero otherwise. Useful sums:
 $\sum_{m=1..n} m = n(n+1)/2$; $\sum_{m=1..n} m^2 = n(n+1)(2n+1)/6$.

Normalization α ?

- A. $1/[n(n+1)]$
- B. $1/n$
- C. $2/[n(n+1)]$
- D. $6/[n(n+1)(2n+1)]$

REFERENCE ANSWER

C. $2/[n(n+1)]$

JEV / CORRECT

C. $2/[n(n+1)]$

API confidence: 1.00
Option probabilities:
{ "B": 0.0, "D": 0.0, "C": 1.0, "A": 0.0 }

Section batch: 333 ms
Not per-question latency

QUESTION + OPTIONS

$P(M=m)=\alpha \cdot m$ for integers $1 \leq m \leq n$, zero otherwise. Useful sums:
 $\sum_{m=1..n} m = n(n+1)/2$; $\sum_{m=1..n} m^2 = n(n+1)(2n+1)/6$.

$E[M]$, expressed in terms of α ?

- A. $\alpha^2 \cdot n(n+1)(2n+1)/6$
- B. $\alpha \cdot n(n+1)(2n+1)/6$
- C. $\alpha \cdot n(n+1)/2$
- D. $\alpha \cdot n^2$

REFERENCE ANSWER

B. $\alpha \cdot n(n+1)(2n+1)/6$

JEV / CORRECT

B. $\alpha \cdot n(n+1)(2n+1)/6$

API confidence: 0.64
Option probabilities:
{ "B": 0.73, "D": 0.0, "C": 0.02, "A": 0.25 }

Section batch: 333 ms
Not per-question latency

QUESTION + OPTIONS

$P(M=m)=\alpha \cdot m$ for integers $1 \leq m \leq n$, zero otherwise. Useful sums:
 $\sum_{m=1..n} m = n(n+1)/2$; $\sum_{m=1..n} m^2 = n(n+1)(2n+1)/6$.

CDF at integer m ?

- A. 0 if $m < 1$; $\alpha \cdot m^2$ if $1 \leq m \leq n$; 1 if $m > n$
- B. 0 if $m < 1$; $\alpha \cdot m(m+1)/2$ if $1 \leq m \leq n$; 1 if $m > n$
- C. 0 if $m < 1$; $\alpha \cdot m(m-1)/2$ if $1 \leq m \leq n$; 1 if $m > n$
- D. 0 if $m < 1$; $\alpha \cdot m$ if $1 \leq m \leq n$; 1 if $m > n$

REFERENCE ANSWER

B. 0 if $m < 1$; $\alpha \cdot m(m+1)/2$
if $1 \leq m \leq n$; 1 if $m > n$

JEV / CORRECT

B. 0 if $m < 1$; $\alpha \cdot m(m+1)/2$
if $1 \leq m \leq n$; 1 if $m > n$

API confidence: 0.99
Option probabilities:
{ "B": 0.99, "D": 0.0, "C": 0.01, "A": 0.0 }

Section batch: 333 ms
Not per-question latency

QUESTION + OPTIONS

A bidirectional laser is anchored at $(-1,0)$. Its angle θ from the positive x -axis is uniform on $(-\pi/2,\pi/2)$. Y is its vertical coordinate where the beam intersects $x=0$.

Y as a function of θ ?

- A. $\tan(\theta)$
- B. $\cos(\theta)$
- C. $\sin(\theta)$
- D. $1/\tan(\theta)$

REFERENCE ANSWER

A. $\tan(\theta)$

JEV / CORRECT

A. $\tan(\theta)$

API confidence: 0.99
Option probabilities:
 $\{ "C": 0.0, "D": 0.0, "A": 1.0, "B": 0.0 \}$

Section batch: 336 ms
Not per-question latency

QUESTION + OPTIONS

A bidirectional laser is anchored at $(-1,0)$. Its angle Θ from the positive x -axis is uniform on $(-\pi/2,\pi/2)$. Y is its vertical coordinate where the beam intersects $x=0$.

CDF $F_Y(y)$ for real y ?

- A. $1/2+\arctan(y)/\pi$
- B. $1/2+\tan(y)/\pi$
- C. $\arctan(y)/\pi$
- D. $1/[\pi(1+y^2)]$

REFERENCE ANSWER

A. $1/2+\arctan(y)/\pi$

JEV / CORRECT

A. $1/2+\arctan(y)/\pi$

API confidence: 0.99
Option probabilities:
{ $"C"$: 0.0, $"D"$: 0.0, $"A"$: 1.0, $"B"$: 0.0}

Section batch: 336 ms
Not per-question latency

QUESTION + OPTIONS

A bidirectional laser is anchored at $(-1,0)$. Its angle Θ from the positive x -axis is uniform on $(-\pi/2,\pi/2)$. Y is its vertical coordinate where the beam intersects $x=0$.

Density $f_Y(y)$ for real y ?

A. $1/[\pi(1+y^2)]$

B. $1/2+\arctan(y)/\pi$

C. $\exp(-y^2/2)/\sqrt{2\pi}$

D. $1/[\pi(1+y)]$

REFERENCE ANSWER

A. $1/[\pi(1+y^2)]$

JEV / CORRECT

A. $1/[\pi(1+y^2)]$

API confidence: 1.00
Option probabilities:
{ $"C"$: 0.0, $"D"$: 0.0, $"A"$: 1.0, $"B"$: 0.0}

Section batch: 336 ms
Not per-question latency

QUESTION + OPTIONS

Four guests receive their four distinct umbrellas in a uniformly random permutation. C_i means guest i receives their own umbrella.

$P(C_1)$?

A. $1/24$

B. $1/4$

C. $3/4$

D. $1/2$

REFERENCE ANSWER

B. $1/4$

JEV / CORRECT

B. $1/4$

API confidence: 0.99
Option probabilities:
{**"A"**: 0.01, "C": 0.0, "B": 0.99, "D": 0.0}

Section batch: 434 ms
Not per-question latency

QUESTION + OPTIONS

Four guests receive their four distinct umbrellas in a uniformly random permutation. C_i means guest i receives their own umbrella.

Why is $P(C_i)=P(C_j)$ for every i,j ?

- A. Symmetry
- B. Transitivity
- C. Independence
- D. Disjointness

REFERENCE ANSWER

A. Symmetry

JEV / CORRECT

A. Symmetry

API confidence: 1.00
Option probabilities:
{**"A"**: 1.0, "C": 0.0, "B": 0.0, "D": 0.0}

Section batch: 434 ms
Not per-question latency

QUESTION + OPTIONS

Four guests receive their four distinct umbrellas in a uniformly random permutation. C_i means guest i receives their own umbrella.

Number of distinct pairwise-intersection terms in inclusion-exclusion?

- A. 16
- B. 12
- C. 6
- D. 4

REFERENCE ANSWER

C. 6

JEV / CORRECT

C. 6

API confidence: 0.98
Option probabilities:
{**"A"**: 0.0, **"C"**: 0.99, "B": 0.01, "D": 0.0}

Section batch: 434 ms
Not per-question latency

QUESTION + OPTIONS

Four guests receive their four distinct umbrellas in a uniformly random permutation. C_i means guest i receives their own umbrella.

Probability at least one guest receives their own umbrella?

- A. $9/24$
- B. $1-(3/4)^4$
- C. $15/24$
- D. $1/4$

REFERENCE ANSWER

C. $15/24$

JEV / CORRECT

C. $15/24$

API confidence: 0.90
Option probabilities:
{**"A"**: 0.06, **"C"**: 0.93, "B": 0.01, "D": 0.0}

Section batch: 434 ms
Not per-question latency

QUESTION + OPTIONS

$n \geq 4$ distinct balls independently choose uniformly among n labeled bins. X counts indices $i=1, \dots, n-1$ for which bins i and $i+1$ are both empty.

$E[X]$?

- A. $(n-1)((n-2)/n)^n$
- B. $n((n-2)/n)^n$
- C. $((n-2)/n)^n$
- D. $(n-1)((n-1)/n)^{(2n)}$

REFERENCE ANSWER

A. $(n-1)((n-2)/n)^n$

Pre-run repair:
Specify independent uniform placements and $n \geq 4$ for the combined variance formula.

JEV / CORRECT

A. $(n-1)((n-2)/n)^n$

API confidence: 0.97
Option probabilities:
{ "B": 0.0, "D": 0.01, "C": 0.01, "A": 0.98 }

Section batch: 463 ms
Not per-question latency

QUESTION + OPTIONS

$n \geq 4$ distinct balls independently choose uniformly among n labeled bins. X counts indices $i=1, \dots, n-1$ for which bins i and $i+1$ are both empty.

Define $a=((n-2)/n)^n$, $b=((n-3)/n)^n$, $c=((n-4)/n)^n$. $\text{Var}(X)$?

- A. $(n-1)a+2(n-2)c+(n-2)(n-3)b-(n-1)^2a^2$
- B. $(n-1)a(1-a)$
- C. $(n-1)a+2(n-2)b+(n-2)(n-3)c-(n-1)^2a^2$
- D. $(n-1)a+(n-2)b+(n-2)(n-3)c-(n-1)^2a^2$

REFERENCE ANSWER

C. $(n-1)a+2(n-2)b+(n-2)(n-3)c-(n-1)^2a^2$

JEV / CORRECT

C. $(n-1)a+2(n-2)b+(n-2)(n-3)c-(n-1)^2a^2$

API confidence: 0.75
Option probabilities:
{ "B": 0.01, "D": 0.05, "C": 0.81, "A": 0.13 }

Section batch: 463 ms
Not per-question latency

QUESTION + OPTIONS

Suppose $P(x)$ is false for every $x \geq 0$. Then for every $x \geq 0$, $P(x)$ implies there exists $y \geq x$ with $Q(y)$.

A. False

B. True

REFERENCE ANSWER

B. True

JEV / CORRECT

B. True

API confidence: 0.97
Option probabilities:
{ "A": 0.01, "B": 0.99 }

Section batch: 320 ms
Not per-question latency

QUESTION + OPTIONS

Number of propositional forms on n variables up to logical equivalence, with AND, OR, NOT and no quantifiers?

- A. n
- B. $2n$
- C. n^2
- D. 2^n
- E. $2^{(2^n)}$

REFERENCE ANSWER

E. $2^{(2^n)}$

JEV / CORRECT

E. $2^{(2^n)}$

API confidence: 1.00
Option probabilities:
{`"E": 1.0, "D": 0.0, "A": 0.0, "C": 0.0, "B": 0.0`}

Section batch: 320 ms
Not per-question latency

QUESTION + OPTIONS

Odd prime p and integer n satisfy $n \equiv -n \pmod{p}$. What residue must n have?

- A. 1
- B. 0
- C. 2
- D. $p/2$
- E. $p-1$

REFERENCE ANSWER

B. 0

JEV / CORRECT

B. 0

API confidence: 0.97
Option probabilities:
{`"E"`: 0.0, `"D"`: 0.02, `"A"`: 0.0, `"C"`: 0.0, `"B"`: 0.98}

Section batch: 320 ms
Not per-question latency

QUESTION + OPTIONS

A total program can decide for arbitrary P , input x and line number n whether that line is ever executed in $P(x)$.

- A. True
- B. False

REFERENCE ANSWER

B. False

JEV / CORRECT

B. False

API confidence: 0.98
Option probabilities:
{ "A": 0.01, "B": 0.99 }

Section batch: 320 ms
Not per-question latency

QUESTION + OPTIONS

For fixed nonnegative k , number of integer-coefficient polynomials of degree at most k ?

- A. Countably infinite
- B. Uncountably infinite
- C. Finite

REFERENCE ANSWER

A. Countably infinite

JEV / CORRECT

A. Countably infinite

API confidence: 0.99
Option probabilities:
{`"A": 1.0, "C": 0.0, "B": 0.0`}

Section batch: 320 ms
Not per-question latency

QUESTION + OPTIONS

Ten message symbols in $0..15$, correct up to six corrupted transmitted symbols with Reed-Solomon. Smallest prime field size?

- A. 11
- B. 17
- C. 23
- D. 29

REFERENCE ANSWER

C. 23

JEV / INCORRECT

B. 17

API confidence: 0.64
Option probabilities:
{ "D": 0.08, "A": 0.07, "C": 0.12, "B": 0.73 }

Section batch: 320 ms
Not per-question latency

QUESTION + OPTIONS

A graph on n vertices is a disjoint union of k trees. Edge count?

- A. $k(n-1)$
- B. $n-k+1$
- C. $n-1$
- D. $n-k$
- E. Not determined

REFERENCE ANSWER

D. $n-k$

JEV / CORRECT

D. $n-k$

API confidence: 1.00
Option probabilities:
{`"D"`: 1.0, `"E"`: 0.0, `"A"`: 0.0, `"C"`: 0.0, `"B"`: 0.0}

Section batch: 320 ms
Not per-question latency

QUESTION + OPTIONS

Positive n, m, k with $k \leq n, m$. Evaluate $\sum_{i=0..k} C(n, i) C(m, k-i)$.

- A. $C(n+m, k)$
- B. $C(nm, k)$
- C. $n!m!/(k!)^2$
- D. $2^{(n+m)}$
- E. None of these

REFERENCE ANSWER

A. $C(n+m, k)$

JEV / CORRECT

A. $C(n+m, k)$

API confidence: 0.99
Option probabilities:
{`"E": 0.0, "D": 0.0, "A": 1.0, "C": 0.0, "B": 0.0`}

Section batch: 320 ms
Not per-question latency

QUESTION + OPTIONS

Shortest paths in the 7-cube from 0000000 to 1011001?

- A. 128
- B. 1
- C. 16
- D. 24
- E. 4

REFERENCE ANSWER

D. 24

JEV / INCORRECT

E. 4

API confidence: 0.98
Option probabilities:
{**"D"**: 0.0, **"E"**: 0.98, **"A"**: 0.01, **"C"**: 0.01, **"B"**: 0.0}

Section batch: 320 ms
Not per-question latency

QUESTION + OPTIONS

There exists a simple undirected graph with 7 vertices and 7 edges containing an Eulerian tour.

- A. True
- B. False

REFERENCE ANSWER

A. True

JEV / CORRECT

A. True

API confidence: 0.35
Option probabilities:
{ "A": 0.67, "B": 0.33 }

Section batch: 320 ms
Not per-question latency

QUESTION + OPTIONS

There exists a simple undirected graph with 4 vertices and 5 edges containing an Eulerian tour.

- A. False
- B. True

REFERENCE ANSWER

A. False

JEV / CORRECT

A. False

API confidence: 0.52
Option probabilities:
{ "A": 0.76, "B": 0.24 }

Section batch: 320 ms
Not per-question latency

QUESTION + OPTIONS

There exists a simple undirected graph with 5 vertices and 7 edges containing an Eulerian tour.

A. True

B. False

REFERENCE ANSWER

A. True

JEV / INCORRECT

B. False

API confidence: 0.46
Option probabilities:
{ "A": 0.27, "B": 0.73 }

Section batch: 320 ms
Not per-question latency

QUESTION + OPTIONS

3^42 modulo 55?

A. 27

B. 1

C. 9

D. 3

REFERENCE ANSWER

C. 9

JEV / INCORRECT

A. 27

API confidence: 0.53
Option probabilities:
{ "D": 0.09, "A": 0.65, "C": 0.14, "B": 0.12 }

Section batch: 396 ms
Not per-question latency

QUESTION + OPTIONS

Solve $17x \equiv 7 \pmod{42}$, x in $0..41$.

A. 7

B. 35

C. 17

D. 5

REFERENCE ANSWER

B. 35

JEV / CORRECT

B. 35

API confidence: 0.23
Option probabilities:
{`"D"`: 0.36, `"A"`: 0.15, `"C"`: 0.07, `"B"`: 0.42}

Section batch: 396 ms
Not per-question latency

QUESTION + OPTIONS

GF(5), threshold three shares. $P(1)=1,P(2)=1,P(4)=2$; degree at most two. Secret $P(0)$?

- A. 1
- B. 2
- C. 4
- D. 3

REFERENCE ANSWER

D. 3

JEV / INCORRECT

B. 2

API confidence: 0.06
Option probabilities:
{**"D"**: 0.28, "B": 0.3, "C": 0.28, "A": 0.14}

Section batch: 396 ms
Not per-question latency

QUESTION + OPTIONS

Is $f(x)=x^2 \bmod 7$ a bijection on $0..6$? Give a witness or inverse.

A. Yes: its inverse is $x^4 \bmod 7$.

B. Yes: its inverse is itself.

C. No: $f(1)=f(6)=1$.

D. No: $f(0)=f(1)=0$.

REFERENCE ANSWER

C. No: $f(1)=f(6)=1$.

JEV / CORRECT

C. No: $f(1)=f(6)=1$.

API confidence: 0.99
Option probabilities:
{`"D": 0.0, "A": 0.0, "C": 1.0, "B": 0.0`}

Section batch: 396 ms
Not per-question latency

QUESTION + OPTIONS

- For $x \neq 1$, prove $(x^n - 1)/(x - 1) = \sum_{i=0}^{n-1} x^i$ by induction on $n \geq 1$.
- A. Assume $x=1$, divide both sides by $x-1$, and then extend to all x .
- B. Base $n=1$ is $1=1$. If the identity holds at $n=k$, then $x^{k+1} - 1 = x(x^k - 1) + (x - 1) = (x - 1)[x \sum_{i=0}^{k-1} x^i + 1] = (x - 1) \sum_{i=0}^k x^i$; divide by nonzero $x - 1$.
- C. Base $n=1$ holds. Replace n by $n+1$ in the desired identity, which proves the induction step without using the hypothesis.
- D. The geometric series formula proves itself, so no base or induction step is needed.

REFERENCE ANSWER

B. Base $n=1$ is $1=1$. If the identity holds at $n=k$, then $x^{k+1} - 1 = x(x^k - 1) + (x - 1) = (x - 1)[x \sum_{i=0}^{k-1} x^i + 1] = (x - 1) \sum_{i=0}^k x^i$; divide by nonzero $x - 1$.

JEV / CORRECT

B. Base $n=1$ is $1=1$. If the identity holds at $n=k$, then $x^{k+1} - 1 = x(x^k - 1) + (x - 1) = (x - 1)[x \sum_{i=0}^{k-1} x^i + 1] = (x - 1) \sum_{i=0}^k x^i$; divide by nonzero $x - 1$.

API confidence: 1.00
Option probabilities:
{ "D": 0.0, "A": 0.0, "B": 1.0, "C": 0.0 }

Section batch: 329 ms
Not per-question latency

QUESTION + OPTIONS

Prove $2^m - 1$ prime implies m prime for natural m . Hint: factor a geometric sum.

- A. $m=0,1$ do not yield primes. If $m=ab$ with $a,b>1$, then $2^m - 1 = (2^a - 1)[1 + 2^a + \dots + (2^a)^{b-1}]$, a product of two integers greater than one.
- B. If $m=ab$, then $2^m - 1 = (2^a - 1)(2^b - 1)$.
- C. A prime exponent always makes a Mersenne prime, and reversing that statement proves the result.
- D. Every odd number is prime, so m must be odd and hence prime.

REFERENCE ANSWER

A. $m=0,1$ do not yield primes. If $m=ab$ with $a,b>1$, then $2^m - 1 = (2^a - 1)[1 + 2^a + \dots + (2^a)^{b-1}]$, a product of two integers greater than one.

JEV / CORRECT

A. $m=0,1$ do not yield primes. If $m=ab$ with $a,b>1$, then $2^m - 1 = (2^a - 1)[1 + 2^a + \dots + (2^a)^{b-1}]$, a product of two integers greater than one.

API confidence: 1.00
Option probabilities:
{ "D": 0.0, "A": 1.0, "B": 0.0, "C": 0.0 }

Section batch: 329 ms
Not per-question latency

QUESTION + OPTIONS

Jobs 1:A>B>C>D,2:B>C>D>A,3:C>D>A>B,4:B>A>C>D. Candidates
A:2>3>1>4,B:3>1>2>4,C:1>2>4>3,D:2>4>3>1.

Classify (1,B),(2,C),(3,A),(4,D).

- A. Stable and job-optimal
- B. Unstable; blocking pair (1,A)
- C. Unstable; blocking pair (4,C)
- D. Stable and candidate-optimal

REFERENCE ANSWER

D. Stable and
candidate-optimal

JEV / INCORRECT

A. Stable and job-optimal

API confidence: 0.16
Option probabilities:
{ "B": 0.22, "C": 0.15, "A": 0.37, "D": 0.26 }

Section batch: 423 ms
Not per-question latency

QUESTION + OPTIONS

Jobs 1:A>B>C>D,2:B>C>D>A,3:C>D>A>B,4:B>A>C>D. Candidates
A:2>3>1>4,B:3>1>2>4,C:1>2>4>3,D:2>4>3>1.

Classify (1,A),(2,B),(3,C),(4,D).

A. Unstable; blocking pair (4,C)

B. Stable and job-optimal

C. Stable and candidate-optimal

D. Unstable; blocking pair (1,B)

REFERENCE ANSWER

A. Unstable; blocking pair
(4,C)

JEV / INCORRECT

B. Stable and job-optimal

API confidence: 0.38
Option probabilities:
{ "B": 0.54, "C": 0.32, "A": 0.07, "D": 0.07 }

Section batch: 423 ms
Not per-question latency

QUESTION + OPTIONS

Uniformly choose one fair four-sided die: faces {1,2,3,4} or faces {1,2,2,4}. Roll the chosen die twice independently conditional on identity.

Given first roll 3, probability second roll 2?

- A. 5/12
- B. 3/8
- C. 1/4
- D. 1/2

REFERENCE ANSWER

C. 1/4

JEV / INCORRECT

A. 5/12

API confidence: 0.13
Option probabilities:
{"D": 0.3, "C": 0.21, "A": 0.33999999999999997, "B": 0.15}

Section batch: 414 ms
Not per-question latency

QUESTION + OPTIONS

Uniformly choose one fair four-sided die: faces {1,2,3,4} or faces {1,2,2,4}. Roll the chosen die twice independently conditional on identity.

Given first roll 2, probability second roll 2?

- A. 1/4
- B. 3/8
- C. 5/12
- D. 1/2

REFERENCE ANSWER

C. 5/12

JEV / CORRECT

C. 5/12

API confidence: 0.21
Option probabilities:
{ "D": 0.28, "A": 0.03, "C": 0.41, "B": 0.28 }

Section batch: 414 ms
Not per-question latency

QUESTION + OPTIONS

P,Q have degree at most d with every coefficient independently uniform in GF(p), prime $p>d$.

Probability $P(x)=Q(x)$ for every field element?

- A. $1/p^d$
- B. $1/p^{(d+1)}$
- C. $1/(d+1)$
- D. $1/p$

REFERENCE ANSWER

B. $1/p^{(d+1)}$

JEV / CORRECT

B. $1/p^{(d+1)}$

API confidence: 0.95
Option probabilities:
{ "C": 0.0, "A": 0.03, "D": 0.01, "B": 0.96 }

Section batch: 369 ms
Not per-question latency

QUESTION + OPTIONS

P,Q have degree at most d with every coefficient independently uniform in $\text{GF}(p)$, prime $p > d$.

Probability $P(0)=Q(0)$?

A. $1/p^{(d+1)}$

B. $1/p^2$

C. $1/p$

D. $1/2$

REFERENCE ANSWER

C. $1/p$

JEV / CORRECT

C. $1/p$

API confidence: 0.98
Option probabilities:
{ "C": 0.98, "A": 0.01, "D": 0.0, "B": 0.01 }

Section batch: 369 ms
Not per-question latency

QUESTION + OPTIONS

P, Q have degree at most d with every coefficient independently uniform in $\text{GF}(p)$, prime $p > d$.

For $0 \leq k \leq d-1$, probability $P(i) = Q(i)$ for every $i = 0, \dots, k$?

- A. $(k+1)/p$
- B. $1/p^k$
- C. $1/p^{(k+1)}$
- D. $1/p^{(d-k)}$

REFERENCE ANSWER

C. $1/p^{(k+1)}$

JEV / CORRECT

C. $1/p^{(k+1)}$

API confidence: 0.86
Option probabilities:
{ "C": 0.89, "A": 0.06, "D": 0.02, "B": 0.03 }

Section batch: 369 ms
Not per-question latency

QUESTION + OPTIONS

N independent node lifetimes are $\text{Exp}(\text{rate } \lambda)$. Divide into ℓ groups of $k=N/\ell$ nodes. A group fails when any node fails; system fails when all groups fail. $P(\text{system fails by } t \geq 0)$?

- A. $(1-\exp(-\lambda t))^{\ell}$
- B. $(1-\exp(-k \lambda t))^{\ell}$
- C. $1-\exp(-N \lambda t)$
- D. $1-(1-\exp(-\lambda t))^N$

REFERENCE ANSWER

B. $(1-\exp(-k \lambda t))^{\ell}$

JEV / CORRECT

B. $(1-\exp(-k \lambda t))^{\ell}$

API confidence: 0.67
Option probabilities:
{**"B"**: 0.76, "D": 0.01, "C": 0.01, "A": 0.22}

Section batch: 364 ms
Not per-question latency

QUESTION + OPTIONS

Density $f(x)=\alpha \cdot x$ on $[0,1]$, zero elsewhere; $\mu=E[X]$.

Normalizing α ?

- A. 1
- B. 1/2
- C. 2
- D. 3

REFERENCE ANSWER

C. 2

JEV / CORRECT

C. 2

API confidence: 1.00
Option probabilities:
{ "A": 0.0, "B": 0.0, "C": 1.0, "D": 0.0 }

Section batch: 304 ms
Not per-question latency

QUESTION + OPTIONS

Density $f(x)=\alpha \cdot x$ on $[0,1]$, zero elsewhere; $\mu=E[X]$.

$P(X\leq 1/2)$, expressed in α ?

- A. $\alpha/8$
- B. $\alpha/4$
- C. $\alpha/2$
- D. $\alpha/16$

REFERENCE ANSWER

A. $\alpha/8$

JEV / CORRECT

A. $\alpha/8$

API confidence: 0.29
Option probabilities:
{ "A": 0.47, "B": 0.46, "C": 0.01, "D": 0.06 }

Section batch: 304 ms
Not per-question latency

QUESTION + OPTIONS

Density $f(x)=\alpha \cdot x$ on $[0,1]$, zero elsewhere; $\mu=E[X]$.

$E[X]$, expressed in α ?

A. $\alpha/4$

B. $\alpha/3$

C. $\alpha/2$

D. $\alpha^2/3$

REFERENCE ANSWER

B. $\alpha/3$

JEV / CORRECT

B. $\alpha/3$

API confidence: 0.64
Option probabilities:
{**"A"**: 0.08, **"B"**: 0.73, "C": 0.13, "D": 0.06}

Section batch: 304 ms
Not per-question latency

QUESTION + OPTIONS

Density $f(x)=\alpha \cdot x$ on $[0,1]$, zero elsewhere; $\mu=E[X]$.

$\text{Var}(X)$, expressed in α and μ ?

A. $\alpha/3-\mu^2$

B. $\alpha/4-\mu$

C. $\alpha/4+\mu^2$

D. $\alpha/4-\mu^2$

REFERENCE ANSWER

D. $\alpha/4-\mu^2$

JEV / CORRECT

D. $\alpha/4-\mu^2$

API confidence: 0.70
Option probabilities:
{ "A": 0.21, "B": 0.01, "C": 0.0, "D": 0.78 }

Section batch: 304 ms
Not per-question latency

QUESTION + OPTIONS

X,Y are independent; Y,Z are independent. $E[X]=0,E[Y]=1,E[Z]=2$. Each variance equals 10.

Under the given assumptions, X and Z are independent.

A. Could be either

B. True

C. False

REFERENCE ANSWER

A. Could be either

JEV / CORRECT

A. Could be either

API confidence: 0.51
Option probabilities:
{`"C"`: 0.32, `"B"`: 0.01, `"A"`: 0.67}

Section batch: 399 ms
Not per-question latency

QUESTION + OPTIONS

X,Y are independent; Y,Z are independent. $E[X]=0,E[Y]=1,E[Z]=2$. Each variance equals 10.

Under the given assumptions, $E[X+2Y-Z]=0$.

A. Could be either

B. True

C. False

REFERENCE ANSWER

B. True

JEV / CORRECT

B. True

API confidence: 0.27
Option probabilities:
{**"C"**: 0.46, "B": 0.51, "A": 0.03}

Section batch: 399 ms
Not per-question latency

QUESTION + OPTIONS

X,Y are independent; Y,Z are independent. $E[X]=0,E[Y]=1,E[Z]=2$. Each variance equals 10.

Under the given assumptions, $P(Y\geq 10)\leq 1/10$.

- A. True
- B. False
- C. Could be either

REFERENCE ANSWER

C. Could be either

JEV / INCORRECT

A. True

API confidence: 0.43
Option probabilities:
{**"C"**: 0.22, "B": 0.16, "A": 0.62}

Section batch: 399 ms
Not per-question latency

QUESTION + OPTIONS

X,Y are independent; Y,Z are independent. $E[X]=0,E[Y]=1,E[Z]=2$. Each variance equals 10.

Under the given assumptions, $E[XY]=2$.

A. Could be either

B. False

C. True

REFERENCE ANSWER

B. False

JEV / CORRECT

B. False

API confidence: 0.93
Option probabilities:
{`"C"`: 0.03, `"B"`: 0.95, `"A"`: 0.02}

Section batch: 399 ms
Not per-question latency

QUESTION + OPTIONS

X,Y are independent; Y,Z are independent. $E[X]=0,E[Y]=1,E[Z]=2$. Each variance equals 10.

Under the given assumptions, $\text{Var}(X-Y)=20$.

A. Could be either

B. True

C. False

REFERENCE ANSWER

B. True

JEV / CORRECT

B. True

API confidence: 0.87
Option probabilities:
{`"C"`: 0.04, `"B"`: 0.91, `"A"`: 0.05}

Section batch: 399 ms
Not per-question latency

QUESTION + OPTIONS

X,Y are independent; Y,Z are independent. $E[X]=0,E[Y]=1,E[Z]=2$. Each variance equals 10.

Under the given assumptions, $\text{Var}(2X)=20$.

- A. True
- B. Could be either
- C. False

REFERENCE ANSWER

C. False

JEV / INCORRECT

A. True

API confidence: 0.97
Option probabilities:
{`"C"`: 0.01, `"B"`: 0.01, `"A"`: 0.98}

Section batch: 399 ms
Not per-question latency

QUESTION + OPTIONS

X,Y are independent; Y,Z are independent. $E[X]=0,E[Y]=1,E[Z]=2$. Each variance equals 10.

Under the given assumptions, $P(|X| \geq 5) \leq 2/5$.

- A. True
- B. False
- C. Could be either

REFERENCE ANSWER

A. True

JEV / CORRECT

A. True

API confidence: 0.69
Option probabilities:
{ "C": 0.1, "B": 0.1, "A": 0.8 }

Section batch: 399 ms
Not per-question latency

QUESTION + OPTIONS

X,Y are independent; Y,Z are independent. $E[X]=0,E[Y]=1,E[Z]=2$. Each variance equals 10.

Under the given assumptions, $P(|X| \geq \sqrt{10}) > 0$.

- A. True
- B. Could be either
- C. False

REFERENCE ANSWER

A. True

JEV / INCORRECT

B. Could be either

API confidence: 0.28
Option probabilities:
{ "C": 0.05, "B": 0.52, "A": 0.43 }

Section batch: 399 ms
Not per-question latency

QUESTION + OPTIONS

X_i are iid uniform on $\{1,2,3\}$; $S_n = \sum X_i$. Choose a, b so $(S_n - a)/b$ converges to $N(0,1)$.

- A. $a=n, b=\sqrt{n}$
- B. $a=2n, b=2n/3$
- C. $a=2, b=\sqrt{2/3}$
- D. $a=2n, b=\sqrt{2n/3}$

REFERENCE ANSWER

D. $a=2n, b=\sqrt{2n/3}$

JEV / CORRECT

D. $a=2n, b=\sqrt{2n/3}$

API confidence: 1.00
Option probabilities:
{ "C": 0.0, "A": 0.0, "D": 1.0, "B": 0.0 }

Section batch: 334 ms
Not per-question latency

QUESTION + OPTIONS

Piano has 52 white and 36 black keys. Chords are unordered sets of 2..10 distinct keys. Melodies are ordered sequences, repetition allowed unless constrained.

Five-key chords with exactly two white and three black?

- A. $C(88,5)$
- B. $C(52,3)C(36,2)$
- C. $52^2 \cdot 36^3$
- D. $C(52,2)C(36,3)$

REFERENCE ANSWER

D. $C(52,2)C(36,3)$

JEV / CORRECT

D. $C(52,2)C(36,3)$

API confidence: 1.00
Option probabilities:
{ "B": 0.0, "C": 0.0, "D": 1.0, "A": 0.0 }

Section batch: 356 ms
Not per-question latency

QUESTION + OPTIONS

Piano has 52 white and 36 black keys. Chords are unordered sets of 2..10 distinct keys. Melodies are ordered sequences, repetition allowed unless constrained.

Chords from a fixed set of ten keys?

A. $C(10,2)$

B. 2^{10-11}

C. 2^{10}

D. 2^{10-1}

REFERENCE ANSWER

B. 2^{10-11}

JEV / CORRECT

B. 2^{10-11}

API confidence: 0.95
Option probabilities:
{`"B"`: 0.96, `"C"`: 0.0, `"A"`: 0.01, `"D"`: 0.03}

Section batch: 356 ms
Not per-question latency

QUESTION + OPTIONS

Piano has 52 white and 36 black keys. Chords are unordered sets of 2..10 distinct keys. Melodies are ordered sequences, repetition allowed unless constrained.

Melodies of exactly twelve keys?

- A. 12^{88}
- B. $88!/76!$
- C. $C(88,12)$
- D. 88^{12}

REFERENCE ANSWER

D. 88^{12}

JEV / CORRECT

D. 88^{12}

API confidence: 0.97
Option probabilities:
{ "B": 0.0, "C": 0.0, "D": 0.98, "A": 0.02 }

Section batch: 356 ms
Not per-question latency

QUESTION + OPTIONS

Piano has 52 white and 36 black keys. Chords are unordered sets of 2..10 distinct keys. Melodies are ordered sequences, repetition allowed unless constrained.

Melodies with 40 white and 10 black notes, no adjacent black notes?

- A. $52^{40} \cdot 36^{10} \cdot C(41, 10)$
- B. $C(52, 40)C(36, 10)$
- C. $52^{40} \cdot 36^{10} \cdot C(39, 10)$
- D. $52^{40} \cdot 36^{10} \cdot C(50, 10)$

REFERENCE ANSWER

A. $52^{40} \cdot 36^{10} \cdot C(41, 10)$

JEV / CORRECT

A. $52^{40} \cdot 36^{10} \cdot C(41, 10)$

API confidence: 0.94
Option probabilities:
{ "B": 0.0, "C": 0.03, "D": 0.02, "A": 0.95 }

Section batch: 356 ms
Not per-question latency

QUESTION + OPTIONS

Piano has 52 white and 36 black keys. Chords are unordered sets of 2..10 distinct keys. Melodies are ordered sequences, repetition allowed unless constrained.

Choose 200 keys as a multiset, unlimited repetition?

- A. C(200,88)
- B. C(287,87)
- C. C(288,88)
- D. 88^{200}

REFERENCE ANSWER

B. C(287,87)

JEV / INCORRECT

C. C(288,88)

API confidence: 0.19
Option probabilities:
{ "B": 0.32, "C": 0.39, "D": 0.25, "A": 0.04 }

Section batch: 356 ms
Not per-question latency

QUESTION + OPTIONS

Piano has 52 white and 36 black keys. Chords are unordered sets of 2..10 distinct keys. Melodies are ordered sequences, repetition allowed unless constrained.

Split a fixed 200-note melody into four consecutive parts, at least twenty notes each. Count?

- A. C(199,3)
- B. C(120,3)
- C. C(123,3)
- D. C(124,4)

REFERENCE ANSWER

C. C(123,3)

JEV / INCORRECT

A. C(199,3)

API confidence: 0.52
Option probabilities:
{ "B": 0.14, "C": 0.2, "A": 0.64, "D": 0.02 }

Section batch: 356 ms
Not per-question latency

QUESTION + OPTIONS

Cycle graph on $n \geq 3$ vertices. Each edge independently fails with probability $1/2$ and is removed. X counts isolated vertices.

Probability a fixed vertex is isolated?

- A. $1/8$
- B. $1/4$
- C. $1/n$
- D. $1/2$

REFERENCE ANSWER

B. $1/4$

JEV / CORRECT

B. $1/4$

API confidence: 0.96
Option probabilities:
{ "B": 0.97, "C": 0.0, "A": 0.02, "D": 0.01 }

Section batch: 409 ms
Not per-question latency

QUESTION + OPTIONS

Cycle graph on $n \geq 3$ vertices. Each edge independently fails with probability $1/2$ and is removed. X counts isolated vertices.

$E[X]$?

A. $n/2$

B. $1/4$

C. $n/8$

D. $n/4$

REFERENCE ANSWER

D. $n/4$

JEV / CORRECT

D. $n/4$

API confidence: 0.70
Option probabilities:
{`"B": 0.0`, `"C": 0.03`, `"A": 0.19`, `"D": 0.78`}

Section batch: 409 ms
Not per-question latency

QUESTION + OPTIONS

Cycle graph on $n \geq 3$ vertices. Each edge independently fails with probability $1/2$ and is removed. X counts isolated vertices.

Probability adjacent vertices are both isolated?

- A. $1/4$
- B. $1/2$
- C. $1/16$
- D. $1/8$

REFERENCE ANSWER

D. $1/8$

JEV / INCORRECT

C. $1/16$

API confidence: 0.34
Option probabilities:
{ "B": 0.01, "C": 0.51, "A": 0.18, "D": 0.3 }

Section batch: 409 ms
Not per-question latency

QUESTION + OPTIONS

Cycle graph on $n \geq 3$ vertices. Each edge independently fails with probability $1/2$ and is removed. X counts isolated vertices.

For two nonadjacent vertices (when present), probability both isolated?

- A. $1/4$
- B. $1/16$
- C. $1/32$
- D. $1/8$

REFERENCE ANSWER

B. $1/16$

JEV / CORRECT

B. $1/16$

API confidence: 0.64
Option probabilities:
{ "B": 0.74, "C": 0.09, "A": 0.07, "D": 0.1 }

Section batch: 409 ms
Not per-question latency

QUESTION + OPTIONS

Cycle graph on $n \geq 3$ vertices. Each edge independently fails with probability $1/2$ and is removed. X counts isolated vertices.

$\text{Var}(X)$?

A. $5n/16$

B. $3n/16$

C. $n/4$

D. $n^2/16$

REFERENCE ANSWER

A. $5n/16$

JEV / INCORRECT

B. $3n/16$

API confidence: 0.46
Option probabilities:
{"B": 0.6, "C": 0.11, "A": 0.28, "D": 0.01}

Section batch: 409 ms
Not per-question latency

QUESTION + OPTIONS

Cycle graph on $n \geq 3$ vertices. Each edge independently fails with probability $1/2$ and is removed. X counts isolated vertices.

Chebyshev upper bound on $P(X \geq n/2)$, clipped to probability range?

- A. $\min(1, 5/(4n))$
- B. $\min(1, 5/n)$
- C. $\min(1, 20/n)$
- D. $\min(1, 3/n)$

REFERENCE ANSWER

B. $\min(1, 5/n)$

JEV / INCORRECT

C. $\min(1, 20/n)$

API confidence: 0.22
Option probabilities:
{ "B": 0.3, "C": 0.42, "A": 0.17, "D": 0.11 }

Section batch: 409 ms
Not per-question latency

QUESTION + OPTIONS

Dolphins arrive as a homogeneous Poisson process with mean spacing 20 minutes. Each dolphin performs a trick independently with probability p each minute, then leaves at that minute’s end independently with probability $q > 0$. All behaviors independent across dolphins and time.

Distribution of arrivals in one hour?

A. Poisson(3)

B. Poisson(20)

C. Bin(60, 1/20)

D. Geom(1/20)

REFERENCE ANSWER

A. Poisson(3)

Pre-run repair:
Specify homogeneous Poisson arrivals; average spacing alone is insufficient.

JEV / CORRECT

A. Poisson(3)

API confidence: 1.00
Option probabilities:
{ "C": 0.0, "A": 1.0, "D": 0.0, "B": 0.0 }

Section batch: 310 ms
Not per-question latency

QUESTION + OPTIONS

Dolphins arrive as a homogeneous Poisson process with mean spacing 20 minutes. Each dolphin performs a trick independently with probability p each minute, then leaves at that minute’s end independently with probability $q > 0$. All behaviors independent across dolphins and time.

Distribution of minutes a dolphin stays, counting its first minute?

- A. Geom(p) on 1,2,...
- B. Geom(q) on 1,2,...
- C. Exp(rate q)
- D. Poisson($1/q$)

REFERENCE ANSWER

B. Geom(q) on 1,2,...

JEV / CORRECT

B. Geom(q) on 1,2,...

API confidence: 0.89
Option probabilities:
{ $"C"$: 0.0, $"A"$: 0.08, $"D"$: 0.0, $"B"$: 0.92}

Section batch: 310 ms
Not per-question latency

QUESTION + OPTIONS

Dolphins arrive as a homogeneous Poisson process with mean spacing 20 minutes. Each dolphin performs a trick independently with probability p each minute, then leaves at that minute’s end independently with probability $q > 0$. All behaviors independent across dolphins and time.

Probability a dolphin stays exactly five minutes?

- A. $(1-q)^4 \cdot q$
- B. $(1-q)^4$
- C. $(1-q)^5 \cdot q$
- D. $q^4 \cdot (1-q)$

REFERENCE ANSWER

A. $(1-q)^4 \cdot q$

JEV / CORRECT

A. $(1-q)^4 \cdot q$

API confidence: 0.93
Option probabilities:
{ "D": 0.0, "A": 0.95, "C": 0.04, "B": 0.01 }

Section batch: 310 ms
Not per-question latency

QUESTION + OPTIONS

Dolphins arrive as a homogeneous Poisson process with mean spacing 20 minutes. Each dolphin performs a trick independently with probability p each minute, then leaves at that minute’s end independently with probability $q > 0$. All behaviors independent across dolphins and time.

Expected minutes a dolphin stays?

- A. q
- B. $1/p$
- C. $1/q$
- D. $(1-q)/q$

REFERENCE ANSWER

C. $1/q$

JEV / CORRECT

C. $1/q$

API confidence: 0.89
Option probabilities:
{ "C": 0.91, "A": 0.01, "D": 0.06, "B": 0.02 }

Section batch: 310 ms
Not per-question latency

QUESTION + OPTIONS

Dolphins arrive as a homogeneous Poisson process with mean spacing 20 minutes. Each dolphin performs a trick independently with probability p each minute, then leaves at that minute’s end independently with probability $q > 0$. All behaviors independent across dolphins and time.

Given a twenty-minute stay, probability of exactly k tricks?

- A. $C(20,k)q^k(1-q)^{(20-k)}$
- B. $p^k(1-p)^{(20-k)}$
- C. $C(20,k)p^kq$
- D. $C(20,k)p^k(1-p)^{(20-k)}$

REFERENCE ANSWER

D. $C(20,k)p^k(1-p)^{(20-k)}$

JEV / CORRECT

D. $C(20,k)p^k(1-p)^{(20-k)}$

API confidence: 0.78
Option probabilities:
{ "D": 0.84, "A": 0.1, "C": 0.02, "B": 0.04 }

Section batch: 310 ms
Not per-question latency

QUESTION + OPTIONS

Dolphins arrive as a homogeneous Poisson process with mean spacing 20 minutes. Each dolphin performs a trick independently with probability p each minute, then leaves at that minute’s end independently with probability $q > 0$. All behaviors independent across dolphins and time.

Given a twenty-minute stay, expected tricks?

- A. $20q$
- B. $20p$
- C. $20/p$
- D. p/q

REFERENCE ANSWER

B. $20p$

JEV / CORRECT

B. $20p$

API confidence: 0.64
Option probabilities:
{`"C"`: 0.01, `"A"`: 0.05, `"D"`: 0.2, `"B"`: 0.74}

Section batch: 310 ms
Not per-question latency

QUESTION + OPTIONS

Dolphins arrive as a homogeneous Poisson process with mean spacing 20 minutes. Each dolphin performs a trick independently with probability p each minute, then leaves at that minute’s end independently with probability $q > 0$. All behaviors independent across dolphins and time.

Unconditional expected total tricks per dolphin?

- A. $1/(pq)$
- B. $p/(1-q)$
- C. q/p
- D. p/q

REFERENCE ANSWER

D. p/q

JEV / CORRECT

D. p/q

API confidence: 0.50
Option probabilities:
{ "C": 0.0, "A": 0.02, "D": 0.62, "B": 0.36 }

Section batch: 310 ms
Not per-question latency

QUESTION + OPTIONS

Markov chain: 1->2 with probability1; 2->3 with1; 3->1 and 3->4 each1/2; 4->5 with1; 5->2 with1.

Is it irreducible? Justify.

- A. No; no self-loops exist.
- B. No; transitions from states1,2,4,5 are deterministic.
- C. Yes; every state can reach state2, and state2 can reach every state.
- D. Yes; every state has the same number of outgoing edges.

REFERENCE ANSWER

C. Yes; every state can reach state2, and state2 can reach every state.

JEV / CORRECT

C. Yes; every state can reach state2, and state2 can reach every state.

API confidence: 0.95
Option probabilities:
{ "B": 0.04, "C": 0.96, "A": 0.0, "D": 0.0 }

Section batch: 489 ms
Not per-question latency

QUESTION + OPTIONS

Markov chain: 1->2 with probability1; 2->3 with1; 3->1 and 3->4 each1/2; 4->5 with1; 5->2 with1.

Is it aperiodic? Justify.

A. Yes; all states have period0.

B. No; no self-loop exists, so period is2.

C. No; a five-state chain always has period5.

D. Yes; state2 has return paths of lengths3 and4, whose gcd is1.

REFERENCE ANSWER

D. Yes; state2 has return paths of lengths3 and4, whose gcd is1.

JEV / CORRECT

D. Yes; state2 has return paths of lengths3 and4, whose gcd is1.

API confidence: 0.99
Option probabilities:
{ "B": 0.0, "C": 0.0, "A": 0.0, "D": 1.0 }

Section batch: 489 ms
Not per-question latency

QUESTION + OPTIONS

Markov chain: 1->2 with probability1; 2->3 with1; 3->1 and 3->4 each1/2; 4->5 with1; 5->2 with1.

Stationary $\pi_1=\pi_5=1/7$. Find π_2 .

A. 3/7

B. 1/7

C. 2/7

D. 1/5

REFERENCE ANSWER

C. 2/7

JEV / CORRECT

C. 2/7

API confidence: 0.58
Option probabilities:
{**"B"**: 0.09, **"C"**: 0.69000000000000001, **"D"**: 0.0, **"A"**: 0.22}

Section batch: 489 ms
Not per-question latency

QUESTION + OPTIONS

Markov chain: 1->2 with probability1; 2->3 with1; 3->1 and 3->4 each1/2; 4->5 with1; 5->2 with1.

bi is expected hitting time of state1 from i. Given b3=5, find b5.

- A. 5
- B. 10
- C. 7
- D. 6

REFERENCE ANSWER

C. 7

JEV / INCORRECT

D. 6

API confidence: 0.21
Option probabilities:
{ "B": 0.1, "C": 0.38, "A": 0.11, "D": 0.41 }

Section batch: 489 ms
Not per-question latency

QUESTION + OPTIONS

Markov chain: 1->2 with probability1; 2->3 with1; 3->1 and 3->4 each1/2; 4->5 with1; 5->2 with1.

Replace 4->5 by a probability-one self-loop at4. Expected hitting time of state1 from5?

- A. 14
- B. Infinity
- C. 5
- D. 7

REFERENCE ANSWER

B. Infinity

JEV / CORRECT

B. Infinity

API confidence: 0.90
Option probabilities:
{ "B": 0.93, "C": 0.02, "A": 0.02, "D": 0.03 }

Section batch: 489 ms
Not per-question latency

QUESTION + OPTIONS

The last question of this same exam states: it is Jay’s birthday today (May 16).

Which TA has a birthday on May 16?

A. Andy

B. Malia

C. Evelyn

D. Jay

REFERENCE ANSWER

D. Jay

JEV / CORRECT

D. Jay

API confidence: 0.99
Option probabilities:
{**"D"**: 1.0, "A": 0.0, "B": 0.0, "C": 0.0}

Section batch: 301 ms
Not per-question latency

QUESTION + OPTIONS

Complete: (P implies NOT Q) is equivalent to (NOT P OR ____).

- A. Q
- B. P
- C. NOT Q
- D. True

REFERENCE ANSWER

C. NOT Q

JEV / CORRECT

C. NOT Q

API confidence: 0.99
Option probabilities:
{ "D": 0.0, "A": 0.0, "C": 1.0, "B": 0.0 }

Section batch: 430 ms
Not per-question latency

QUESTION + OPTIONS

P AND (Q OR R) is equivalent to (P OR Q) AND (P OR R).

A. False

B. True

REFERENCE ANSWER

A. False

JEV / CORRECT

A. False

API confidence: 0.52
Option probabilities:
{ "A": 0.76, "B": 0.24 }

Section batch: 430 ms
Not per-question latency

QUESTION + OPTIONS

Truth status of $P \text{ AND } (\text{NOT } P \text{ OR } Q) \text{ AND } (\text{NOT } P \text{ OR NOT } Q)$?

- A. Could be either
- B. False
- C. True

REFERENCE ANSWER

B. False

JEV / CORRECT

B. False

API confidence: 0.89
Option probabilities:
{**"A"**: 0.07, "C": 0.01, "B": 0.92}

Section batch: 430 ms
Not per-question latency

QUESTION + OPTIONS

N includes zero. For every n , $P(n) \Rightarrow Q(n+1)$ and $Q(n) \Rightarrow P(n+1)$. Also $P(0)$ holds.

$P(n)$ holds for every even n .

A. True

B. False

REFERENCE ANSWER

A. True

JEV / CORRECT

A. True

API confidence: 0.92
Option probabilities:
{ "A": 0.96, "B": 0.04 }

Section batch: 430 ms
Not per-question latency

QUESTION + OPTIONS

N includes zero. For every n, $P(n) \Rightarrow Q(n+1)$ and $Q(n) \Rightarrow P(n+1)$. Also $P(0)$ holds.

For every n, NOT $Q(n+1)$ implies NOT $P(n)$.

A. False

B. True

REFERENCE ANSWER

B. True

JEV / CORRECT

B. True

API confidence: 0.95
Option probabilities:
{ "A": 0.03, "B": 0.97 }

Section batch: 430 ms
Not per-question latency

QUESTION + OPTIONS

N includes zero. For every n, $P(n) \Rightarrow Q(n+1)$ and $Q(n) \Rightarrow P(n+1)$. Also $P(0)$ holds.

$Q(0)$ implies $Q(n)$ for every n.

A. False

B. True

REFERENCE ANSWER

B. True

JEV / CORRECT

B. True

API confidence: 0.43
Option probabilities:
{ "A": 0.29, "B": 0.71 }

Section batch: 430 ms
Not per-question latency

QUESTION + OPTIONS

NOT forall n [P(n) OR Q(n)] implies exists n NOT P(n).

A. True

B. False

REFERENCE ANSWER

A. True

JEV / CORRECT

A. True

API confidence: 0.98
Option probabilities:
{ "A": 0.99, "B": 0.01 }

Section batch: 430 ms
Not per-question latency

QUESTION + OPTIONS

Distinct primes $p, q > 2$ and positive e, d satisfy $ed \equiv 1 \pmod{(p-1)(q-1)}$. Prove $x^{ed} \equiv x \pmod{pq}$ for every integer x , without merely citing RSA correctness.

- A. Cancel x from the congruence for all x , including multiples of p and q , then use its inverse.
- B. Fermat applies modulo pq directly with exponent $pq-1$, and $ed \equiv pq-1$.
- C. Modulo each prime, if x is zero the equality is immediate; otherwise Fermat applies because $ed-1$ is a multiple of that prime minus one. CRT then combines the equalities modulo p and q .
- D. Since $ed \equiv 1$ modulo the totient, $ed \equiv 1$ as integers, so the equality is exact.

REFERENCE ANSWER

C. Modulo each prime, if x is zero the equality is immediate; otherwise Fermat applies because $ed-1$ is a multiple of that prime minus one. CRT then combines the equalities modulo p and q .

JEV / CORRECT

C. Modulo each prime, if x is zero the equality is immediate; otherwise Fermat applies because $ed-1$ is a multiple of that prime minus one. CRT then combines the equalities modulo p and q .

API confidence: 1.00
Option probabilities:
{ "A": 0.0, "B": 0.0, "C": 1.0, "D": 0.0 }

Section batch: 314 ms
Not per-question latency

QUESTION + OPTIONS

Up to isomorphism, give all trees on four vertices as edge sets on $\{1,2,3,4\}$.

- A. $\{12,23,34\}$ and $\{12,23,34,41\}$
- B. Only $\{12,23,34\}$
- C. $\{12,23,31\}$ and $\{12,23,34\}$
- D. $\{12,23,34\}$ and $\{12,13,14\}$

REFERENCE ANSWER

D. $\{12,23,34\}$ and $\{12,13,14\}$

JEV / CORRECT

D. $\{12,23,34\}$ and $\{12,13,14\}$

API confidence: 0.97
Option probabilities:
 $\{ \text{"A": 0.0, "B": 0.02, "C": 0.0, "D": 0.98} \}$

Section batch: 314 ms
Not per-question latency

QUESTION + OPTIONS

Every three-vertex tree is a subgraph of K_3 (not necessarily induced).

A. True

B. False

REFERENCE ANSWER

A. True

JEV / CORRECT

A. True

API confidence: 0.51
Option probabilities:
{ "A": 0.75, "B": 0.25 }

Section batch: 314 ms
Not per-question latency

QUESTION + OPTIONS

Prove a simple graph of minimum degree d contains every k -vertex tree for $1 \leq k \leq d$.

- A. Any k vertices of the graph form a tree when $k \leq d$.
- B. Induct on tree size. Remove a leaf, embed the smaller tree, and map the leaf to an unused neighbor of its parent's image. At most $k-2$ other embedded vertices can occupy neighbors, fewer than d . The single-vertex base is immediate.
- C. Every degree- d vertex has all its neighbors mutually adjacent, so it contains every tree directly.
- D. Induct by adding arbitrary edges to the target tree; every missing edge must already appear in the host graph.

REFERENCE ANSWER

B. Induct on tree size. Remove a leaf, embed the smaller tree, and map the leaf to an unused neighbor of its parent's image. At most $k-2$ other embedded vertices can occupy neighbors, fewer than d . The single-vertex base is immediate.

JEV / CORRECT

B. Induct on tree size. Remove a leaf, embed the smaller tree, and map the leaf to an unused neighbor of its parent's image. At most $k-2$ other embedded vertices can occupy neighbors, fewer than d . The single-vertex base is immediate.

API confidence: 1.00
Option probabilities:
{ "A": 0.0, "B": 1.0, "C": 0.0, "D": 0.0 }

Section batch: 314 ms
Not per-question latency

QUESTION + OPTIONS

All n jobs have the same ranking. In synchronous job-proposing deferred acceptance, counting the initial proposal day as day 1, how many days until all are held?

- A. $n-1$
- B. n
- C. 1
- D. n^2

REFERENCE ANSWER

B. n

Pre-run repair:
Fix day-count convention; original grading accepted n and $n-1$.

JEV / CORRECT

B. n

API confidence: 0.22
Option probabilities:
{`"D"`: 0.04, `"A"`: 0.36, `"C"`: 0.19, `"B"`: 0.41}

Section batch: 313 ms
Not per-question latency

QUESTION + OPTIONS

If all jobs have the same strict ranking, the stable matching is unique.

A. True

B. False

REFERENCE ANSWER

A. True

JEV / CORRECT

A. True

API confidence: 0.77
Option probabilities:
{ "A": 0.88, "B": 0.12 }

Section batch: 313 ms
Not per-question latency

QUESTION + OPTIONS

If all candidates have the same strict ranking, the stable matching is unique.

A. True

B. False

REFERENCE ANSWER

A. True

JEV / CORRECT

A. True

API confidence: 0.86
Option probabilities:
{ "A": 0.93, "B": 0.07 }

Section batch: 313 ms
Not per-question latency

QUESTION + OPTIONS

All preference lists are independently uniform permutations, n jobs and n candidates. Expected number of candidates receiving exactly i first-day proposals?

- A. $n \cdot (1 - 1/n)^i$
- B. n/i
- C. $n \cdot C(n,i) \cdot (1/n)^i \cdot (1 - 1/n)^{(n-i)}$
- D. $C(n,i) \cdot (1/n)^i \cdot (1 - 1/n)^{(n-i)}$

REFERENCE ANSWER

C. $n \cdot C(n,i) \cdot (1/n)^i \cdot (1 - 1/n)^{(n-i)}$

JEV / CORRECT

C. $n \cdot C(n,i) \cdot (1/n)^i \cdot (1 - 1/n)^{(n-i)}$

API confidence: 0.68
Option probabilities:
{ "D": 0.19, "A": 0.04, "C": 0.76, "B": 0.01 }

Section batch: 313 ms
Not per-question latency

QUESTION + OPTIONS

For $n=2$ with independently uniform strict preference lists, probability both possible matchings are stable?

- A. $1/16$
- B. $1/4$
- C. $1/8$
- D. $1/2$

REFERENCE ANSWER

C. $1/8$

JEV / INCORRECT

D. $1/2$

API confidence: 0.17
Option probabilities:
{`"D"`: 0.39, `"A"`: 0.05, `"C"`: 0.24, `"B"`: 0.32}

Section batch: 313 ms
Not per-question latency

QUESTION + OPTIONS

A connected simple planar embedding has n vertices and every face boundary has four edge-sides. Edge count?

- A. $2n-2$
- B. $3n-6$
- C. $n-1$
- D. $2n-4$

REFERENCE ANSWER

D. $2n-4$

Pre-run repair:
State connectedness required by the Euler formula used in the key.

JEV / INCORRECT

A. $2n-2$

API confidence: 0.42
Option probabilities:
{ "C": 0.0, "B": 0.0, "A": 0.57, "D": 0.43 }

Section batch: 415 ms
Not per-question latency

QUESTION + OPTIONS

G has a connected simple planar embedding with v vertices, e edges, f faces, all face boundaries simple cycles. F keeps G, adds one vertex per face and joins it to every vertex on that face, including the outer face. F is planar.

Number of vertices of F?

- A. $v+f+e$
- B. $2v$
- C. $v+f$
- D. $v+e$

REFERENCE ANSWER

C. $v+f$

JEV / CORRECT

C. $v+f$

API confidence: 1.00
Option probabilities:
{**"C"**: 1.0, "B": 0.0, "A": 0.0, "D": 0.0}

Section batch: 415 ms
Not per-question latency

QUESTION + OPTIONS

G has a connected simple planar embedding with v vertices, e edges, f faces, all face boundaries simple cycles. F keeps G, adds one vertex per face and joins it to every vertex on that face, including the outer face. F is planar.

Number of edges of F?

- A. $3(v+f)-6$
- B. $3v-6$
- C. $2e$
- D. $e+f$

REFERENCE ANSWER

A. $3(v+f)-6$

Pre-run repair:
Specify connected embedding and simple facial cycles, required for the source triangulation argument.

JEV / CORRECT

A. $3(v+f)-6$

API confidence: 0.61
Option probabilities:
{ "C": 0.2, "B": 0.01, "A": 0.7, "D": 0.09 }

Section batch: 415 ms
Not per-question latency

QUESTION + OPTIONS

Remove one edge from a tree. How many connected components result?

- A. 2
- B. 1
- C. 3
- D. 0

REFERENCE ANSWER

A. 2

JEV / CORRECT

A. 2

API confidence: 1.00
Option probabilities:
{ "C": 0.0, "B": 0.0, "A": 1.0, "D": 0.0 }

Section batch: 415 ms
Not per-question latency

QUESTION + OPTIONS

Minimum edges removed from $K(2n)$ to make it bipartite?

- A. $n-1$
- B. n^2
- C. $n(n-1)$
- D. $2n(n-1)$

REFERENCE ANSWER

C. $n(n-1)$

JEV / INCORRECT

B. n^2

API confidence: 0.54
Option probabilities:
{ "C": 0.33, "B": 0.65, "A": 0.01, "D": 0.01 }

Section batch: 415 ms
Not per-question latency

QUESTION + OPTIONS

Minimum vertex colors for a tree with at least one edge?

- A. 1
- B. d
- C. 2
- D. d+1

REFERENCE ANSWER

C. 2

JEV / CORRECT

C. 2

Pre-run repair:
Exclude the one-vertex tree.

API confidence: 0.99
Option probabilities:
{ "C": 1.0, "B": 0.0, "A": 0.0, "D": 0.0 }

Section batch: 415 ms
Not per-question latency

QUESTION + OPTIONS

Minimum edge colors for a tree of maximum degree d ?

A. $2d$

B. d

C. $d+1$

D. 2

REFERENCE ANSWER

B. d

JEV / CORRECT

B. d

API confidence: 0.92
Option probabilities:
{`"C"`: 0.04, `"B"`: 0.94, `"A"`: 0.0, `"D"`: 0.02}

Section batch: 415 ms
Not per-question latency

QUESTION + OPTIONS

Maximum edges in a simple n -vertex graph, $n \geq 3$, where every cycle has length at least n ?

- A. $2n-2$
- B. n
- C. $n-1$
- D. $n+1$

REFERENCE ANSWER

B. n

JEV / INCORRECT

A. $2n-2$

API confidence: 0.15
Option probabilities:
{**"C"**: 0.24, "B": 0.34, "A": 0.37, "D": 0.05}

Section batch: 415 ms
Not per-question latency

QUESTION + OPTIONS

Length in edges of an Eulerian tour in a graph with n vertices, m edges?

- A. n
- B. $n-1$
- C. m
- D. $2m$

REFERENCE ANSWER

C. m

JEV / CORRECT

C. m

API confidence: 0.86
Option probabilities:
{**"C"**: 0.89, "B": 0.0, "A": 0.0, "D": 0.11}

Section batch: 415 ms
Not per-question latency

QUESTION + OPTIONS

Delete the edges of a simple k -cycle from a connected graph, retaining all vertices. What universal lower bound on the remaining component count is attainable for some such graphs?

- A. k
- B. 1
- C. $k-1$
- D. 2

REFERENCE ANSWER

B. 1

Pre-run repair:
Ask universal attainable bound; for particular tiny n,k , one component need not be attainable.

JEV / INCORRECT

A. k

API confidence: 0.22
Option probabilities:
{ $"C"$: 0.11, $"B"$: 0.26, $"A"$: 0.42, $"D"$: 0.21}

Section batch: 415 ms
Not per-question latency

QUESTION + OPTIONS

Delete the edges of a simple k -cycle from a connected graph, retaining all vertices. Maximum possible remaining component count?

- A. $k+1$
- B. $2k$
- C. k
- D. $k-1$

REFERENCE ANSWER

C. k

JEV / CORRECT

C. k

API confidence: 0.52
Option probabilities:
{ $"C"$: 0.63, $"B"$: 0.04, $"A"$: 0.25, $"D"$: 0.08}

Section batch: 415 ms
Not per-question latency

QUESTION + OPTIONS

2^36 mod 7?

- A. 1
- B. 2
- C. 4
- D. 0

REFERENCE ANSWER

A. 1

JEV / CORRECT

A. 1

API confidence: 0.21
Option probabilities:
{"B": 0.33, "D": 0.0, "C": 0.25, "A": 0.42}

Section batch: 436 ms
Not per-question latency

QUESTION + OPTIONS

$2^{36} \bmod 35$?

- A. 4
- B. 16
- C. 1
- D. 8

REFERENCE ANSWER

C. 1

JEV / INCORRECT

B. 16

API confidence: 0.37
Option probabilities:
{"B": 0.53, "D": 0.07, "C": 0.18, "A": 0.22}

Section batch: 436 ms
Not per-question latency

QUESTION + OPTIONS

$\gcd(385,70)$?

A. 5

B. 35

C. 70

D. 7

REFERENCE ANSWER

B. 35

JEV / CORRECT

B. 35

API confidence: 0.93
Option probabilities:
{**"B"**: 0.95, "D": 0.04, "C": 0.0, "A": 0.01}

Section batch: 436 ms
Not per-question latency

QUESTION + OPTIONS

Number of distinct square residues modulo 3, including zero?

- A. 2
- B. 3
- C. 1
- D. 0

REFERENCE ANSWER

A. 2

JEV / CORRECT

A. 2

API confidence: 0.93
Option probabilities:
{ "B": 0.04, "D": 0.0, "C": 0.01, "A": 0.95 }

Section batch: 436 ms
Not per-question latency

QUESTION + OPTIONS

Number of distinct square residues modulo 15, including zero?

- A. 6
- B. 8
- C. 4
- D. 7

REFERENCE ANSWER

A. 6

JEV / CORRECT

A. 6

API confidence: 0.56
Option probabilities:
{"B": 0.05, "D": 0.12, "C": 0.16, "A": 0.67}

Section batch: 436 ms
Not per-question latency

QUESTION + OPTIONS

If $x \equiv 0 \pmod d$, then $bx - kd \equiv 0 \pmod d$ for all integers b, k .

A. True

B. False

REFERENCE ANSWER

A. True

JEV / CORRECT

A. True

API confidence: 0.99
Option probabilities:
{"B": 0.0, "A": 1.0}

Section batch: 436 ms
Not per-question latency

QUESTION + OPTIONS

If $x \equiv 1 \pmod d$, then $bx - kd \equiv 1 \pmod d$ for all integers b, k .

A. False

B. True

REFERENCE ANSWER

A. False

JEV / INCORRECT

B. True

API confidence: 0.49
Option probabilities:
{ "B": 0.74, "A": 0.26 }

Section batch: 436 ms
Not per-question latency

QUESTION + OPTIONS

$\gcd(a,m)=d$ and $2a=b \bmod m$, with positive modulus m .
Assume $d>1$. Give the least positive t , nonzero modulo m , with $(2+t)a=b \bmod m$.

- A. m/d
- B. d
- C. a/d
- D. m

REFERENCE ANSWER

A. m/d

JEV / CORRECT

A. m/d

Pre-run repair:
Require $d>1$; if $d=1$ the source requests an impossible nonzero shift modulo m .

API confidence: 0.79
Option probabilities:
{ $"B"$: 0.13, $"D"$: 0.02, $"C"$: 0.01, $"A"$: 0.84}

Section batch: 436 ms
Not per-question latency

QUESTION + OPTIONS

$\gcd(a,m)=d$ and $2a=b \bmod m$, with positive modulus m .

b must be even.

A. True

B. False

REFERENCE ANSWER

B. False

JEV / CORRECT

B. False

API confidence: 0.46
Option probabilities:
{"B": 0.73, "A": 0.27}

Section batch: 436 ms
Not per-question latency

QUESTION + OPTIONS

$\gcd(a,m)=d$ and $2a=b \bmod m$, with positive modulus m .

d divides b .

A. True

B. False

REFERENCE ANSWER

A. True

JEV / CORRECT

A. True

API confidence: 0.91
Option probabilities:
{**"B"**: 0.05, "A": 0.95}

Section batch: 436 ms
Not per-question latency

QUESTION + OPTIONS

$\gcd(a,m)=d$ and $2a=b \bmod m$, with positive modulus m .

How many distinct solutions modulo m does $ax=b \bmod m$ have, given it is solvable?

- A. d
- B. m/d
- C. 1
- D. m

REFERENCE ANSWER

A. d

JEV / CORRECT

A. d

API confidence: 0.75
Option probabilities:
{**"B"**: 0.16, "D": 0.0, "C": 0.03, "A": 0.81}

Section batch: 436 ms
Not per-question latency

QUESTION + OPTIONS

Prime $p > 2$: count square residues including zero.

A. $(p-1)/2$

B. p

C. $(p+1)/2$

D. $p-1$

REFERENCE ANSWER

C. $(p+1)/2$

JEV / CORRECT

C. $(p+1)/2$

API confidence: 0.99
Option probabilities:
{`"B": 0.0, "D": 0.0, "C": 1.0, "A": 0.0`}

Section batch: 436 ms
Not per-question latency

QUESTION + OPTIONS

Distinct primes $p, q > 2$: count square residues modulo pq , including zero. Hint: CRT.

- A. $(p-1)(q-1)/4$
- B. $(p+q)/2$
- C. $(pq+1)/2$
- D. $(p+1)(q+1)/4$

REFERENCE ANSWER

D. $(p+1)(q+1)/4$

JEV / CORRECT

D. $(p+1)(q+1)/4$

API confidence: 0.99
Option probabilities:
{`"B": 0.0, "D": 1.0, "C": 0.0, "A": 0.0`}

Section batch: 436 ms
Not per-question latency

QUESTION + OPTIONS

GF(5) interpolation yields $P=x^2+4x+1$. One normalized Lagrange basis polynomial is $\Delta=x^2+3x+2$. Recover the three interpolation points.

- A. $\{(1,2),(3,0),(4,0)\}$
- B. $\{(1,1),(3,2),(4,3)\}$
- C. $\{(0,1),(3,2),(4,3)\}$
- D. $\{(1,1),(2,3),(4,3)\}$

REFERENCE ANSWER

B. $\{(1,1),(3,2),(4,3)\}$

JEV / CORRECT

B. $\{(1,1),(3,2),(4,3)\}$

API confidence: 0.45
Option probabilities:
 $\{ \text{"B": 0.58, "C": 0.12, "D": 0.07, "A": 0.23} \}$

Section batch: 399 ms
Not per-question latency

QUESTION + OPTIONS

Every polynomial of degree exactly two is a bijection over every prime field.

A. True

B. False

REFERENCE ANSWER

B. False

JEV / CORRECT

B. False

API confidence: 0.99
Option probabilities:
{**"B"**: 0.99, "A": 0.01}

Section batch: 399 ms
Not per-question latency

QUESTION + OPTIONS

Every polynomial of degree exactly one is a bijection over a prime field.

A. True

B. False

REFERENCE ANSWER

A. True

JEV / CORRECT

A. True

API confidence: 0.89
Option probabilities:
{"B": 0.05, "A": 0.95}

Section batch: 399 ms
Not per-question latency

QUESTION + OPTIONS

Where do $2x+3$ and $3x+2$ intersect over $\text{GF}(5)$?

- A. 4
- B. 0
- C. 1
- D. 2

REFERENCE ANSWER

C. 1

JEV / INCORRECT

A. 4

API confidence: 0.18
Option probabilities:
{`"B"`: 0.07, `"A"`: 0.39, `"D"`: 0.16, `"C"`: 0.38}

Section batch: 399 ms
Not per-question latency

QUESTION + OPTIONS

Distinct formal polynomials of degrees d_P, d_Q over $GF(p)$, $p > \max(d_P, d_Q)$: tight general upper bound on intersection coordinates?

- A. $d_P + d_Q$
- B. p
- C. $\min(d_P, d_Q)$
- D. $\max(d_P, d_Q)$

REFERENCE ANSWER

D. $\max(d_P, d_Q)$

JEV / INCORRECT

C. $\min(d_P, d_Q)$

API confidence: 0.32
Option probabilities:
{**"B"**: 0.0, "C": 0.49, "D": 0.41, "A": 0.1}

Section batch: 399 ms
Not per-question latency

QUESTION + OPTIONS

Over $\text{GF}(p)$, $p > 3$, fixed P . Count polynomials Q of degree at most three with $Q(1) = P(1), Q(2) = P(2)$.

- A. $(p-1)p$
- B. p^2
- C. 1
- D. p

REFERENCE ANSWER

B. p^2

Pre-run repair:
Explicit degree-at-most convention matching
source reference.

JEV / CORRECT

B. p^2

API confidence: 0.81
Option probabilities:
{**"B"**: 0.86, "A": 0.07, "D": 0.07, "C": 0.0}

Section batch: 399 ms
Not per-question latency

QUESTION + OPTIONS

Encode n message symbols as polynomial coefficients. Degree bound of message P ?

- A. At most $n+2k$
- B. At most $n-1$
- C. Exactly n
- D. Exactly k

REFERENCE ANSWER

B. At most $n-1$

JEV / CORRECT

B. At most $n-1$

API confidence: 0.99
Option probabilities:
{`"B": 1.0, "C": 0.0, "D": 0.0, "A": 0.0`}

Section batch: 399 ms
Not per-question latency

QUESTION + OPTIONS

How many distinct evaluations suffice to correct k corruptions in n message symbols?

- A. $n+2k-1$
- B. $2n+k$
- C. $n+k$
- D. $n+2k$

REFERENCE ANSWER

D. $n+2k$

JEV / CORRECT

D. $n+2k$

API confidence: 0.82
Option probabilities:
{**"B"**: 0.0, "A": 0.05, "D": 0.87, "C": 0.08}

Section batch: 399 ms
Not per-question latency

QUESTION + OPTIONS

Why does $E(i)(P(i)-r_i)=0$ at each transmitted coordinate, where E vanishes at error locations?

- A. At a corrupted coordinate $E(i)=0$; at an uncorrupted one $P(i)-r_i=0$. Thus at least one factor vanishes everywhere.
- B. Both factors vanish at every coordinate.
- C. Every field product with an error polynomial is zero.
- D. The product has degree zero, so it is identically zero.

REFERENCE ANSWER

A. At a corrupted coordinate $E(i)=0$; at an uncorrupted one $P(i)-r_i=0$. Thus at least one factor vanishes everywhere.

JEV / CORRECT

A. At a corrupted coordinate $E(i)=0$; at an uncorrupted one $P(i)-r_i=0$. Thus at least one factor vanishes everywhere.

API confidence: 1.00
Option probabilities:
{ "B": 0.0, "C": 0.0, "D": 0.0, "A": 1.0 }

Section batch: 399 ms
Not per-question latency

QUESTION + OPTIONS

Distinct arrangements of BAA?

- A. 1
- B. 3
- C. 6
- D. 2

REFERENCE ANSWER

B. 3

JEV / CORRECT

B. 3

API confidence: 0.84
Option probabilities:
{ "B": 0.88, "D": 0.11, "A": 0.01, "C": 0.0 }

Section batch: 311 ms
Not per-question latency

QUESTION + OPTIONS

Distinct arrangements of 126?

- A. 1
- B. 3
- C. 9
- D. 6

REFERENCE ANSWER

D. 6

JEV / CORRECT

D. 6

API confidence: 0.31
Option probabilities:
{ "D": 0.48, "B": 0.11, "A": 0.34, "C": 0.07 }

Section batch: 311 ms
Not per-question latency

QUESTION + OPTIONS

n distinct bears, k distinct children, $n>k$. Assign one bear each, without reuse.
Count?

- A. n^k
- B. k^n
- C. $C(n,k)$
- D. $n!/(n-k)!$

REFERENCE ANSWER

D. $n!/(n-k)!$

JEV / CORRECT

D. $n!/(n-k)!$

API confidence: 1.00
Option probabilities:
{**"D"**: 1.0, "B": 0.0, "A": 0.0, "C": 0.0}

Section batch: 311 ms
Not per-question latency

QUESTION + OPTIONS

Bipartite labeled graph with fixed parts each of size n and exactly m edges. Count?

- A. $2^{(n^2)}$
- B. $C(n^2, m)$
- C. $n^{(2m)}$
- D. $C(2n, m)$

REFERENCE ANSWER

B. $C(n^2, m)$

JEV / CORRECT

B. $C(n^2, m)$

API confidence: 1.00
Option probabilities:
{`"D"`: 0.0, `"B"`: 1.0, `"A"`: 0.0, `"C"`: 0.0}

Section batch: 311 ms
Not per-question latency

QUESTION + OPTIONS

Number of functions from p residues to p residues?

- A. p^p
- B. $p!$
- C. 2^p
- D. p^2

REFERENCE ANSWER

A. p^p

JEV / CORRECT

A. p^p

API confidence: 1.00
Option probabilities:
{`"D": 0.0, "B": 0.0, "A": 1.0, "C": 0.0`}

Section batch: 311 ms
Not per-question latency

QUESTION + OPTIONS

Number of bijections from p residues to themselves?

- A. p^2
- B. p^p
- C. p
- D. $p!$

REFERENCE ANSWER

D. $p!$

JEV / CORRECT

D. $p!$

API confidence: 1.00
Option probabilities:
{**"B"**: 0.0, **"D"**: 1.0, **"A"**: 0.0, **"C"**: 0.0}

Section batch: 311 ms
Not per-question latency

QUESTION + OPTIONS

Form three named teams of four distinct players from 15 people, no overlap.
Count?

- A. $15!/(4!4!4!3!3!)$
- B. $C(15,12)$
- C. $C(15,4)^3$
- D. $C(15,4)C(11,4)C(7,4)$

REFERENCE ANSWER

D. $C(15,4)C(11,4)C(7,4)$

JEV / CORRECT

D. $C(15,4)C(11,4)C(7,4)$

API confidence: 0.80
Option probabilities:
{**"D"**: 0.86, "B": 0.0, "A": 0.14, "C": 0.0}

Section batch: 311 ms
Not per-question latency

QUESTION + OPTIONS

Give a combinatorial proof of $\sum_{i=0..n} C(n,i)C(n,n-i)=C(2n,n)$.

- A. Choose n objects from two disjoint n-object groups. Classify each choice by how many i come from the first group; exactly n-i come from the second.
- B. Choose the same subset twice, which counts every n-subset of 2n once.
- C. Choose i from both groups, always obtaining n total objects regardless of i.
- D. Every binomial coefficient equals the number of permutations of its top argument.

REFERENCE ANSWER

A. Choose n objects from two disjoint n-object groups. Classify each choice by how many i come from the first group; exactly n-i come from the second.

JEV / CORRECT

A. Choose n objects from two disjoint n-object groups. Classify each choice by how many i come from the first group; exactly n-i come from the second.

API confidence: 1.00
Option probabilities:
{"D": 0.0, "B": 0.0, "A": 1.0, "C": 0.0}

Section batch: 733 ms
Not per-question latency

QUESTION + OPTIONS

Given $\sum_{i=0..n} C(n,i)C(n,n-i)=C(2n,n)$, why does $\sum_{i=0..n} C(n,i)^2=C(2n,n)$ follow?

- A. All summands are equal to $C(2n,n)/n$.
- B. $C(n,n-i)=C(n,i)$ by taking complements of subsets.
- C. Every binomial coefficient equals its own square.
- D. $C(n,n-i)=n-i$.

REFERENCE ANSWER

B. $C(n,n-i)=C(n,i)$ by taking complements of subsets.

JEV / CORRECT

B. $C(n,n-i)=C(n,i)$ by taking complements of subsets.

API confidence: 1.00
Option probabilities:
{ "D": 0.0, "B": 1.0, "A": 0.0, "C": 0.0 }

Section batch: 733 ms
Not per-question latency

QUESTION + OPTIONS

The power set of N has the same cardinality as $[0,1]$.

A. False

B. True

REFERENCE ANSWER

B. True

JEV / CORRECT

B. True

API confidence: 0.90
Option probabilities:
{`"B"`: 0.95, `"A"`: 0.05}

Section batch: 718 ms
Not per-question latency

QUESTION + OPTIONS

A finite Cartesian product of countable sets is countable.

A. False

B. True

REFERENCE ANSWER

B. True

JEV / CORRECT

B. True

API confidence: 0.97
Option probabilities:
{ "B": 0.99, "A": 0.01 }

Section batch: 718 ms
Not per-question latency

QUESTION + OPTIONS

$A = \mathbb{Z} \times \mathbb{Z}$; $f: A \rightarrow C$ is onto and $g: C \rightarrow B$ is injective.

A is countable.

A. True

B. False

REFERENCE ANSWER

A. True

JEV / CORRECT

A. True

API confidence: 1.00
Option probabilities:
{"B": 0.0, "A": 1.0}

Section batch: 718 ms
Not per-question latency

QUESTION + OPTIONS

$A = Z \times Z$; $f: A \rightarrow C$ is onto and $g: C \rightarrow B$ is injective.

These assumptions imply $|A|$ is strictly smaller than $|B|$.

A. False

B. True

REFERENCE ANSWER

A. False

JEV / CORRECT

A. False

API confidence: 0.99
Option probabilities:
{ "B": 0.01, "A": 0.99 }

Section batch: 718 ms
Not per-question latency

QUESTION + OPTIONS

Give a bijection $(0,1] \rightarrow [1,\infty)$.

- A. $f(x)=1/x$
- B. $f(x)=1/(1-x)$
- C. $f(x)=x+1$
- D. $f(x)=-\ln(x)$

REFERENCE ANSWER

A. $f(x)=1/x$

JEV / CORRECT

A. $f(x)=1/x$

API confidence: 0.99
Option probabilities:
{**"B"**: 0.0, "C": 0.0, "D": 0.0, "A": 1.0}

Section batch: 718 ms
Not per-question latency

QUESTION + OPTIONS

There is an algorithm deciding whether $P(x)$ halts within $|x|^k$ steps, for arbitrary P , nonempty finite x and nonnegative integer k .

A. False

B. True

REFERENCE ANSWER

B. True

JEV / CORRECT

B. True

API confidence: 0.44
Option probabilities:
{`"B"`: 0.72, `"A"`: 0.28}

Section batch: 326 ms
Not per-question latency

QUESTION + OPTIONS

Hypothetical HaltsOnEmpty decides whether a program halts on empty input. Fill:
Halt(P,x) defines inner(y): __1__; then returns HaltsOnEmpty(__2__).

- A. (return True; inner)
- B. (P(x); inner)
- C. (P(x); x)
- D. (P(y); P)

REFERENCE ANSWER

B. (P(x); inner)

JEV / CORRECT

B. (P(x); inner)

API confidence: 0.59
Option probabilities:
{ "B": 0.7, "D": 0.12, "A": 0.02, "C": 0.16 }

Section batch: 326 ms
Not per-question latency

QUESTION + OPTIONS

Sharp upper bound on $P(A \cup B)$ using only $a=P(A), b=P(B)$?

- A. $a+b$
- B. $a*b$
- C. $\max(a,b)$
- D. $\min(1,a+b)$

REFERENCE ANSWER

D. $\min(1,a+b)$

Pre-run repair:
Clip at one; source unqualified union bound is not the lowest upper bound when $a+b>1$.

JEV / CORRECT

D. $\min(1,a+b)$

API confidence: 0.98
Option probabilities:
{ "B": 0.0, "D": 0.98, "C": 0.0, "A": 0.02 }

Section batch: 297 ms
Not per-question latency

QUESTION + OPTIONS

Sharp lower bound on $P(A \text{ union } B)$ using only $a=P(A),b=P(B)$?

- A. $a+b$
- B. $\max(a,b)$
- C. $\min(a,b)$
- D. $a*b$

REFERENCE ANSWER

B. $\max(a,b)$

JEV / CORRECT

B. $\max(a,b)$

API confidence: 1.00
Option probabilities:
{**"B"**: 1.0, "D": 0.0, "C": 0.0, "A": 0.0}

Section batch: 297 ms
Not per-question latency

QUESTION + OPTIONS

A is a subset of B and both have positive probability. $P(A \text{ given } B)$?

- A. 1
- B. $P(B)/P(A)$
- C. $P(A)/P(B)$
- D. $P(A)P(B)$

REFERENCE ANSWER

C. $P(A)/P(B)$

JEV / CORRECT

C. $P(A)/P(B)$

API confidence: 0.99
Option probabilities:
{`"B": 0.0, "D": 0.0, "C": 1.0, "A": 0.0`}

Section batch: 297 ms
Not per-question latency

QUESTION + OPTIONS

A is a subset of B and $P(A) > 0$. $P(B \text{ given } A)$?

- A. 0
- B. $P(B)$
- C. $P(A)/P(B)$
- D. 1

REFERENCE ANSWER

D. 1

JEV / CORRECT

D. 1

API confidence: 1.00
Option probabilities:
{**"B"**: 0.0, **"D"**: 1.0, "C": 0.0, "A": 0.0}

Section batch: 297 ms
Not per-question latency

QUESTION + OPTIONS

Events have probabilities $a=P(A), b=P(B), c=P(C)$, with $P(A \text{ intersection } B)=P(B \text{ intersection } C)=\alpha$. Assume these quantities are feasible.

Sharp upper bound on $P(A \text{ intersection } C)$?

- A. $a+c$
- B. $\min(a,b,c)$
- C. α
- D. $\min(a,c)$

REFERENCE ANSWER

D. $\min(a,c)$

JEV / CORRECT

D. $\min(a,c)$

API confidence: 0.66
Option probabilities:
{ $"B"$: 0.08, $"D"$: 0.75, $"C"$: 0.16, $"A"$: 0.01}

Section batch: 297 ms
Not per-question latency

QUESTION + OPTIONS

Events have probabilities $a=P(A), b=P(B), c=P(C)$, with $P(A \text{ intersection } B)=P(B \text{ intersection } C)=\alpha$. Assume these quantities are feasible.

Sharp lower bound on $P(A \text{ intersection } C)$ using all the given quantities?

- A. $\max(0, 2\alpha - b) + \max(0, a + c - 2\alpha + b - 1)$
- B. $\max(0, a + c - 1)$
- C. $\max(0, 2\alpha - b)$
- D. α

REFERENCE ANSWER

A. $\max(0, 2\alpha - b) + \max(0, a + c - 2\alpha + b - 1)$

Pre-run repair:
Correct incomplete source lower bound:
intersections forced outside B must also be counted.

JEV / CORRECT

A. $\max(0, 2\alpha - b) + \max(0, a + c - 2\alpha + b - 1)$

API confidence: 0.90
Option probabilities:
{ "B": 0.02, "D": 0.0, "C": 0.05, "A": 0.93 }

Section batch: 297 ms
Not per-question latency

QUESTION + OPTIONS

Events have probabilities $a=P(A), b=P(B), c=P(C)$, with $P(A \text{ intersection } B)=P(B \text{ intersection } C)=\alpha$. Assume these quantities are feasible.

Justify a sharp lower bound using the partition into B and its complement.

- A. The overlap is always exactly α , regardless of a, b, c .
- B. The two known intersections are equal, so A and C must be identical.
- C. Ignore the complement of B , because neither A nor C can extend beyond B .
- D. Inside B , overlap is at least $\max(0, 2\alpha - b)$. Outside B , the masses $a - \alpha$ and $c - \alpha$ share a region of mass $1 - b$, forcing $\max(0, a + c - 2\alpha + b - 1)$. Add the independently attainable minima.

REFERENCE ANSWER

D. Inside B , overlap is at least $\max(0, 2\alpha - b)$. Outside B , the masses $a - \alpha$ and $c - \alpha$ share a region of mass $1 - b$, forcing $\max(0, a + c - 2\alpha + b - 1)$. Add the independently attainable minima.

Pre-run repair:
Extend source argument to cover the omitted complement region.

JEV / CORRECT

D. Inside B , overlap is at least $\max(0, 2\alpha - b)$. Outside B , the masses $a - \alpha$ and $c - \alpha$ share a region of mass $1 - b$, forcing $\max(0, a + c - 2\alpha + b - 1)$. Add the independently attainable minima.

API confidence: 1.00
Option probabilities:
{ "B": 0.0, "D": 1.0, "C": 0.0, "A": 0.0 }

Section batch: 297 ms
Not per-question latency

QUESTION + OPTIONS

Choose a fair four-sided or fair six-sided die with equal probability, then roll the chosen die twice independently conditional on its identity. A:first roll 1; B:second roll 1; C:four-sided die selected.

P(A given B)?

- A. 5/24
- B. 13/60
- C. 1/6
- D. 1/4

REFERENCE ANSWER

B. 13/60

JEV / INCORRECT

C. 1/6

API confidence: 0.46
Option probabilities:
{ "B": 0.08, "C": 0.59, "A": 0.1, "D": 0.23 }

Section batch: 373 ms
Not per-question latency

QUESTION + OPTIONS

Choose a fair four-sided or fair six-sided die with equal probability, then roll the chosen die twice independently conditional on its identity. A:first roll 1; B:second roll 1; C:four-sided die selected.

P(C given A)?

A. 2/5

B. 1/4

C. 1/2

D. 3/5

REFERENCE ANSWER

D. 3/5

JEV / INCORRECT

A. 2/5

API confidence: 0.34
Option probabilities:
{ "C": 0.14, "B": 0.02, "A": 0.51, "D": 0.33 }

Section batch: 373 ms
Not per-question latency

QUESTION + OPTIONS

Independent Bernoulli X, Y each have mean $1/2$. $P(X=Y)$?

- A. 1
- B. $1/4$
- C. $1/2$
- D. $3/4$

REFERENCE ANSWER

C. $1/2$

JEV / CORRECT

C. $1/2$

API confidence: 0.98
Option probabilities:
{ $"D"$: 0.01, $"A"$: 0.0, $"B"$: 0.0, $"C"$: 0.99}

Section batch: 371 ms
Not per-question latency

QUESTION + OPTIONS

Bernoulli X, Y each have mean $1/2$ and correlation $1/2$.

$E[XY]$?

A. $1/4$

B. $3/8$

C. $1/2$

D. $1/8$

REFERENCE ANSWER

B. $3/8$

JEV / CORRECT

B. $3/8$

API confidence: 0.88
Option probabilities:
{ $"D"$: 0.02, $"A"$: 0.01, $"B"$: 0.91, $"C"$: 0.06}

Section batch: 371 ms
Not per-question latency

QUESTION + OPTIONS

Bernoulli X, Y each have mean $1/2$ and correlation $1/2$.

$P(X=Y)$?

A. $1/2$

B. $3/4$

C. $3/8$

D. $1/4$

REFERENCE ANSWER

B. $3/4$

JEV / CORRECT

B. $3/4$

API confidence: 0.53
Option probabilities:
{ $"D"$: 0.02, $"A"$: 0.27, $"B"$: 0.66, $"C"$: 0.05}

Section batch: 371 ms
Not per-question latency

QUESTION + OPTIONS

Sample n people independently from a population with positive-test probability p .
 X_i indicates a positive test.

$E[X_i]$?

A. $p(1-p)$

B. $1-p$

C. p

D. np

REFERENCE ANSWER

C. p

JEV / CORRECT

C. p

API confidence: 1.00
Option probabilities:
{ $"C"$: 1.0, $"A"$: 0.0, $"B"$: 0.0, $"D"$: 0.0}

Section batch: 288 ms
Not per-question latency

QUESTION + OPTIONS

Sample n people independently from a population with positive-test probability p .
 X_i indicates a positive test.

Sharp p -independent upper bound on $\text{Var}(X_i)$?

- A. 1
- B. p
- C. $1/4$
- D. $1/2$

REFERENCE ANSWER

C. $1/4$

JEV / CORRECT

C. $1/4$

API confidence: 0.87
Option probabilities:
{ $"C"$: 0.91, $"A"$: 0.02, $"B"$: 0.07, $"D"$: 0.0}

Section batch: 288 ms
Not per-question latency

QUESTION + OPTIONS

Sample n people independently from a population with positive-test probability p . X_i indicates a positive test.

50 of 100 independently sampled people test positive. Using Chebyshev and the worst-case Bernoulli variance, give a 95% confidence interval for p .

- A. $[1/2 - 1/20, 1/2 + 1/20]$
- B. $[1/2 - 1/\sqrt{20}, 1/2 + 1/\sqrt{20}]$
- C. $[1/2 - 1/10, 1/2 + 1/10]$
- D. $[1/2 - 1/\sqrt{100}, 1/2 + 1/\sqrt{100}]$

REFERENCE ANSWER

B.
 $[1/2 - 1/\sqrt{20}, 1/2 + 1/\sqrt{20}]$

Pre-run repair:
State independent sampling assumed in source solution.

JEV / CORRECT

B.
 $[1/2 - 1/\sqrt{20}, 1/2 + 1/\sqrt{20}]$

API confidence: 0.53
Option probabilities:
{ "C": 0.26, "A": 0.06, "B": 0.65, "D": 0.03 }

Section batch: 288 ms
Not per-question latency

QUESTION + OPTIONS

Prove every tournament (one directed edge per unordered vertex pair) has a Hamiltonian path.

- A. Every tournament has a vertex pointing to all others, so choose it first recursively.
- B. All tournaments are acyclic, so a topological sort always gives a path.
- C. Follow outgoing edges greedily; a visited vertex can never be encountered again.
- D. Induct including zero/one-vertex bases. Pick v ; split remaining vertices into those pointing to v and those v points to. Each induced tournament has a Hamiltonian path; concatenate the first path, v , then the second.

REFERENCE ANSWER

D. Induct including zero/one-vertex bases. Pick v ; split remaining vertices into those pointing to v and those v points to. Each induced tournament has a Hamiltonian path; concatenate the first path, v , then the second.

JEV / CORRECT

D. Induct including zero/one-vertex bases. Pick v ; split remaining vertices into those pointing to v and those v points to. Each induced tournament has a Hamiltonian path; concatenate the first path, v , then the second.

API confidence: 1.00
Option probabilities:
{`"D"`: 1.0, `"A"`: 0.0, `"C"`: 0.0, `"B"`: 0.0}

Section batch: 435 ms
Not per-question latency

QUESTION + OPTIONS

Orient every edge of a complete n -vertex graph independently with a fair coin.
Number of possible tournaments?

- A. $C(n,2)$
- B. $2^C(n,2)$
- C. $2^{(n^2)}$
- D. $n!$

REFERENCE ANSWER

B. $2^C(n,2)$

JEV / CORRECT

B. $2^C(n,2)$

API confidence: 1.00
Option probabilities:
{**"D"**: 0.0, "A": 0.0, "C": 0.0, "B": 1.0}

Section batch: 435 ms
Not per-question latency

QUESTION + OPTIONS

Orient every edge of a complete n -vertex graph independently with a fair coin.
Expected Hamiltonian paths in the resulting tournament?

- A. $n!/2^{(n-1)}$
- B. $n!/2^{C(n,2)}$
- C. $2^{(n-1)}$
- D. $n/2$

REFERENCE ANSWER

A. $n!/2^{(n-1)}$

JEV / CORRECT

A. $n!/2^{(n-1)}$

API confidence: 0.88
Option probabilities:
{`"D"`: 0.0, `"A"`: 0.91, `"C"`: 0.0, `"B"`: 0.09}

Section batch: 435 ms
Not per-question latency

QUESTION + OPTIONS

Random variables have finite second moments; $\text{Var}(X) > 0$.

The best affine least-squares estimator of Y from X passes through the origin iff $E[Y]$ equals what?

- A. $\text{Cov}(X, Y) / E[X]$
- B. 0
- C. $\text{Cov}(X, Y) * E[X] / \text{Var}(X)$
- D. $E[X]$

REFERENCE ANSWER

C. $\text{Cov}(X, Y) * E[X] / \text{Var}(X)$

JEV / INCORRECT

B. 0

API confidence: 0.84
Option probabilities:
{ "B": 0.88, "D": 0.0, "A": 0.04, "C": 0.08 }

Section batch: 337 ms
Not per-question latency

QUESTION + OPTIONS

Random variables have finite second moments; $\text{Var}(X) > 0$.

$E[X^2]$ in terms of variance and mean?

A. $\text{Var}(X) - E[X]^2$

B. $E[X]^2$

C. $\text{Var}(X) + E[X]^2$

D. $\text{Var}(X)^2 + E[X]$

REFERENCE ANSWER

C. $\text{Var}(X) + E[X]^2$

JEV / CORRECT

C. $\text{Var}(X) + E[X]^2$

API confidence: 1.00
Option probabilities:
{ "D": 0.0, "B": 0.0, "A": 0.0, "C": 1.0 }

Section batch: 337 ms
Not per-question latency

QUESTION + OPTIONS

Random variables have finite second moments; $\text{Var}(X) > 0$.

If $E[X] = E[Y] = t$, what t makes $\text{Cov}(X, Y) = E[XY]$?

- A. 0
- B. 1/2
- C. -1
- D. 1

REFERENCE ANSWER

A. 0

JEV / CORRECT

A. 0

API confidence: 1.00
Option probabilities:
{ "D": 0.0, "B": 0.0, "A": 1.0, "C": 0.0 }

Section batch: 337 ms
Not per-question latency

QUESTION + OPTIONS

Random variables have finite second moments; $\text{Var}(X) > 0$.

If X, Y are independent, best affine least-squares estimator of Y given X ?

A. $E[XY]$

B. $E[X]$

C. $E[Y]$

D. X

REFERENCE ANSWER

C. $E[Y]$

JEV / CORRECT

C. $E[Y]$

API confidence: 1.00
Option probabilities:
{`"D": 0.0, "B": 0.0, "A": 0.0, "C": 1.0`}

Section batch: 337 ms
Not per-question latency

QUESTION + OPTIONS

Independent $X, Y \sim \text{Bin}(n, p)$. Distribution of $X + Y$?

- A. $\text{Poisson}(2np)$
- B. $\text{Bin}(n, 2p)$
- C. $\text{Bin}(2n, p)$
- D. $\text{Bin}(2n, p^2)$

REFERENCE ANSWER

C. $\text{Bin}(2n, p)$

JEV / CORRECT

C. $\text{Bin}(2n, p)$

API confidence: 1.00
Option probabilities:
{**"B"**: 0.0, **"C"**: 1.0, "A": 0.0, "D": 0.0}

Section batch: 289 ms
Not per-question latency

QUESTION + OPTIONS

Independent $X, Y \sim \text{Geom}(p)$, counting trials from 1. Distribution of $\min(X, Y)$?

- A. $\text{Geom}(2p - p^2)$
- B. $\text{Geom}(p^2)$
- C. $\text{Geom}(p)$
- D. $\text{Geom}(2p)$

REFERENCE ANSWER

A. $\text{Geom}(2p - p^2)$

JEV / CORRECT

A. $\text{Geom}(2p - p^2)$

API confidence: 0.97
Option probabilities:
{`"B": 0.0, "A": 0.98, "C": 0.01, "D": 0.01`}

Section batch: 289 ms
Not per-question latency

QUESTION + OPTIONS

Fixed $\lambda > 0$ and nonnegative integer i . Limit as $n \rightarrow \infty$ of $C(n,i)(\lambda/n)^i(1-\lambda/n)^{(n-i)}$?

- A. $\exp(-\lambda)$
- B. $\exp(-i)^i \lambda / \lambda!$
- C. $\lambda^i / i!$
- D. $\exp(-\lambda) \lambda^i / i!$

REFERENCE ANSWER

D. $\exp(-\lambda) \lambda^i / i!$

JEV / CORRECT

D. $\exp(-\lambda) \lambda^i / i!$

API confidence: 0.99
Option probabilities:
{ "B": 0.0, "A": 0.0, "C": 0.0, "D": 1.0 }

Section batch: 289 ms
Not per-question latency

QUESTION + OPTIONS

First $X \sim \text{Uniform}(0,1]$; conditional on $X=x$, draw $Y \sim \text{Uniform}[0,x]$.

Marginal density of X ?

- A. $-\ln(x)$ on $(0,1]$, zero elsewhere
- B. 1 on $(0,1]$, zero elsewhere
- C. $1/x$ on $(0,1]$, zero elsewhere
- D. $2x$ on $(0,1]$, zero elsewhere

REFERENCE ANSWER

B. 1 on $(0,1]$, zero elsewhere

JEV / CORRECT

B. 1 on $(0,1]$, zero elsewhere

API confidence: 0.96
Option probabilities:
{ "B": 0.98, "A": 0.02, "C": 0.0, "D": 0.0 }

Section batch: 289 ms
Not per-question latency

QUESTION + OPTIONS

First $X \sim \text{Uniform}(0,1]$; conditional on $X=x$, draw $Y \sim \text{Uniform}[0,x]$.
Describe the joint support region, replacing the requested shading.

- A. $0 \leq x,y \leq 1$, the full square
- B. $0 \leq x \leq 1$ and $0 \leq y \leq x$
- C. $x+y \leq 1$ with $x,y \geq 0$
- D. $0 \leq y \leq 1$ and $0 \leq x \leq y$

REFERENCE ANSWER

B. $0 \leq x \leq 1$ and $0 \leq y \leq x$

JEV / CORRECT

B. $0 \leq x \leq 1$ and $0 \leq y \leq x$

API confidence: 1.00
Option probabilities:
{ "B": 1.0, "A": 0.0, "C": 0.0, "D": 0.0 }

Section batch: 289 ms
Not per-question latency

QUESTION + OPTIONS

First $X \sim \text{Uniform}(0,1]$; conditional on $X=x$, draw $Y \sim \text{Uniform}[0,x]$.

Conditional density of Y given $X=x$ on its support?

- A. $1/y$
- B. x
- C. $1/x$
- D. 1

REFERENCE ANSWER

C. $1/x$

JEV / CORRECT

C. $1/x$

API confidence: 1.00
Option probabilities:
{**"B"**: 0.0, "A": 0.0, "C": 1.0, "D": 0.0}

Section batch: 289 ms
Not per-question latency

QUESTION + OPTIONS

First $X \sim \text{Uniform}(0,1]$; conditional on $X=x$, draw $Y \sim \text{Uniform}[0,x]$.

Marginal density of Y , ignoring irrelevant endpoint values?

- A. $1/y$ for $0 < y < 1$, zero elsewhere
- B. $2(1-y)$ for $0 < y < 1$, zero elsewhere
- C. $-\ln(y)$ for $0 < y < 1$, zero elsewhere
- D. 1 for $0 < y < 1$, zero elsewhere

REFERENCE ANSWER

C. $-\ln(y)$ for $0 < y < 1$, zero elsewhere

JEV / CORRECT

C. $-\ln(y)$ for $0 < y < 1$, zero elsewhere

API confidence: 0.92
Option probabilities:
{ "B": 0.03, "A": 0.01, "C": 0.95, "D": 0.01 }

Section batch: 289 ms
Not per-question latency

QUESTION + OPTIONS

Continuous X has CDF F . For $a \leq b$, $P(a \leq X \leq b)$?

- A. $F(a)-F(b)$
- B. $F(b)/F(a)$
- C. $F(a)+F(b)$
- D. $F(b)-F(a)$

REFERENCE ANSWER

D. $F(b)-F(a)$

JEV / CORRECT

D. $F(b)-F(a)$

API confidence: 1.00
Option probabilities:
{ $"B"$: 0.0, $"D"$: 1.0, $"A"$: 0.0, $"C"$: 0.0}

Section batch: 393 ms
Not per-question latency

QUESTION + OPTIONS

X has density f. For $a \leq b$, $P(a \leq X \leq b)$?

- A. $\int_a^b x \cdot f(x) \, dx$
- B. $f(b) - f(a)$
- C. $f(a) + f(b)$
- D. $\int_a^b f(x) \, dx$

REFERENCE ANSWER

D. $\int_a^b f(x) \, dx$

JEV / CORRECT

D. $\int_a^b f(x) \, dx$

API confidence: 1.00
Option probabilities:
{**"B"**: 0.0, **"D"**: 1.0, "A": 0.0, "C": 0.0}

Section batch: 393 ms
Not per-question latency

QUESTION + OPTIONS

Continuous X has CDF F with $F(a) < 1$. $P(X \leq b \text{ given } X \geq a)$?

- A. $[F(b)-F(a)]/F(a)$ for all a,b
- B. $F(b)/(1-F(a))$ for all a,b
- C. 0 if $b < a$; otherwise $[F(b)-F(a)]/[1-F(a)]$
- D. $F(b)-F(a)$ for all a,b

REFERENCE ANSWER

C. 0 if $b < a$; otherwise $[F(b)-F(a)]/[1-F(a)]$

JEV / CORRECT

C. 0 if $b < a$; otherwise $[F(b)-F(a)]/[1-F(a)]$

Pre-run repair:
Conditioning event must have positive probability.

API confidence: 1.00
Option probabilities:
{"B": 0.0, "D": 0.0, "A": 0.0, "C": 1.0}

Section batch: 393 ms
Not per-question latency

QUESTION + OPTIONS

$X \sim \text{Uniform}[a, b]$, $a < s < t < b$. $P(X \leq t \text{ given } X \geq s)$?

- A. $(t-s)/(b-s)$
- B. $(t-s)/(t-a)$
- C. $(t-s)/(b-a)$
- D. $(t-a)/(b-a)$

REFERENCE ANSWER

A. $(t-s)/(b-s)$

JEV / CORRECT

A. $(t-s)/(b-s)$

API confidence: 0.99
Option probabilities:
{**"B"**: 0.0, **"D"**: 0.0, **"A"**: 1.0, **"C"**: 0.0}

Section batch: 393 ms
Not per-question latency

QUESTION + OPTIONS

A nondegenerate bounded uniform distribution is memoryless.

A. True

B. False

REFERENCE ANSWER

B. False

JEV / CORRECT

B. False

API confidence: 0.99
Option probabilities:
{ "B": 1.0, "A": 0.0 }

Section batch: 393 ms
Not per-question latency

QUESTION + OPTIONS

X is the minimum of m independent Uniform[0,1] draws. Its density?

- A. 1/m on [0,1], zero elsewhere
- B. (1-x)^m on [0,1], zero elsewhere
- C. m*x^(m-1) on [0,1], zero elsewhere
- D. m(1-x)^(m-1) on [0,1], zero elsewhere

REFERENCE ANSWER

D. $m(1-x)^{(m-1)}$ on [0,1], zero elsewhere

JEV / CORRECT

D. $m(1-x)^{(m-1)}$ on [0,1], zero elsewhere

API confidence: 0.98
Option probabilities:
{ "B": 0.0, "D": 0.99, "A": 0.0, "C": 0.01 }

Section batch: 393 ms
Not per-question latency

QUESTION + OPTIONS

Expected minimum of m independent $\text{Uniform}[0,1]$ draws?

- A. $1/(m+1)$
- B. $m/(m+1)$
- C. $1/m$
- D. $1/2$

REFERENCE ANSWER

A. $1/(m+1)$

JEV / CORRECT

A. $1/(m+1)$

API confidence: 1.00
Option probabilities:
{**"B"**: 0.0, **"D"**: 0.0, **"A"**: 1.0, **"C"**: 0.0}

Section batch: 393 ms
Not per-question latency

QUESTION + OPTIONS

States 0..29. From i, move to i+3 or i+5 modulo 30, each with probability 1/2.

Is this chain irreducible?

A. Yes

B. No

REFERENCE ANSWER

A. Yes

JEV / CORRECT

A. Yes

API confidence: 0.73
Option probabilities:
{ "B": 0.14, "A": 0.86 }

Section batch: 344 ms
Not per-question latency

QUESTION + OPTIONS

States 0..29. From i, move to i+3 or i+5 modulo 30, each with probability 1/2.

Period of state 0?

- A. 10
- B. 1
- C. 2
- D. 6

REFERENCE ANSWER

C. 2

JEV / INCORRECT

B. 1

API confidence: 0.36
Option probabilities:
{ "B": 0.52, "D": 0.06, "C": 0.19, "A": 0.23 }

Section batch: 344 ms
Not per-question latency

QUESTION + OPTIONS

States 0..29. From i, move to i+3 or i+5 modulo 30, each with probability 1/2.

The uniform distribution on these states is invariant.

A. True

B. False

REFERENCE ANSWER

A. True

JEV / CORRECT

A. True

API confidence: 0.83
Option probabilities:
{ "B": 0.08, "A": 0.92 }

Section batch: 344 ms
Not per-question latency

QUESTION + OPTIONS

Start at Evelyn. Each person chooses uniformly among outgoing neighbors:
Evelyn->{Andy,Jay}; Andy->{Malia,Jay}; Jay->{Malia}; Malia->{Gavin};
Gavin->{Evelyn}. One transition per minute.

Expected minutes until first reaching Andy?

- A. 4
- B. 8
- C. 5
- D. 2

REFERENCE ANSWER

C. 5

JEV / INCORRECT

D. 2

API confidence: 0.27
Option probabilities:
{"B": 0.1, "D": 0.45, "C": 0.13, "A": 0.32}

Section batch: 344 ms
Not per-question latency

QUESTION + OPTIONS

Start at Evelyn. Each person chooses uniformly among outgoing neighbors:
Evelyn->{Andy,Jay}; Andy->{Malia,Jay}; Jay->{Malia}; Malia->{Gavin};
Gavin->{Evelyn}. One transition per minute.

Probability of reaching Jay before Gavin?

- A. 2/3
- B. 1/4
- C. 3/4
- D. 1/2

REFERENCE ANSWER

C. 3/4

JEV / INCORRECT

A. 2/3

API confidence: 0.36
Option probabilities:
{ "B": 0.04, "D": 0.12, "C": 0.32, "A": 0.52 }

Section batch: 344 ms
Not per-question latency

QUESTION + OPTIONS

(NOT P implies P) is equivalent to P.

A. False

B. True

REFERENCE ANSWER

B. True

JEV / CORRECT

B. True

API confidence: 0.87
Option probabilities:
{ "A": 0.07, "B": 0.93 }

Section batch: 398 ms
Not per-question latency

QUESTION + OPTIONS

[(P OR Q) AND (P implies R) AND (Q implies R)] is equivalent to R.

A. True

B. False

REFERENCE ANSWER

B. False

JEV / INCORRECT

A. True

API confidence: 0.16
Option probabilities:
{ "A": 0.58, "B": 0.42 }

Section batch: 398 ms
Not per-question latency

QUESTION + OPTIONS

exists x [P(x) AND NOT Q(x)] is equivalent to forall x [NOT P(x) implies Q(x)].

A. False

B. True

REFERENCE ANSWER

A. False

JEV / CORRECT

A. False

API confidence: 0.57
Option probabilities:
{ "A": 0.78, "B": 0.22 }

Section batch: 398 ms
Not per-question latency

QUESTION + OPTIONS

exists x [P(x) AND NOT Q(x)] is equivalent to NOT forall x [P(x) implies Q(x)].

A. True

B. False

REFERENCE ANSWER

A. True

JEV / CORRECT

A. True

API confidence: 0.98
Option probabilities:
{ "A": 0.99, "B": 0.01 }

Section batch: 398 ms
Not per-question latency

QUESTION + OPTIONS

Simplify (P AND Q) OR (P AND NOT Q).

- A. Q
- B. P OR Q
- C. False
- D. P

REFERENCE ANSWER

D. P

JEV / CORRECT

D. P

API confidence: 1.00
Option probabilities:
{ "D": 1.0, "C": 0.0, "A": 0.0, "B": 0.0 }

Section batch: 398 ms
Not per-question latency

QUESTION + OPTIONS

Simplify $P \text{ AND } (P \text{ implies } Q)$.

- A. $P \text{ AND } Q$
- B. Q
- C. $P \text{ OR } Q$
- D. P

REFERENCE ANSWER

A. $P \text{ AND } Q$

JEV / CORRECT

A. $P \text{ AND } Q$

API confidence: 0.97
Option probabilities:
{ $"D"$: 0.02, $"C"$: 0.0, $"A"$: 0.97, $"B"$: 0.01}

Section batch: 398 ms
Not per-question latency

QUESTION + OPTIONS

Which proof technique uses $[P(1) \text{ AND } \dots \text{ AND } P(k)]$ implies $P(k+1)$?

- A. Contraposition
- B. Strong induction
- C. Proof by cases
- D. Diagonalization

REFERENCE ANSWER

B. Strong induction

JEV / CORRECT

B. Strong induction

API confidence: 1.00
Option probabilities:
{`"B": 1.0, "C": 0.0, "D": 0.0, "A": 0.0`}

Section batch: 351 ms
Not per-question latency

QUESTION + OPTIONS

Real x,y have $(x+y)/2=a$. Prove $x\leq a$ or $y\leq a$.

- A. If both $x>a$ and $y>a$, their average would exceed a , a contradiction.
- B. The average is always less than each input.
- C. Since the average is a , both x and y must equal a .
- D. Assume $x\leq a$; this assumption proves the desired statement for every x,y .

REFERENCE ANSWER

A. If both $x>a$ and $y>a$, their average would exceed a , a contradiction.

JEV / CORRECT

A. If both $x>a$ and $y>a$, their average would exceed a , a contradiction.

API confidence: 1.00
Option probabilities:
{`"B": 0.0, "C": 0.0, "D": 0.0, "A": 1.0`}

Section batch: 351 ms
Not per-question latency

QUESTION + OPTIONS

Every graph with maximum degree at most two is planar.

A. False

B. True

REFERENCE ANSWER

B. True

JEV / CORRECT

B. True

API confidence: 0.93
Option probabilities:
{ "B": 0.97, "A": 0.03 }

Section batch: 302 ms
Not per-question latency

QUESTION + OPTIONS

A graph containing a vertex of degree six cannot be planar.

A. True

B. False

REFERENCE ANSWER

B. False

JEV / CORRECT

B. False

API confidence: 0.97
Option probabilities:
{**"B"**: 0.98, "A": 0.02}

Section batch: 302 ms
Not per-question latency

QUESTION + OPTIONS

A simple cycle on n vertices is bipartite iff n is odd.

A. False

B. True

REFERENCE ANSWER

A. False

JEV / CORRECT

A. False

API confidence: 0.98
Option probabilities:
{`"B"`: 0.01, `"A"`: 0.99}

Section batch: 302 ms
Not per-question latency

QUESTION + OPTIONS

Minimum vertex colors for a d-dimensional hypercube, $d \geq 1$?

- A. $d+1$
- B. 2
- C. d
- D. 2^d

REFERENCE ANSWER

B. 2

Pre-run repair:
Require positive dimension to exclude a single vertex.

JEV / CORRECT

B. 2

API confidence: 0.99
Option probabilities:
{**"B"**: 1.0, "C": 0.0, "D": 0.0, "A": 0.0}

Section batch: 302 ms
Not per-question latency

QUESTION + OPTIONS

A connected simple planar graph with at least two edges has no triangles. Give and justify an edge bound in terms of n vertices.

- A. $e \leq 2n - 4$: every face has at least four edge-sides, so $4f \leq 2e$; combine with $n - e + f = 2$.
- B. $e \leq 2n$: Euler’s formula is $n + e = f + 2$.
- C. $e \leq n - 1$: no triangles means there are no cycles.
- D. $e \leq 3n - 6$ and this is tight even without triangles; every face remains triangular.

REFERENCE ANSWER

A. $e \leq 2n - 4$: every face has at least four edge-sides, so $4f \leq 2e$; combine with $n - e + f = 2$.

JEV / CORRECT

A. $e \leq 2n - 4$: every face has at least four edge-sides, so $4f \leq 2e$; combine with $n - e + f = 2$.

API confidence: 1.00
Option probabilities:
{ "B": 0.0, "C": 0.0, "D": 0.0, "A": 1.0 }

Section batch: 302 ms
Not per-question latency

QUESTION + OPTIONS

- Prove the four-dimensional hypercube is nonplanar.
- A. It has degree four at every vertex, and any such graph is nonplanar.
 - B. It has an odd cycle, which all planar graphs forbid.
 - C. It has 16 vertices, exceeding the maximum number permitted in a planar graph.
 - D. It has 16 vertices and 32 edges and is bipartite; a triangle-free planar graph on 16 vertices has at most 28 edges.

REFERENCE ANSWER

D. It has 16 vertices and 32 edges and is bipartite; a triangle-free planar graph on 16 vertices has at most 28 edges.

JEV / CORRECT

D. It has 16 vertices and 32 edges and is bipartite; a triangle-free planar graph on 16 vertices has at most 28 edges.

API confidence: 1.00
Option probabilities:
{"B": 0.0, "C": 0.0, "D": 1.0, "A": 0.0}

Section batch: 302 ms
Not per-question latency

QUESTION + OPTIONS

If all candidates rank the same job last, job-proposing deferred acceptance cannot finish in one day.

A. True

B. False

REFERENCE ANSWER

B. False

JEV / CORRECT

B. False

API confidence: 0.72
Option probabilities:
{ "A": 0.14, "B": 0.86 }

Section batch: 299 ms
Not per-question latency

QUESTION + OPTIONS

If all jobs have the same strict ranking of candidates, the stable matching is unique.

A. True

B. False

REFERENCE ANSWER

A. True

JEV / CORRECT

A. True

API confidence: 0.85
Option probabilities:
{ "A": 0.93, "B": 0.07 }

Section batch: 299 ms
Not per-question latency

QUESTION + OPTIONS

It is impossible for every candidate to get its favorite job in a job-optimal stable matching.

A. False

B. True

REFERENCE ANSWER

A. False

JEV / CORRECT

A. False

API confidence: 0.30
Option probabilities:
{ "A": 0.65, "B": 0.35 }

Section batch: 299 ms
Not per-question latency

QUESTION + OPTIONS

A job and candidate who rank each other first are paired in every stable matching.

A. False

B. True

REFERENCE ANSWER

B. True

JEV / CORRECT

B. True

API confidence: 0.88
Option probabilities:
{ "A": 0.06, "B": 0.94 }

Section batch: 299 ms
Not per-question latency

QUESTION + OPTIONS

There exists integer x with $x \equiv 1 \pmod{10}$ and $x \equiv 2 \pmod{15}$.

A. True

B. False

REFERENCE ANSWER

B. False

JEV / INCORRECT

A. True

API confidence: 0.22
Option probabilities:
{ "A": 0.61, "B": 0.39 }

Section batch: 391 ms
Not per-question latency

QUESTION + OPTIONS

- Why are $x \equiv 1 \pmod{10}$ and $x \equiv 2 \pmod{15}$ inconsistent?
- A. Their product is even, which prevents integer solutions.
 - B. Neither 10 nor 15 is prime, so no system using them has a solution.
 - C. The residues 1 and 2 must be identical as integers in any CRT system.
 - D. Reducing both modulo 5 requires $x \equiv 1$ and $x \equiv 2 \pmod{5}$ simultaneously.

REFERENCE ANSWER

D. Reducing both modulo 5 requires $x \equiv 1$ and $x \equiv 2 \pmod{5}$ simultaneously.

JEV / CORRECT

D. Reducing both modulo 5 requires $x \equiv 1$ and $x \equiv 2 \pmod{5}$ simultaneously.

API confidence: 1.00
Option probabilities:
{`"C"`: 0.0, `"A"`: 0.0, `"B"`: 0.0, `"D"`: 1.0}

Section batch: 391 ms
Not per-question latency

QUESTION + OPTIONS

There exists integer x with $x \equiv 6 \pmod{10}$ and $x \equiv 1 \pmod{15}$.

A. False

B. True

REFERENCE ANSWER

B. True

JEV / INCORRECT

A. False

API confidence: 0.19
Option probabilities:
{ "A": 0.6, "B": 0.4 }

Section batch: 391 ms
Not per-question latency

QUESTION + OPTIONS

Give a witness satisfying $x \equiv 6 \pmod{10}$ and $x \equiv 1 \pmod{15}$.

- A. 31
- B. 16
- C. 46+1
- D. 6

REFERENCE ANSWER

B. 16

JEV / INCORRECT

A. 31

API confidence: 0.54
Option probabilities:
{"D": 0.01, "A": 0.66, "B": 0.29, "C": 0.04}

Section batch: 391 ms
Not per-question latency

QUESTION + OPTIONS

Prove $x^2 \equiv (m-x)^2$ modulo positive m .

- A. The equality holds as integers for all x .
- B. Both squares always have residue one.
- C. Their difference is $m^2 - 2mx = m(m - 2x)$, a multiple of m .
- D. Squaring changes every residue to zero.

REFERENCE ANSWER

C. Their difference is $m^2 - 2mx = m(m - 2x)$, a multiple of m .

JEV / CORRECT

C. Their difference is $m^2 - 2mx = m(m - 2x)$, a multiple of m .

API confidence: 1.00
Option probabilities:
{ "C": 1.0, "A": 0.0, "B": 0.0, "D": 0.0 }

Section batch: 391 ms
Not per-question latency

QUESTION + OPTIONS

- For positive even n , prove $\sum_{k=1..n} (-1)^k k^2$ is divisible by $n+1$.
- A. There are an even number of terms, so every such sum is divisible by $n+1$.
 - B. Pair adjacent terms, whose differences are all exactly $n+1$.
 - C. Every individual squared term is divisible by $n+1$.
 - D. Pair k with $n+1-k$. Their squares agree modulo $n+1$ and their signs are opposite since n is even, so every pair cancels.

REFERENCE ANSWER

D. Pair k with $n+1-k$. Their squares agree modulo $n+1$ and their signs are opposite since n is even, so every pair cancels.

JEV / CORRECT

D. Pair k with $n+1-k$. Their squares agree modulo $n+1$ and their signs are opposite since n is even, so every pair cancels.

API confidence: 0.95
Option probabilities:
{ "C": 0.0, "A": 0.01, "D": 0.96, "B": 0.03 }

Section batch: 391 ms
Not per-question latency

QUESTION + OPTIONS

Over $\text{GF}(5)$, how many formal polynomials of degree at most 3 pass through one specified point?

- A. 25
- B. 625
- C. 125
- D. 100

REFERENCE ANSWER

C. 125

Pre-run repair:
Resolve source degree ambiguity as at most three; original grading accepted both strict and non-strict interpretations.

JEV / CORRECT

C. 125

API confidence: 0.78
Option probabilities:
{`"D"`: 0.03, `"A"`: 0.03, `"B"`: 0.1, `"C"`: 0.84}

Section batch: 340 ms
Not per-question latency

QUESTION + OPTIONS

A Shamir polynomial of degree at most two over GF(5) gives shares (1,3),(2,4),(4,2). Secret is P(0).

Find the secret.

- A. 1
- B. 4
- C. 2
- D. 3

REFERENCE ANSWER

B. 4

JEV / INCORRECT

A. 1

API confidence: 0.13
Option probabilities:
{ "D": 0.27, "A": 0.33999999999999997, "B": 0.24, "C": 0.15 }

Section batch: 340 ms
Not per-question latency

QUESTION + OPTIONS

A Shamir polynomial of degree at most two over GF(5) gives shares (1,3),(2,4),(4,2). Secret is P(0).

What value belongs in a share at x=3?

- A. 1
- B. 2
- C. 4
- D. 3

REFERENCE ANSWER

B. 2

JEV / INCORRECT

A. 1

API confidence: 0.26
Option probabilities:
{ "D": 0.27, "A": 0.44, "B": 0.12, "C": 0.17 }

Section batch: 340 ms
Not per-question latency

QUESTION + OPTIONS

Eight Reed-Solomon evaluations are transmitted over GF(11), correcting up to two corrupted values. Maximum message length in field symbols?

- A. 6
- B. 2
- C. 4
- D. 8

REFERENCE ANSWER

C. 4

Pre-run repair:
Ask maximum length; shorter messages also meet the stated guarantee.

JEV / CORRECT

C. 4

API confidence: 0.62
Option probabilities:
{"D": 0.0, "A": 0.27, "B": 0.01, "C": 0.72}

Section batch: 340 ms
Not per-question latency

QUESTION + OPTIONS

Minimal error locator is $E(x)=x^2-6x+8$ over $GF(11)$. Which evaluation coordinates are corrupted?

- A. 6 and 8
- B. 1 and 8
- C. 2 and 4
- D. 3 and 5

REFERENCE ANSWER

C. 2 and 4

Pre-run repair:
Specify minimal locator to exclude padding roots.

JEV / CORRECT

C. 2 and 4

API confidence: 0.96
Option probabilities:
{`"D"`: 0.01, `"A"`: 0.01, `"B"`: 0.01, `"C"`: 0.97}

Section batch: 340 ms
Not per-question latency

QUESTION + OPTIONS

Ten rounds give +30 for a win, -30 for a loss, starting at zero. Number of ordered outcomes ending at +60?

- A. C(10,4)
- B. 2^10
- C. C(10,2)
- D. C(10,5)

REFERENCE ANSWER

A. C(10,4)

JEV / CORRECT

A. C(10,4)

API confidence: 0.32
Option probabilities:
{ "C": 0.32, "B": 0.01, "A": 0.49, "D": 0.18 }

Section batch: 288 ms
Not per-question latency

QUESTION + OPTIONS

Ten-digit IDs allow 0..9 in every position, with no equal adjacent digits. Count?

A. $9 \cdot 10^9$

B. $10 \cdot 9^9$

C. 10^{10}

D. $10!$

REFERENCE ANSWER

B. $10 \cdot 9^9$

JEV / CORRECT

B. $10 \cdot 9^9$

API confidence: 0.99
Option probabilities:
{**"C"**: 0.0, **"B"**: 0.99, **"A"**: 0.01, **"D"**: 0.0}

Section batch: 288 ms
Not per-question latency

QUESTION + OPTIONS

Distribute eight integer points into three named stats; first nonnegative, others strictly positive. Count?

- A. 3^8
- B. $C(8,2)$
- C. $C(7,2)$
- D. $C(10,2)$

REFERENCE ANSWER

B. $C(8,2)$

JEV / INCORRECT

D. $C(10,2)$

API confidence: 0.54
Option probabilities:
{**"C"**: 0.18, "B": 0.05, "A": 0.11, "D": 0.66}

Section batch: 288 ms
Not per-question latency

QUESTION + OPTIONS

Choose distinct captain and lieutenant from eleven people. Count?

- A. 121
- B. 110
- C. 55
- D. 22

REFERENCE ANSWER

B. 110

JEV / CORRECT

B. 110

API confidence: 0.97
Option probabilities:
{ "C": 0.0, "B": 0.98, "A": 0.02, "D": 0.0 }

Section batch: 288 ms
Not per-question latency

QUESTION + OPTIONS

Seven distinct collectible items; choose a subset with at least two. Count?

- A. 120
- B. 21
- C. 127
- D. 128

REFERENCE ANSWER

A. 120

JEV / INCORRECT

C. 127

API confidence: 0.99
Option probabilities:
{ "C": 1.0, "B": 0.0, "A": 0.0, "D": 0.0 }

Section batch: 288 ms
Not per-question latency

QUESTION + OPTIONS

Two islands each have n named checkpoints, $n \geq 2$. Travel only between islands. Starting at one fixed checkpoint, count directed tours visiting every checkpoint exactly once before returning.

- A. $n!(n-1)!/2$
- B. $n!(n-1)!$
- C. $(2n-1)!$
- D. $(n!)^2$

REFERENCE ANSWER

B. $n!(n-1)!$

Pre-run repair:
Fix the starting checkpoint and distinguish reverse traversal, matching the source’s intended count.

JEV / CORRECT

B. $n!(n-1)!$

API confidence: 0.57
Option probabilities:
{ "C": 0.02, "B": 0.68, "A": 0.17, "D": 0.13 }

Section batch: 288 ms
Not per-question latency

QUESTION + OPTIONS

Number of functions from an n -element set to itself that are not bijections?

- A. $n^n - n!$
- B. $n^n - n$
- C. $n! - n$
- D. $2^n - n!$

REFERENCE ANSWER

A. $n^n - n!$

JEV / CORRECT

A. $n^n - n!$

API confidence: 1.00
Option probabilities:
{`"D"`: 0.0, `"C"`: 0.0, `"A"`: 1.0, `"B"`: 0.0}

Section batch: 288 ms
Not per-question latency

QUESTION + OPTIONS

Functions $N \rightarrow \{\text{True}, \text{False}\}$ form a countable set.

A. True

B. False

REFERENCE ANSWER

B. False

JEV / CORRECT

B. False

API confidence: 0.92
Option probabilities:
{`"B"`: 0.96, `"A"`: 0.04}

Section batch: 396 ms
Not per-question latency

QUESTION + OPTIONS

Finite binary strings form a countable set.

A. False

B. True

REFERENCE ANSWER

B. True

JEV / CORRECT

B. True

API confidence: 0.98
Option probabilities:
{ "B": 0.99, "A": 0.01 }

Section batch: 396 ms
Not per-question latency

QUESTION + OPTIONS

It is impossible to write a halting analyzer that correctly handles even some programs.

A. False

B. True

REFERENCE ANSWER

A. False

JEV / CORRECT

A. False

API confidence: 0.63
Option probabilities:
{ "B": 0.19, "A": 0.81 }

Section batch: 396 ms
Not per-question latency

QUESTION + OPTIONS

No always-terminating analyzer can correctly decide for all programs whether they ever print a particular fixed string.

A. False

B. True

REFERENCE ANSWER

B. True

JEV / CORRECT

B. True

API confidence: 0.95
Option probabilities:
{ "B": 0.97, "A": 0.03 }

Section batch: 396 ms
Not per-question latency

QUESTION + OPTIONS

It is impossible to decide for arbitrary program P and finite N whether P hits a runtime error within its first N execution steps.

A. True

B. False

REFERENCE ANSWER

B. False

JEV / CORRECT

B. False

API confidence: 0.67
Option probabilities:
{"B": 0.83, "A": 0.17}

Section batch: 396 ms
Not per-question latency

QUESTION + OPTIONS

Why can no total analyzer decide whether an arbitrary Python program ever assigns a string to a given variable? Assume unbounded theoretical computation.

A. A variable has no value before assignment, so no analyzer can read any program.

B. Finite programs contain uncountably many variable names.

C. Python never exposes variable types, even during execution.

D. Given P,input x, construct a program with a fresh variable initially 0, simulate P(x), then assign a string to that variable if simulation halts. The analyzer would decide halting.

REFERENCE ANSWER

D. Given P,input x, construct a program with a fresh variable initially 0, simulate P(x), then assign a string to that variable if simulation halts. The analyzer would decide halting.

JEV / CORRECT

D. Given P,input x, construct a program with a fresh variable initially 0, simulate P(x), then assign a string to that variable if simulation halts. The analyzer would decide halting.

API confidence: 1.00
Option probabilities:
{ "C": 0.0, "B": 0.0, "A": 0.0, "D": 1.0 }

Section batch: 396 ms
Not per-question latency

QUESTION + OPTIONS

A five-sided die has $P(1)=1/2$; values 2,3,4,5 share the remaining probability equally. A is an odd result; B is a perfect-square result.

$P(A)$?

A. $1/2$

B. $3/5$

C. $5/8$

D. $3/4$

REFERENCE ANSWER

D. $3/4$

JEV / INCORRECT

C. $5/8$

API confidence: 0.74
Option probabilities:
{**"A"**: 0.02, **"C"**: 0.8, "B": 0.06, "D": 0.12}

Section batch: 352 ms
Not per-question latency

QUESTION + OPTIONS

A five-sided die has $P(1)=1/2$; values 2,3,4,5 share the remaining probability equally. A is an odd result; B is a perfect-square result.

P(NOT B)?

A. $2/5$

B. $1/2$

C. $5/8$

D. $3/8$

REFERENCE ANSWER

D. $3/8$

JEV / INCORRECT

C. $5/8$

API confidence: 0.76
Option probabilities:
{ "A": 0.04, "C": 0.82, "B": 0.05, "D": 0.09 }

Section batch: 352 ms
Not per-question latency

QUESTION + OPTIONS

A five-sided die has $P(1)=1/2$; values 2,3,4,5 share the remaining probability equally. A is an odd result; B is a perfect-square result.

$P(A \text{ union } B)$?

A. $3/4$

B. 1

C. $5/8$

D. $7/8$

REFERENCE ANSWER

D. $7/8$

JEV / CORRECT

D. $7/8$

API confidence: 0.31
Option probabilities:
{ "A": 0.3, "C": 0.1, "B": 0.12, "D": 0.48 }

Section batch: 352 ms
Not per-question latency

QUESTION + OPTIONS

A five-sided die has $P(1)=1/2$; values 2,3,4,5 share the remaining probability equally. A is an odd result; B is a perfect-square result.

$P(A \text{ given } B)$?

A. $4/5$

B. $3/4$

C. $1/2$

D. $5/8$

REFERENCE ANSWER

A. $4/5$

JEV / INCORRECT

B. $3/4$

API confidence: 0.12
Option probabilities:
{ "A": 0.29, "C": 0.28, "B": 0.33, "D": 0.1 }

Section batch: 352 ms
Not per-question latency

QUESTION + OPTIONS

A five-sided die has $P(1)=1/2$; values 2,3,4,5 share the remaining probability equally. A is an odd result; B is a perfect-square result.

$P(A \text{ intersection } B \text{ given } A \text{ union } B)$?

A. $4/7$

B. $4/5$

C. $1/2$

D. $7/8$

REFERENCE ANSWER

A. $4/7$

JEV / CORRECT

A. $4/7$

API confidence: 0.51
Option probabilities:
{ "A": 0.63, "C": 0.13, "B": 0.21, "D": 0.03 }

Section batch: 352 ms
Not per-question latency

QUESTION + OPTIONS

A five-sided die has $P(1)=1/2$; values 2,3,4,5 share the remaining probability equally. A is an odd result; B is a perfect-square result.

$P(A \text{ intersection NOT } B \text{ given } B)$?

- A. 0
- B. $3/8$
- C. 1
- D. $4/5$

REFERENCE ANSWER

A. 0

JEV / CORRECT

A. 0

API confidence: 0.92
Option probabilities:
{ "A": 0.95, "C": 0.01, "B": 0.02, "D": 0.02 }

Section batch: 352 ms
Not per-question latency

QUESTION + OPTIONS

A five-sided die has $P(1)=1/2$; values 2,3,4,5 share the remaining probability equally. A is an odd result; B is a perfect-square result.

Now vary $P(1)=p<1$ and keep the other four outcomes equally likely. Which p makes A and B independent?

- A. 1/5
- B. 1/2
- C. 1/3
- D. 0

REFERENCE ANSWER

C. 1/3

JEV / INCORRECT

B. 1/2

API confidence: 0.10
Option probabilities:
{ "A": 0.31, "C": 0.3, "B": 0.33, "D": 0.06 }

Section batch: 352 ms
Not per-question latency

QUESTION + OPTIONS

A detector flags plagiarized submissions with probability p_1 and original submissions with probability p_2 . Class CS1 has 10% plagiarized submissions; CS100 has 2%.

Must $p_1 + p_2$ equal one?

- A. No, it cannot.
- B. Yes, always.
- C. Depends; it can but need not.

REFERENCE ANSWER

C. Depends; it can but need not.

JEV / CORRECT

C. Depends; it can but need not.

API confidence: 0.38
Option probabilities:
{`"B": 0.01, "A": 0.4, "C": 0.59`}

Section batch: 298 ms
Not per-question latency

QUESTION + OPTIONS

A detector flags plagiarized submissions with probability p_1 and original submissions with probability p_2 . Class CS1 has 10% plagiarized submissions; CS100 has 2%.

$p_1=0.8, p_2=0.2$. Given a CS1 submission was flagged, probability it was plagiarized?

- A. 4/5
- B. 4/13
- C. 1/4
- D. 1/10

REFERENCE ANSWER

B. 4/13

JEV / CORRECT

B. 4/13

API confidence: 0.70
Option probabilities:
{ "B": 0.78, "D": 0.0, "C": 0.01, "A": 0.21 }

Section batch: 298 ms
Not per-question latency

QUESTION + OPTIONS

A detector flags plagiarized submissions with probability p_1 and original submissions with probability p_2 . Class CS1 has 10% plagiarized submissions; CS100 has 2%.

$p_1=0.8, p_2=0.2$. Given a CS100 submission was flagged, probability it was plagiarized?

- A. 4/13
- B. 4/5
- C. 1/50
- D. 4/53

REFERENCE ANSWER

D. 4/53

JEV / INCORRECT

A. 4/13

API confidence: 0.47
Option probabilities:
{ "B": 0.04, "D": 0.34, "C": 0.01, "A": 0.61 }

Section batch: 298 ms
Not per-question latency

QUESTION + OPTIONS

A detector flags plagiarized submissions with probability p_1 and original submissions with probability p_2 . Class CS1 has 10% plagiarized submissions; CS100 has 2%.

Choose either class with equal probability, then a uniform submission within it. An auditor establishes plagiarism without the detector. Given plagiarism, probability the class was CS1?

- A. $1/10$
- B. $1/2$
- C. $5/6$
- D. $4/13$

REFERENCE ANSWER

C. $5/6$

JEV / CORRECT

C. $5/6$

API confidence: 0.59
Option probabilities:
{`"B": 0.11, "D": 0.18, "C": 0.69, "A": 0.02`}

Section batch: 298 ms
Not per-question latency

QUESTION + OPTIONS

There are $n \geq 2$ states, each with two distinct senators; all $2n$ senators are uniformly assigned seats around a round table.

Probability the two California senators sit adjacent?

- A. $2/(2n)$
- B. $2/(2n-1)$
- C. $1/(2n-1)$
- D. $1/n$

REFERENCE ANSWER

B. $2/(2n-1)$

JEV / CORRECT

B. $2/(2n-1)$

API confidence: 0.46
Option probabilities:
{ "C": 0.38, "B": 0.6, "A": 0.01, "D": 0.01 }

Section batch: 396 ms
Not per-question latency

QUESTION + OPTIONS

There are $n \geq 2$ states, each with two distinct senators; all $2n$ senators are uniformly assigned seats around a round table.

Probability the California pair is adjacent given the New Mexico pair is adjacent?

A. $2/(2n-1)$

B. $2/(2n-2)$

C. $1/(2n-2)$

D. $4/((2n-1)(2n-2))$

REFERENCE ANSWER

B. $2/(2n-2)$

JEV / INCORRECT

A. $2/(2n-1)$

API confidence: 0.25
Option probabilities:
{ "C": 0.17, "A": 0.43, "B": 0.33, "D": 0.07 }

Section batch: 396 ms
Not per-question latency

QUESTION + OPTIONS

There are $n \geq 2$ states, each with two distinct senators; all $2n$ senators are uniformly assigned seats around a round table.

One California senator is happy if adjacent to either of two specified other senators. Probability of happiness?

- A. $4/(2n-1)-2/((2n-1)(2n-2))$
- B. $2/(2n-1)$
- C. $4/(2n-1)-4/((2n-1)(2n-2))$
- D. $4/(2n-1)$

REFERENCE ANSWER

A. $4/(2n-1)-2/((2n-1)(2n-2))$

JEV / INCORRECT

C. $4/(2n-1)-4/((2n-1)(2n-2))$

API confidence: 0.40
Option probabilities:
{ "C": 0.55, "B": 0.01, "A": 0.36, "D": 0.08 }

Section batch: 396 ms
Not per-question latency

QUESTION + OPTIONS

There are $n \geq 2$ states, each with two distinct senators; all $2n$ senators are uniformly assigned seats around a round table.

N_i means senator i is adjacent to their state partner. $P(N_i)$?

- A. $1/(2n-1)$
- B. $2/(2n-2)$
- C. $1/n$
- D. $2/(2n-1)$

REFERENCE ANSWER

D. $2/(2n-1)$

JEV / CORRECT

D. $2/(2n-1)$

API confidence: 0.70
Option probabilities:
{ "C": 0.01, "A": 0.21, "B": 0.01, "D": 0.77 }

Section batch: 396 ms
Not per-question latency

QUESTION + OPTIONS

There are $n \geq 2$ states, each with two distinct senators; all $2n$ senators are uniformly assigned seats around a round table.

Are the events N_i pairwise independent over all senators?

A. Yes

B. No

REFERENCE ANSWER

B. No

JEV / CORRECT

B. No

API confidence: 0.63
Option probabilities:
{ "A": 0.18, "B": 0.82 }

Section batch: 396 ms
Not per-question latency

QUESTION + OPTIONS

There are $n \geq 2$ states, each with two distinct senators; all $2n$ senators are uniformly assigned seats around a round table.

Why are the N_i not pairwise independent?

- A. Every N_i has probability one.
- B. For the two senators of one state, their events are identical with probability strictly between zero and one; conditioning on one makes the other certain.
- C. Events on a finite sample space can never be independent.
- D. All adjacency events are mutually exclusive.

REFERENCE ANSWER

B. For the two senators of one state, their events are identical with probability strictly between zero and one; conditioning on one makes the other certain.

JEV / CORRECT

B. For the two senators of one state, their events are identical with probability strictly between zero and one; conditioning on one makes the other certain.

API confidence: 0.99
Option probabilities:
{ "C": 0.0, "A": 0.0, "B": 0.99, "D": 0.01 }

Section batch: 396 ms
Not per-question latency

QUESTION + OPTIONS

There are $n \geq 2$ states, each with two distinct senators; all $2n$ senators are uniformly assigned seats around a round table.

Expected number of senators adjacent to their state partner?

A. $4n/(2n-2)$

B. $4n/(2n-1)$

C. 2

D. $2n/(2n-1)$

REFERENCE ANSWER

B. $4n/(2n-1)$

JEV / INCORRECT

D. $2n/(2n-1)$

API confidence: 0.37
Option probabilities:
{ "C": 0.05, "A": 0.03, "B": 0.39, "D": 0.53 }

Section batch: 396 ms
Not per-question latency

QUESTION + OPTIONS

Pairwise independent X_i have finite second moments. An attempted induction sets $Y = X_1 + \dots + X_{(n-1)}$, then applies a lemma requiring independent Y and X_n to add their variances. What is wrong?

- A. Pairwise independence of the X_i does not ensure independence of Y and X_n .
- B. Variance never distributes over independent sums.
- C. The sum Y is not a random variable.
- D. Pairwise independence forbids defining a sum.

REFERENCE ANSWER

A. Pairwise independence of the X_i does not ensure independence of Y and X_n .

JEV / CORRECT

A. Pairwise independence of the X_i does not ensure independence of Y and X_n .

API confidence: 1.00
Option probabilities:
{ "A": 1.0, "C": 0.0, "B": 0.0, "D": 0.0 }

Section batch: 348 ms
Not per-question latency

QUESTION + OPTIONS

Prove variance of a sum of pairwise independent finite-variance variables equals the sum of variances.

- A. Pairwise independence implies mutual independence, so group arbitrary sums and use independence recursively.
- B. Expand $\text{Var}(\sum X_i) = \sum \text{Var}(X_i) + 2\sum_{i < j} \text{Cov}(X_i, X_j)$; pairwise independence makes each cross covariance zero.
- C. Linearity of expectation directly implies linearity of every nonlinear statistic.
- D. Every pairwise independent variable has mean zero, so all cross terms vanish.

REFERENCE ANSWER

B. Expand $\text{Var}(\sum X_i) = \sum \text{Var}(X_i) + 2\sum_{i < j} \text{Cov}(X_i, X_j)$; pairwise independence makes each cross covariance zero.

JEV / CORRECT

B. Expand $\text{Var}(\sum X_i) = \sum \text{Var}(X_i) + 2\sum_{i < j} \text{Cov}(X_i, X_j)$; pairwise independence makes each cross covariance zero.

API confidence: 1.00
Option probabilities:
{ "A": 0.0, "C": 0.0, "B": 1.0, "D": 0.0 }

Section batch: 348 ms
Not per-question latency

QUESTION + OPTIONS

Choose uniformly from $S=\{(x,y) \text{ in } \mathbb{Z}^2: |x|+|y|=3\}$, the twelve integer points on the perimeter of the diamond with vertices $(0,3),(3,0),(0,-3),(-3,0)$.

Give $(E[X],E[Y],\text{Var}(Y),\text{Cov}(X,Y))$.

- A. $(0,0,19/6,-19/6)$
- B. $(0,0,19/6,0)$
- C. $(0,0,3,0)$
- D. $(3/2,3/2,5/4,0)$

REFERENCE ANSWER

B. $(0,0,19/6,0)$

JEV / CORRECT

B. $(0,0,19/6,0)$

API confidence: 0.45
Option probabilities:
{"D": 0.0, "C": 0.03, "B": 0.59, "A": 0.38}

Section batch: 329 ms
Not per-question latency

QUESTION + OPTIONS

Choose uniformly from $S=\{(x,y) \text{ in } \mathbb{Z}^2: |x|+|y|=3\}$, the twelve integer points on the perimeter of the diamond with vertices $(0,3),(3,0),(0,-3),(-3,0)$.

Are X and Y independent?

A. Yes

B. No

REFERENCE ANSWER

B. No

JEV / CORRECT

B. No

API confidence: 0.99
Option probabilities:
{**"B"**: 1.0, "A": 0.0}

Section batch: 329 ms
Not per-question latency

QUESTION + OPTIONS

Choose uniformly from $S=\{(x,y) \text{ in } \mathbb{Z}^2: |x|+|y|=3\}$, the twelve integer points on the perimeter of the diamond with vertices $(0,3),(3,0),(0,-3),(-3,0)$.

Give a precise reason X,Y are not independent.

- A. Covariance is zero, which always means dependence.
- B. $P(X=0,Y=2)=0$, but $P(X=0)=P(Y=2)=1/6$, so the product is $1/36$.
- C. All finite-valued random variables are dependent.
- D. Both means are zero, which forbids independence.

REFERENCE ANSWER

B. $P(X=0,Y=2)=0$, but $P(X=0)=P(Y=2)=1/6$, so the product is $1/36$.

JEV / CORRECT

B. $P(X=0,Y=2)=0$, but $P(X=0)=P(Y=2)=1/6$, so the product is $1/36$.

API confidence: 1.00
Option probabilities:
{ "D": 0.0, "C": 0.0, "B": 1.0, "A": 0.0 }

Section batch: 329 ms
Not per-question latency

QUESTION + OPTIONS

Choose uniformly from $S=\{(x,y) \text{ in } \mathbb{Z}^2: |x|+|y|=3\}$, the twelve integer points on the perimeter of the diamond with vertices $(0,3),(3,0),(0,-3),(-3,0)$.

Instead choose uniformly from the seven points in S with $y \geq 0$. Give $(E[X],E[Y],\text{Var}(Y),\text{Cov}(X,Y))$.

A. $(9/7,9/7,52/49,-52/49)$

B. $(0,9/7,19/7,0)$

C. $(0,3/2,5/4,0)$

D. $(0,9/7,52/49,0)$

REFERENCE ANSWER

D. $(0,9/7,52/49,0)$

JEV / CORRECT

D. $(0,9/7,52/49,0)$

API confidence: 0.79
Option probabilities:
 $\{ \text{"D": 0.85, "C": 0.01, "B": 0.12, "A": 0.02} \}$

Section batch: 329 ms
Not per-question latency

QUESTION + OPTIONS

Choose uniformly from $S=\{(x,y) \text{ in } \mathbb{Z}^2: |x|+|y|=3\}$, the twelve integer points on the perimeter of the diamond with vertices $(0,3),(3,0),(0,-3),(-3,0)$.

Instead choose uniformly from the four points in S with $x,y \geq 0$. Give $(E[X],E[Y],\text{Var}(Y),\text{Cov}(X,Y))$.

- A. $(1,1,2,-2)$
- B. $(3/2,3/2,5/4,-5/4)$
- C. $(3/2,3/2,5/4,0)$
- D. $(3/2,3/2,5/4,5/4)$

REFERENCE ANSWER

B. $(3/2,3/2,5/4,-5/4)$

JEV / CORRECT

B. $(3/2,3/2,5/4,-5/4)$

API confidence: 0.96
Option probabilities:
 $\{ \text{"D": 0.01, "C": 0.01, "B": 0.97, "A": 0.01} \}$

Section batch: 329 ms
Not per-question latency

QUESTION + OPTIONS

Independent $X \sim \text{Bin}(n, p), Y \sim \text{Bin}(m, p)$.

$P(X+Y=k)$?

- A. $C(n+m, k)p^k(1-p)^{(n+m-k)}$
- B. $C(n, k)C(m, k)p^{(2k)}(1-p)^{(n+m-2k)}$
- C. $C(n+m, k)p^{(n+m-k)}(1-p)^k$
- D. $p^k(1-p)^{(n+m-k)}$

REFERENCE ANSWER

A. $C(n+m, k)p^k(1-p)^{(n+m-k)}$

JEV / CORRECT

A. $C(n+m, k)p^k(1-p)^{(n+m-k)}$

API confidence: 1.00
Option probabilities:
{ "A": 1.0, "B": 0.0, "C": 0.0, "D": 0.0 }

Section batch: 380 ms
Not per-question latency

QUESTION + OPTIONS

Independent $X \sim \text{Bin}(n, p), Y \sim \text{Bin}(m, p)$.

Distribution of $X + Y$?

A. $\text{Bin}(n + m, p)$

B. $\text{Poisson}((n + m)p)$

C. $\text{Bin}(nm, p)$

D. $\text{Bin}(n + m, 2p)$

REFERENCE ANSWER

A. $\text{Bin}(n + m, p)$

JEV / CORRECT

A. $\text{Bin}(n + m, p)$

API confidence: 1.00
Option probabilities:
{ "A": 1.0, "B": 0.0, "C": 0.0, "D": 0.0 }

Section batch: 380 ms
Not per-question latency

QUESTION + OPTIONS

Independent $X \sim \text{Bin}(n,p), Y \sim \text{Bin}(m,p)$.

Explain the distribution of $X+Y$ without a probability formula.

- A. The sum of any two distributions in the same family stays in that family.
- B. Combine n and m independent Bernoulli trials with the same success probability p ; their total counts successes in $n+m$ such trials.
- C. Independent random variables always sum to a Poisson variable.
- D. Adding the trial counts also doubles the success probability.

REFERENCE ANSWER

B. Combine n and m independent Bernoulli trials with the same success probability p ; their total counts successes in $n+m$ such trials.

JEV / CORRECT

B. Combine n and m independent Bernoulli trials with the same success probability p ; their total counts successes in $n+m$ such trials.

API confidence: 1.00
Option probabilities:
{ "A": 0.0, "B": 1.0, "C": 0.0, "D": 0.0 }

Section batch: 380 ms
Not per-question latency

QUESTION + OPTIONS

X counts heads in 100 independent fair flips. Chebyshev bound for $P(X \leq 10 \text{ or } X \geq 90)$?

- A. 1/16
- B. 1/8
- C. 1/64
- D. 1/40

REFERENCE ANSWER

C. 1/64

JEV / INCORRECT

A. 1/16

API confidence: 0.29
Option probabilities:
{ "A": 0.47, "B": 0.13, "C": 0.32, "D": 0.08 }

Section batch: 380 ms
Not per-question latency

QUESTION + OPTIONS

For X counting heads in 100 independent fair flips, $P(X \leq 10) = P(X \geq 90)$.

A. True

B. False

REFERENCE ANSWER

A. True

JEV / CORRECT

A. True

API confidence: 0.94
Option probabilities:
{ "A": 0.97, "B": 0.03 }

Section batch: 380 ms
Not per-question latency

QUESTION + OPTIONS

X counts heads in 100 independent fair flips. Use a normal approximation without continuity correction for $P(X \leq 10 \text{ or } X \geq 90)$, with $Z \sim N(0, 1)$.

- A. $2P(Z \geq 4)$
- B. $2P(Z \geq 8)$
- C. $2P(Z \geq 40)$
- D. $P(Z \geq 8)$

REFERENCE ANSWER

B. $2P(Z \geq 8)$

Pre-run repair:
Explicitly request no continuity correction; this is a tail approximation, not an exact probability.

JEV / CORRECT

B. $2P(Z \geq 8)$

API confidence: 0.83
Option probabilities:
{ "A": 0.11, "B": 0.87, "C": 0.01, "D": 0.01 }

Section batch: 380 ms
Not per-question latency

QUESTION + OPTIONS

Pay \$8 to roll two independent fair six-sided dice. Receive their final sum. A reroll, if allowed, is independent and replaces that die; each die can be rerolled at most once. Net winnings subtract entry and reroll costs.

Expected net winnings with no rerolls?

- A. 7
- B. -1
- C. -2
- D. 1

REFERENCE ANSWER

B. -1

JEV / CORRECT

B. -1

API confidence: 0.64
Option probabilities:
{ "D": 0.12, "A": 0.02, "C": 0.13, "B": 0.73 }

Section batch: 333 ms
Not per-question latency

QUESTION + OPTIONS

Pay \$8 to roll two independent fair six-sided dice. Receive their final sum. A reroll, if allowed, is independent and replaces that die; each die can be rerolled at most once. Net winnings subtract entry and reroll costs.

Reroll each initial 1 for free. Expected net winnings?

- A. $-1/6$
- B. -1
- C. $1/6$
- D. $5/6$

REFERENCE ANSWER

A. $-1/6$

JEV / INCORRECT

C. $1/6$

API confidence: 0.19
Option probabilities:
{**"D"**: 0.29, "A": 0.21, "C": 0.4, "B": 0.1}

Section batch: 333 ms
Not per-question latency

QUESTION + OPTIONS

Pay \$8 to roll two independent fair six-sided dice. Receive their final sum. A reroll, if allowed, is independent and replaces that die; each die can be rerolled at most once. Net winnings subtract entry and reroll costs.

Choose integer threshold c in advance and reroll each die $\leq c$ for free. Give optimal c and expected net winnings.

- A. (2,1/3)
- B. (4,2/3)
- C. (3,3/2)
- D. (3,1/2)

REFERENCE ANSWER

D. (3,1/2)

JEV / CORRECT

D. (3,1/2)

API confidence: 0.12
Option probabilities:
{ "D": 0.34, "C": 0.33, "A": 0.1, "B": 0.23 }

Section batch: 333 ms
Not per-question latency

QUESTION + OPTIONS

Pay \$8 to roll two independent fair six-sided dice. Receive their final sum. A reroll, if allowed, is independent and replaces that die; each die can be rerolled at most once. Net winnings subtract entry and reroll costs.

Each reroll costs \$1. Give optimal integer threshold c and expected net winnings.

A. $(1, -1/6)$

B. $(3, -1/2)$

C. $(2, -1/3)$

D. $(2, 1/3)$

REFERENCE ANSWER

C. $(2, -1/3)$

JEV / CORRECT

C. $(2, -1/3)$

API confidence: 0.34
Option probabilities:
 $\{ \text{"D": 0.17, "C": 0.51, "A": 0.18, "B": 0.14} \}$

Section batch: 333 ms
Not per-question latency

QUESTION + OPTIONS

Pay \$8 to roll two independent fair six-sided dice. Receive their final sum. A reroll, if allowed, is independent and replaces that die; each die can be rerolled at most once. Net winnings subtract entry and reroll costs.

Smallest integer reroll fee d such that any reroll strictly decreases conditional expected net winnings?

- A. 4
- B. 2
- C. 3
- D. 6

REFERENCE ANSWER

C. 3

JEV / INCORRECT

B. 2

API confidence: 0.18
Option probabilities:
{"D": 0.08, "A": 0.24, "C": 0.29, "B": 0.39}

Section batch: 333 ms
Not per-question latency

QUESTION + OPTIONS

Independent $T1 \sim \text{Exp}(\text{rate } \lambda_1), T2 \sim \text{Exp}(\text{rate } \lambda_2)$, both rates positive.
 $R = \min(T1, T2)$.

PDF $f_R(x)$ for $x \geq 0$?

- A. $\exp(-(\lambda_1 + \lambda_2)x)$
- B. $\lambda_1 \lambda_2 \exp(-(\lambda_1 + \lambda_2)x)$
- C. $(\lambda_1 + \lambda_2) \exp(-(\lambda_1 + \lambda_2)x)$
- D. $\lambda_1 \exp(-\lambda_1 x) + \lambda_2 \exp(-\lambda_2 x)$

REFERENCE ANSWER

C. $(\lambda_1 + \lambda_2) \exp(-(\lambda_1 + \lambda_2)x)$

Pre-run repair:
State independence, required for the source formulas.

JEV / CORRECT

C. $(\lambda_1 + \lambda_2) \exp(-(\lambda_1 + \lambda_2)x)$

API confidence: 1.00
Option probabilities:
{"B": 0.0, "A": 0.0, "D": 0.0, "C": 1.0}

Section batch: 309 ms
Not per-question latency

QUESTION + OPTIONS

Independent $T1 \sim \text{Exp}(\text{rate } \lambda_1), T2 \sim \text{Exp}(\text{rate } \lambda_2)$, both rates positive.
 $R = \min(T1, T2)$.

$E[R]$?

- A. $1/(\lambda_1 + \lambda_2)$
- B. $1/\lambda_1 + 1/\lambda_2$
- C. $\min(1/\lambda_1, 1/\lambda_2)$
- D. $1/(\lambda_1 * \lambda_2)$

REFERENCE ANSWER

A. $1/(\lambda_1 + \lambda_2)$

JEV / CORRECT

A. $1/(\lambda_1 + \lambda_2)$

API confidence: 1.00
Option probabilities:
{ "B": 0.0, "A": 1.0, "D": 0.0, "C": 0.0 }

Section batch: 309 ms
Not per-question latency

QUESTION + OPTIONS

Independent $T_1 \sim \text{Exp}(\text{rate } \lambda_1), T_2 \sim \text{Exp}(\text{rate } \lambda_2)$, both rates positive.
 $R = \min(T_1, T_2)$.

Choose an integral for $P(T_1 \leq T_2)$.

A. $\int_{y=0}^{\infty} \int_{x=0}^y \lambda_1 \lambda_2 \exp(-\lambda_1 x - \lambda_2 y) \, dx \, dy$

B. $\int_{x=0}^{\infty} \exp(-(\lambda_1 + \lambda_2)x) \, dx$

C. $\int_{x=0}^{\infty} \lambda_1 \lambda_2 \exp(-(\lambda_1 + \lambda_2)x) \, dx$

D. $\int_{y=0}^{\infty} \int_{x=y}^{\infty} \lambda_1 \lambda_2 \exp(-\lambda_1 x - \lambda_2 y) \, dx \, dy$

REFERENCE ANSWER

A. $\int_{y=0}^{\infty} \int_{x=0}^y \lambda_1 \lambda_2 \exp(-\lambda_1 x - \lambda_2 y) \, dx \, dy$

JEV / CORRECT

A. $\int_{y=0}^{\infty} \int_{x=0}^y \lambda_1 \lambda_2 \exp(-\lambda_1 x - \lambda_2 y) \, dx \, dy$

API confidence: 0.87
Option probabilities:
{**"B"**: 0.01, **"A"**: 0.91, "D": 0.06, "C": 0.02}

Section batch: 309 ms
Not per-question latency

QUESTION + OPTIONS

Independent $T1 \sim \text{Exp}(\text{rate } \lambda_1), T2 \sim \text{Exp}(\text{rate } \lambda_2)$, both rates positive.
 $R = \min(T1, T2)$.

Evaluate $P(T1 \leq T2)$.

- A. $1/2$
- B. $\lambda_1 * \lambda_2 / (\lambda_1 + \lambda_2)$
- C. $\lambda_2 / (\lambda_1 + \lambda_2)$
- D. $\lambda_1 / (\lambda_1 + \lambda_2)$

REFERENCE ANSWER

D.
 $\lambda_1 / (\lambda_1 + \lambda_2)$

JEV / CORRECT

D.
 $\lambda_1 / (\lambda_1 + \lambda_2)$

API confidence: 0.95
Option probabilities:
{ "B": 0.0, "A": 0.0, "D": 0.96, "C": 0.04 }

Section batch: 309 ms
Not per-question latency

QUESTION + OPTIONS

Independent $T_1, T_2 \sim \text{Uniform}[0, 10]$, $S = \min(T_1, T_2)$.

PDF of S for $0 \leq x \leq 10$?

- A. $(10-x)/50$
- B. $(10-x)^2/100$
- C. $x/50$
- D. $1/10$

REFERENCE ANSWER

A. $(10-x)/50$

JEV / CORRECT

A. $(10-x)/50$

Pre-run repair:
State independence explicitly.

API confidence: 0.98
Option probabilities:
{**"B"**: 0.0, **"A"**: 0.99, **"D"**: 0.0, **"C"**: 0.01}

Section batch: 309 ms
Not per-question latency

QUESTION + OPTIONS

Independent $T_1, T_2 \sim \text{Uniform}[0, 10]$, $S = \min(T_1, T_2)$.

$E[S]$?

A. $20/3$

B. 5

C. $5/2$

D. $10/3$

REFERENCE ANSWER

D. $10/3$

JEV / CORRECT

D. $10/3$

API confidence: 0.96
Option probabilities:
{**"B"**: 0.0, **"A"**: 0.03, **"D"**: 0.97, **"C"**: 0.0}

Section batch: 309 ms
Not per-question latency

QUESTION + OPTIONS

Independent $T_1, T_2 \sim \text{Uniform}[0, 10]$, $S = \min(T_1, T_2)$.

$P(|T_1 - T_2| \leq 1)$?

A. 1/10

B. 9/100

C. 1/5

D. 19/100

REFERENCE ANSWER

D. 19/100

JEV / CORRECT

D. 19/100

API confidence: 0.86
Option probabilities:
{**"B"**: 0.01, "A": 0.0, "D": 0.9, "C": 0.09}

Section batch: 309 ms
Not per-question latency

QUESTION + OPTIONS

$X \sim \text{Exp}(\text{rate } \lambda > 0)$, $Y = \min(X, 2/\lambda)$. Choose a derivation of $E[Y]$.

- A. Integrate $x \cdot \lambda \cdot \exp(-\lambda x)$ from 0 to $2/\lambda$ and add $(2/\lambda)P(X > 2/\lambda)$; the result is $(1 - \exp(-2))/\lambda$.
- B. Discard X values above $2/\lambda$ without assigning their clamped mass; the result is $(1 - 3\exp(-2))/\lambda$.
- C. Clamping at twice the mean leaves the mean unchanged at $1/\lambda$.
- D. The clamp makes Y uniform on $[0, 2/\lambda]$, so $E[Y] = 1/\lambda$.

REFERENCE ANSWER

A. Integrate $x \cdot \lambda \cdot \exp(-\lambda x)$ from 0 to $2/\lambda$ and add $(2/\lambda)P(X > 2/\lambda)$; the result is $(1 - \exp(-2))/\lambda$.

JEV / CORRECT

A. Integrate $x \cdot \lambda \cdot \exp(-\lambda x)$ from 0 to $2/\lambda$ and add $(2/\lambda)P(X > 2/\lambda)$; the result is $(1 - \exp(-2))/\lambda$.

API confidence: 0.95
Option probabilities:
{"B": 0.04, "C": 0.0, "D": 0.0, "A": 0.96}

Section batch: 398 ms
Not per-question latency

QUESTION + OPTIONS

Markov states 0,1,2,3. Transition rows (destination order 0,1,2,3) are [1/2,1/4,1/4,0], [1/2,1/4,1/4,0], [1/2,0,1/4,1/4], [0,1/4,0,3/4]. State 0 is studying, 3 sleeping.

This chain is irreducible.

A. True

B. False

REFERENCE ANSWER

A. True

JEV / INCORRECT

B. False

API confidence: 0.01
Option probabilities:
{ "A": 0.5, "B": 0.5 }

Section batch: 369 ms
Not per-question latency

QUESTION + OPTIONS

Markov states 0,1,2,3. Transition rows (destination order 0,1,2,3) are [1/2,1/4,1/4,0], [1/2,1/4,1/4,0], [1/2,0,1/4,1/4], [0,1/4,0,3/4]. State 0 is studying, 3 sleeping.

Period of the chain?

- A. 3
- B. 2
- C. 4
- D. 1

REFERENCE ANSWER

D. 1

JEV / CORRECT

D. 1

API confidence: 0.81
Option probabilities:
{ "C": 0.01, "D": 0.86, "A": 0.01, "B": 0.12 }

Section batch: 369 ms
Not per-question latency

QUESTION + OPTIONS

Markov states 0,1,2,3. Transition rows (destination order 0,1,2,3) are [1/2,1/4,1/4,0], [1/2,1/4,1/4,0], [1/2,0,1/4,1/4], [0,1/4,0,3/4]. State 0 is studying, 3 sleeping.

Why does the distribution converge to a unique stationary distribution from every initial state?

- A. The rows sum to one, which alone guarantees convergence.
- B. State 3 is absorbing and hence gives the unique stationary mass.
- C. The finite chain is irreducible and aperiodic; self-loops give period one.
- D. All finite chains converge uniquely, even if reducible or periodic.

REFERENCE ANSWER

C. The finite chain is irreducible and aperiodic; self-loops give period one.

JEV / CORRECT

C. The finite chain is irreducible and aperiodic; self-loops give period one.

API confidence: 1.00
Option probabilities:
{ "C": 1.0, "D": 0.0, "A": 0.0, "B": 0.0 }

Section batch: 369 ms
Not per-question latency

QUESTION + OPTIONS

Markov states 0,1,2,3. Transition rows (destination order 0,1,2,3) are $[1/2, 1/4, 1/4, 0]$, $[1/2, 1/4, 1/4, 0]$, $[1/2, 0, 1/4, 1/4]$, $[0, 1/4, 0, 3/4]$. State 0 is studying, 3 sleeping.

Choose stationary equations, plus $\pi_0 + \pi_1 + \pi_2 + \pi_3 = 1$.

- A. $\pi_0 = \pi_1 = \pi_2 = \pi_3 = 1/4$
- B. $\pi_0 = (\pi_0 + \pi_1 + \pi_2)/2$; $\pi_1 = (\pi_0 + \pi_1 + \pi_3)/4$; $\pi_2 = (\pi_0 + \pi_1 + \pi_2)/4$; $\pi_3 = \pi_2/4 + 3\pi_3/4$
- C. $\pi_0 = (\pi_0 + \pi_1)/2$; $\pi_1 = (\pi_0 + \pi_1)/4$; $\pi_2 = \pi_2/4$; $\pi_3 = 3\pi_3/4$
- D. $\pi_0 = \pi_0/2 + \pi_1/4 + \pi_2/4$; $\pi_1 = \pi_0/2 + \pi_1/4 + \pi_2/4$; $\pi_2 = \pi_0/2 + \pi_2/4 + \pi_3/4$; $\pi_3 = \pi_1/4 + 3\pi_3/4$

REFERENCE ANSWER

B. $\pi_0 = (\pi_0 + \pi_1 + \pi_2)/2$;
 $\pi_1 = (\pi_0 + \pi_1 + \pi_3)/4$;
 $\pi_2 = (\pi_0 + \pi_1 + \pi_2)/4$;
 $\pi_3 = \pi_2/4 + 3\pi_3/4$

JEV / CORRECT

B. $\pi_0 = (\pi_0 + \pi_1 + \pi_2)/2$;
 $\pi_1 = (\pi_0 + \pi_1 + \pi_3)/4$;
 $\pi_2 = (\pi_0 + \pi_1 + \pi_2)/4$;
 $\pi_3 = \pi_2/4 + 3\pi_3/4$

API confidence: 0.96
Option probabilities:
{**"C"**: 0.0, **"A"**: 0.01, **"D"**: 0.02, **"B"**: 0.97}

Section batch: 369 ms
Not per-question latency

QUESTION + OPTIONS

Markov states 0,1,2,3. Transition rows (destination order 0,1,2,3) are [1/2,1/4,1/4,0], [1/2,1/4,1/4,0], [1/2,0,1/4,1/4], [0,1/4,0,3/4]. State 0 is studying, 3 sleeping.

Expected steps to first reach state 3, starting at 0?

- A. 4
- B. 8
- C. 16
- D. 12

REFERENCE ANSWER

C. 16

JEV / INCORRECT

B. 8

API confidence: 0.29
Option probabilities:
{"C": 0.2, "A": 0.21, "D": 0.13, "B": 0.45999999999999996}

Section batch: 369 ms
Not per-question latency

QUESTION + OPTIONS

P implies Q is equivalent to NOT P implies NOT Q.

A. True

B. False

REFERENCE ANSWER

B. False

JEV / CORRECT

B. False

API confidence: 0.97
Option probabilities:
{ "B": 0.98, "A": 0.02 }

Section batch: 357 ms
Not per-question latency

QUESTION + OPTIONS

Complete the contrapositive: $(P \text{ AND } Q) \text{ implies } R$ is equivalent to $\text{NOT } R \text{ implies } \text{---}$.

- A. $\text{NOT } P \text{ OR } \text{NOT } Q$
- B. $\text{NOT } P \text{ AND } \text{NOT } Q$
- C. $P \text{ OR } Q$
- D. $P \text{ AND } Q$

REFERENCE ANSWER

A. $\text{NOT } P \text{ OR } \text{NOT } Q$

JEV / CORRECT

A. $\text{NOT } P \text{ OR } \text{NOT } Q$

API confidence: 1.00
Option probabilities:
{ $"B"$: 0.0, $"C"$: 0.0, $"D"$: 0.0, $"A"$: 1.0}

Section batch: 357 ms
Not per-question latency

QUESTION + OPTIONS

NOT exists integer x [$P(x)$ OR $Q(x)$] is equivalent to forall integer x [NOT $P(x)$ AND NOT $Q(x)$].

A. False

B. True

REFERENCE ANSWER

B. True

JEV / CORRECT

B. True

API confidence: 0.99
Option probabilities:
{"B": 0.99, "A": 0.01}

Section batch: 357 ms
Not per-question latency

QUESTION + OPTIONS

NOT forall natural x exists natural y [P(x) AND Q(x,y)] is equivalent to exists natural x forall natural y [NOT P(x) AND NOT Q(x,y)].

A. True

B. False

REFERENCE ANSWER

B. False

JEV / CORRECT

B. False

API confidence: 0.98
Option probabilities:
{"B": 0.99, "A": 0.01}

Section batch: 357 ms
Not per-question latency

QUESTION + OPTIONS

For all natural a and positive integer b , a/b is not $\sqrt{2}$.

A. True

B. False

REFERENCE ANSWER

A. True

JEV / CORRECT

A. True

API confidence: 0.97
Option probabilities:
{**"B"**: 0.01, "A": 0.99}

Section batch: 357 ms
Not per-question latency

QUESTION + OPTIONS

Every natural n is either a perfect square or has irrational square root.

A. True

B. False

REFERENCE ANSWER

A. True

JEV / CORRECT

A. True

API confidence: 0.06
Option probabilities:
{`"B": 0.47, "A": 0.53`}

Section batch: 357 ms
Not per-question latency

QUESTION + OPTIONS

For integers a, b, c , does $a|b$ and $a|c$ imply $a|(b+5c)$? Justify.

- A. No: choose $a=2, b=4, c=6$.
- B. No: multiplying c by 5 destroys divisibility.
- C. Yes: $b=ak, c=al$ imply $b+5c=a(k+5l)$.
- D. Yes: $b+5c$ equals a whenever both are divisible by a .

REFERENCE ANSWER

C. Yes: $b=ak, c=al$ imply $b+5c=a(k+5l)$.

JEV / CORRECT

C. Yes: $b=ak, c=al$ imply $b+5c=a(k+5l)$.

API confidence: 1.00
Option probabilities:
{ $"D"$: 0.0, $"B"$: 0.0, $"A"$: 0.0, $"C"$: 1.0}

Section batch: 363 ms
Not per-question latency

QUESTION + OPTIONS

Does $b^2=n$ imply n divides b for all positive integers b,n ?

- A. Yes: any square divides its square root.
- B. Yes: take square roots of the divisibility $n|b^2$.
- C. No: $b=1,n=1$ is a counterexample.
- D. No: $b=2,n=4$ is a counterexample.

REFERENCE ANSWER

D. No: $b=2,n=4$ is a counterexample.

JEV / CORRECT

D. No: $b=2,n=4$ is a counterexample.

API confidence: 0.87
Option probabilities:
{`"D"`: 0.9, `"B"`: 0.02, `"A"`: 0.07, `"C"`: 0.01}

Section batch: 363 ms
Not per-question latency

QUESTION + OPTIONS

Why must a positive nonsquare integer have an odd exponent in its prime factorization?

A. Every nonsquare integer is prime and has exponent one.

B. An even exponent would force the integer itself to be even.

C. All prime factors of a nonsquare must have odd exponents.

D. If all exponents were even, halving them gives an integer whose square is the original number, a contradiction.

REFERENCE ANSWER

D. If all exponents were even, halving them gives an integer whose square is the original number, a contradiction.

JEV / CORRECT

D. If all exponents were even, halving them gives an integer whose square is the original number, a contradiction.

API confidence: 1.00
Option probabilities:
{ "D": 1.0, "B": 0.0, "A": 0.0, "C": 0.0 }

Section batch: 363 ms
Not per-question latency

QUESTION + OPTIONS

- $x_1=1$; $x_n=\sqrt{1+x_{(n-1)}}$ for $n\geq 2$. Prove $x_n<2$.
- A. Every term equals 1, so the result is immediate.
- B. Base $x_1=1<2$. If $0\leq x_k<2$, then $x_{(k+1)}=\sqrt{1+x_k}<\sqrt{3}<2$, and it remains nonnegative.
- C. Base $x_1=1$. If $x_k<2$, then $x_{(k+1)}=1+\sqrt{x_k}<2$.
- D. The sequence is decreasing because square roots always reduce numbers.

REFERENCE ANSWER

B. Base $x_1=1<2$. If $0\leq x_k<2$, then
 $x_{(k+1)}=\sqrt{1+x_k}<\sqrt{3}<2$,
and it remains nonnegative.

JEV / CORRECT

B. Base $x_1=1<2$. If $0\leq x_k<2$, then
 $x_{(k+1)}=\sqrt{1+x_k}<\sqrt{3}<2$,
and it remains nonnegative.

API confidence: 1.00
Option probabilities:
{ "D": 0.0, "B": 1.0, "A": 0.0, "C": 0.0 }

Section batch: 349 ms
Not per-question latency

QUESTION + OPTIONS

Prove $A_n=2^{(n+2)}+3^{(2n+1)}$ is divisible by 7 for $n \geq 1$.

- A. $A_1=35$; $A(k+1)=2A_k+7 \cdot 3^{(2k+1)}$, so the induction preserves divisibility.
- B. $A_1=35$ and $A_2=259$, so all remaining cases follow without an induction step.
- C. $A_1=35$; $A(k+1)=9A_k$, proving the induction.
- D. Both summands are separately multiples of seven.

REFERENCE ANSWER

A. $A_1=35$;
 $A(k+1)=2A_k+7 \cdot 3^{(2k+1)}$, so
the induction preserves
divisibility.

JEV / CORRECT

A. $A_1=35$;
 $A(k+1)=2A_k+7 \cdot 3^{(2k+1)}$, so
the induction preserves
divisibility.

API confidence: 0.98
Option probabilities:
{ "D": 0.0, "B": 0.0, "A": 0.99, "C": 0.01 }

Section batch: 349 ms
Not per-question latency

QUESTION + OPTIONS

A pair present in both proposer-optimal matchings is present in every stable matching.

A. False

B. True

REFERENCE ANSWER

B. True

JEV / CORRECT

B. True

API confidence: 0.55
Option probabilities:
{"B": 0.78, "A": 0.22}

Section batch: 316 ms
Not per-question latency

QUESTION + OPTIONS

If some pair appears in both proposer-optimal matchings, then the entire stable matching is unique.

A. False

B. True

REFERENCE ANSWER

A. False

JEV / CORRECT

A. False

API confidence: 0.44
Option probabilities:
{ "B": 0.28, "A": 0.72 }

Section batch: 316 ms
Not per-question latency

QUESTION + OPTIONS

With two jobs and two candidates, every stable matching is optimal for one proposer side or both.

A. True

B. False

REFERENCE ANSWER

A. True

JEV / CORRECT

A. True

API confidence: 0.90
Option probabilities:
{ "B": 0.05, "A": 0.95 }

Section batch: 316 ms
Not per-question latency

QUESTION + OPTIONS

There exist instances where a candidate rejecting the less-preferred-of-two rule in job-proposing deferred acceptance can obtain a better final partner.

A. True

B. False

REFERENCE ANSWER

A. True

JEV / INCORRECT

B. False

API confidence: 0.06
Option probabilities:
{"B": 0.53, "A": 0.47}

Section batch: 316 ms
Not per-question latency

QUESTION + OPTIONS

Smallest N such that every n -dimensional hypercube with $n \geq N$ has an even edge count?

- A. 1
- B. 3
- C. 2
- D. 4

REFERENCE ANSWER

C. 2

JEV / CORRECT

C. 2

API confidence: 0.12
Option probabilities:
{ "D": 0.11, "A": 0.28, "C": 0.34, "B": 0.27 }

Section batch: 394 ms
Not per-question latency

QUESTION + OPTIONS

Kn has an even number of edges for every $n > 3$.

A. True

B. False

REFERENCE ANSWER

B. False

JEV / INCORRECT

A. True

API confidence: 0.09
Option probabilities:
{ "A": 0.55, "B": 0.45 }

Section batch: 394 ms
Not per-question latency

QUESTION + OPTIONS

In K_n , how many edges cross a cut with k vertices on one side?

- A. $n-1$
- B. $C(k,2)$
- C. $k(n-k)$
- D. $k \cdot n$

REFERENCE ANSWER

C. $k(n-k)$

JEV / CORRECT

C. $k(n-k)$

API confidence: 0.99
Option probabilities:
{`"D": 0.0, "A": 0.0, "C": 1.0, "B": 0.0`}

Section batch: 394 ms
Not per-question latency

QUESTION + OPTIONS

Minimum edges crossing a nonempty proper cut of an n -vertex tree, $n \geq 2$?

- A. $n-1$
- B. 0
- C. 2
- D. 1

REFERENCE ANSWER

D. 1

JEV / CORRECT

D. 1

API confidence: 1.00
Option probabilities:
{`"D": 1.0, "A": 0.0, "C": 0.0, "B": 0.0`}

Section batch: 394 ms
Not per-question latency

QUESTION + OPTIONS

Maximum edges crossing a cut of an n -vertex tree?

- A. n
- B. 1
- C. $n-1$
- D. $\text{floor}(n/2)$

REFERENCE ANSWER

C. $n-1$

JEV / CORRECT

C. $n-1$

API confidence: 0.27
Option probabilities:
{`"D"`: 0.4, `"A"`: 0.01, `"C"`: 0.45, `"B"`: 0.14}

Section batch: 394 ms
Not per-question latency

QUESTION + OPTIONS

Adding a new edge either reduces the component count or creates a cycle containing that edge.

A. True

B. False

REFERENCE ANSWER

A. True

JEV / CORRECT

A. True

API confidence: 0.98
Option probabilities:
{ "A": 0.99, "B": 0.01 }

Section batch: 394 ms
Not per-question latency

QUESTION + OPTIONS

Minimum possible component count with $n \geq 1$ vertices and e edges?

- A. $n-1$
- B. $e-n+1$
- C. $n-e$
- D. $\max(n-e, 1)$

REFERENCE ANSWER

D. $\max(n-e, 1)$

JEV / CORRECT

D. $\max(n-e, 1)$

API confidence: 0.93
Option probabilities:
{**"D"**: 0.95, "A": 0.0, "C": 0.05, "B": 0.0}

Section batch: 394 ms
Not per-question latency

QUESTION + OPTIONS

Smallest edge-count threshold guaranteeing a cycle in a simple n -vertex graph?

- A. n
- B. $2n$
- C. $n+1$
- D. $n-1$

REFERENCE ANSWER

A. n

JEV / CORRECT

A. n

API confidence: 0.94
Option probabilities:
{`"D": 0.01, "A": 0.95, "C": 0.04, "B": 0.0`}

Section batch: 394 ms
Not per-question latency

QUESTION + OPTIONS

The n -dimensional hypercube is edge-colorable with n colors.

A. True

B. False

REFERENCE ANSWER

A. True

JEV / CORRECT

A. True

API confidence: 0.97
Option probabilities:
{`"B"`: 0.02, `"A"`: 0.98}

Section batch: 292 ms
Not per-question latency

QUESTION + OPTIONS

Every graph of maximum degree d is edge-colorable with d colors.

A. True

B. False

REFERENCE ANSWER

B. False

JEV / CORRECT

B. False

API confidence: 0.92
Option probabilities:
{`"B"`: 0.96, `"A"`: 0.04}

Section batch: 292 ms
Not per-question latency

QUESTION + OPTIONS

Every bipartite graph is edge-colorable with two colors.

A. True

B. False

REFERENCE ANSWER

B. False

JEV / CORRECT

B. False

API confidence: 0.13
Option probabilities:
{ "B": 0.57, "A": 0.43 }

Section batch: 292 ms
Not per-question latency

QUESTION + OPTIONS

A bipartite graph on $n > 2$ vertices is d -regular, and its edges partition into Hamiltonian cycles.

Number of edges?

- A. nd
- B. $d/2$
- C. $nd/2$
- D. $n+d$

REFERENCE ANSWER

C. $nd/2$

JEV / CORRECT

C. $nd/2$

API confidence: 0.42
Option probabilities:
{`"B"`: 0.0, `"C"`: 0.57, `"D"`: 0.0, `"A"`: 0.43}

Section batch: 292 ms
Not per-question latency

QUESTION + OPTIONS

A bipartite graph on $n > 2$ vertices is d -regular, and its edges partition into Hamiltonian cycles.

Number of cycles in this edge partition?

- A. $nd/2$
- B. $d/2$
- C. d
- D. $n/2$

REFERENCE ANSWER

B. $d/2$

JEV / CORRECT

B. $d/2$

API confidence: 0.92
Option probabilities:
{**"B"**: 0.94, "C": 0.05, "A": 0.01, "D": 0.0}

Section batch: 292 ms
Not per-question latency

QUESTION + OPTIONS

A bipartite graph on $n > 2$ vertices is d -regular, and its edges partition into Hamiltonian cycles.

Why can the graph be edge-colored with d colors?

- A. Every d -regular graph automatically has a d -edge-coloring regardless of bipartiteness.
- B. Each cycle gets one color, since its edges do not share endpoints.
- C. Use the two vertex colors as edge colors for all cycles.
- D. Each Hamiltonian cycle is even because the graph is bipartite, so alternate two colors on it; use a disjoint color pair for each of the $d/2$ cycles.

REFERENCE ANSWER

D. Each Hamiltonian cycle is even because the graph is bipartite, so alternate two colors on it; use a disjoint color pair for each of the $d/2$ cycles.

JEV / CORRECT

D. Each Hamiltonian cycle is even because the graph is bipartite, so alternate two colors on it; use a disjoint color pair for each of the $d/2$ cycles.

API confidence: 0.95
Option probabilities:
{ "B": 0.03, "C": 0.0, "A": 0.0, "D": 0.97 }

Section batch: 292 ms
Not per-question latency

QUESTION + OPTIONS

In a d -regular bipartite graph, $d > 0$, prove every S on the left satisfies $|N(S)| \geq |S|$.

- A. Exactly $d|S|$ edges leave S and at most $d|N(S)|$ can meet its neighbors, so $d|S| \leq d|N(S)|$; divide by d .
- B. All neighbors of different left vertices are distinct, so each adds d new vertices.
- C. Each left vertex has at least one neighbor, which alone ensures Hall's condition.
- D. The graph is bipartite, so $|N(S)| = |S|$ for every subset regardless of degree.

REFERENCE ANSWER

A. Exactly $d|S|$ edges leave S and at most $d|N(S)|$ can meet its neighbors, so $d|S| \leq d|N(S)|$; divide by d .

JEV / CORRECT

A. Exactly $d|S|$ edges leave S and at most $d|N(S)|$ can meet its neighbors, so $d|S| \leq d|N(S)|$; divide by d .

API confidence: 1.00
Option probabilities:
{ "B": 0.0, "C": 0.0, "A": 1.0, "D": 0.0 }

Section batch: 292 ms
Not per-question latency

QUESTION + OPTIONS

Compute 7^{50} modulo 35.

- A. 14
- B. 1
- C. 7
- D. 0

REFERENCE ANSWER

A. 14

JEV / INCORRECT

D. 0

API confidence: 0.72
Option probabilities:
{"D": 0.79, "A": 0.11, "C": 0.1, "B": 0.0}

Section batch: 499 ms
Not per-question latency

QUESTION + OPTIONS

Prime q , $N=q^2$. How many residues modulo N are coprime to N ?

- A. q
- B. q^2-q
- C. q^2-1
- D. $q-1$

REFERENCE ANSWER

B. q^2-q

JEV / CORRECT

B. q^2-q

API confidence: 0.99
Option probabilities:
{ $"C"$: 0.0, $"A"$: 0.0, $"D"$: 0.0, $"B"$: 1.0}

Section batch: 499 ms
Not per-question latency

QUESTION + OPTIONS

If q is prime and $\gcd(a,q)=1$, then a has a multiplicative inverse modulo q^2 .

A. False

B. True

REFERENCE ANSWER

B. True

JEV / CORRECT

B. True

API confidence: 0.91
Option probabilities:
{ "A": 0.04, "B": 0.96 }

Section batch: 499 ms
Not per-question latency

QUESTION + OPTIONS

Prime q , $N=q^2$, $\gcd(a,N)=1$. Besides exponent 1, choose an exponent $x>1$ guaranteed to satisfy $a^x=a \bmod N$ for every such a .

- A. q
- B. $q-1$
- C. $q(q-1)+1$
- D. q^2

REFERENCE ANSWER

C. $q(q-1)+1$

Pre-run repair:
Use an explicit exponent >1 and the correct unit-group cardinality.

JEV / CORRECT

C. $q(q-1)+1$

API confidence: 0.93
Option probabilities:
{ $"C"$: 0.94, $"A"$: 0.04, $"D"$: 0.02, $"B"$: 0.0}

Section batch: 499 ms
Not per-question latency

QUESTION + OPTIONS

For all moduli n , $ab \equiv 0 \pmod n$ implies $a \equiv 0 \pmod n$ or $b \equiv 0 \pmod n$.

A. False

B. True

REFERENCE ANSWER

A. False

JEV / CORRECT

A. False

API confidence: 0.99
Option probabilities:
{ "A": 1.0, "B": 0.0 }

Section batch: 499 ms
Not per-question latency

QUESTION + OPTIONS

If m and n are integer linear combinations of x,y , every integer linear combination of m,n is also an integer linear combination of x,y .

A. False

B. True

REFERENCE ANSWER

B. True

JEV / CORRECT

B. True

API confidence: 0.99
Option probabilities:
{ "A": 0.0, "B": 1.0 }

Section batch: 499 ms
Not per-question latency

QUESTION + OPTIONS

For positive x,y , the least positive integer linear combination is $\min(x,y)$.

A. False

B. True

REFERENCE ANSWER

A. False

JEV / CORRECT

A. False

API confidence: 0.70
Option probabilities:
{ "A": 0.85, "B": 0.15 }

Section batch: 499 ms
Not per-question latency

QUESTION + OPTIONS

For positive x,y , the least positive integer linear combination is $\gcd(x,y)$.

A. False

B. True

REFERENCE ANSWER

B. True

JEV / CORRECT

B. True

API confidence: 0.75
Option probabilities:
{ "A": 0.13, "B": 0.87 }

Section batch: 499 ms
Not per-question latency

QUESTION + OPTIONS

If $x \equiv a \pmod m$ and $x \equiv a \pmod n$, with coprime positive m, n , then $x \equiv a \pmod{mn}$.

A. False

B. True

REFERENCE ANSWER

B. True

JEV / CORRECT

B. True

API confidence: 0.94
Option probabilities:
{ "A": 0.03, "B": 0.97 }

Section batch: 499 ms
Not per-question latency

QUESTION + OPTIONS

Positive m, n have gcd q . Smallest positive k with $a + kn \equiv a \pmod m$?

- A. n/q
- B. q
- C. m/q
- D. mn/q

REFERENCE ANSWER

C. m/q

Pre-run repair:
Remove irrelevant $x \neq 0$ restriction; original arbitrary a could otherwise exclude the purported first k .

JEV / CORRECT

C. m/q

API confidence: 0.93
Option probabilities:
{ $"C"$: 0.94, $"A"$: 0.02, $"D"$: 0.03, $"B"$: 0.01}

Section batch: 499 ms
Not per-question latency

QUESTION + OPTIONS

Positive m, n have gcd q . How many x in $0..mn-1$ satisfy $x \equiv a \pmod m$ and $x \equiv a \pmod n$?

- A. q
- B. 1
- C. mn/q
- D. $m+n$

REFERENCE ANSWER

A. q

JEV / CORRECT

A. q

API confidence: 0.65
Option probabilities:
{ $"C"$: 0.01, $"A"$: 0.74, $"D"$: 0.0, $"B"$: 0.25}

Section batch: 499 ms
Not per-question latency

QUESTION + OPTIONS

Prime $p > 2$ has $p-1 = q_1 \cdots q_k$, a product of distinct primes.

For $1 \leq n < p-1$, why does some nonzero x satisfy $x^n \neq 1 \pmod p$?

A. The nonzero residues are all greater than n , so their n th powers cannot reduce to one.

B. Fermat says x^n is never one for any $n < p-1$.

C. The nonzero polynomial $x^n - 1$ has at most n roots but there are $p-1$ nonzero residues.

D. The degree of $x^n - 1$ is $p-1$, so it has exactly $p-1$ roots.

REFERENCE ANSWER

C. The nonzero polynomial $x^n - 1$ has at most n roots but there are $p-1$ nonzero residues.

Pre-run repair:
Require $n \geq 1$; $n=0$ makes the claim false.

JEV / CORRECT

C. The nonzero polynomial $x^n - 1$ has at most n roots but there are $p-1$ nonzero residues.

API confidence: 1.00
Option probabilities:
{ "D": 0.0, "A": 0.0, "C": 1.0, "B": 0.0 }

Section batch: 348 ms
Not per-question latency

QUESTION + OPTIONS

Prime $p > 2$ has $p-1 = q_1 \cdots q_k$, a product of distinct primes.

For each fixed i , prove there exists $a \neq 0, 1$ modulo p with $a^{q_i} = 1$.

A. Set $a = 1$, which satisfies both required inequalities.

B. Choose one a with order divisible by all q_i ; then each q_i separately annihilates it.

C. Let $h = (p-1)/q_i$. The polynomial $x^h - 1$ has fewer than $p-1$ roots, so choose nonzero b with $b^h \neq 1$. Put $a = b^h$; then $a^{q_i} = b^{(p-1)} = 1$ by Fermat.

D. Choose any $a \neq 0, 1$; Fermat says its q_i th power is one.

REFERENCE ANSWER

C. Let $h = (p-1)/q_i$. The polynomial $x^h - 1$ has fewer than $p-1$ roots, so choose nonzero b with $b^h \neq 1$. Put $a = b^h$; then $a^{q_i} = b^{(p-1)} = 1$ by Fermat.

Pre-run repair:
Clarify quantifiers: a may depend on i .

JEV / CORRECT

C. Let $h = (p-1)/q_i$. The polynomial $x^h - 1$ has fewer than $p-1$ roots, so choose nonzero b with $b^h \neq 1$. Put $a = b^h$; then $a^{q_i} = b^{(p-1)} = 1$ by Fermat.

API confidence: 1.00
Option probabilities:
{ "D": 0.0, "A": 0.0, "C": 1.0, "B": 0.0 }

Section batch: 348 ms
Not per-question latency

QUESTION + OPTIONS

If x has order d modulo prime p and $x^q = 1 \pmod p$, prove d divides q .

- A. The order d is always $p-1$ and q is always p .
- B. Every divisor of x also divides q .
- C. Write $q=dm+r$, $0 \leq r < d$. Then $x^r=1$; minimality of d forces $r=0$.
- D. Since $x^d=x^q$, cancel the base to obtain $d=q$ as integers.

REFERENCE ANSWER

C. Write $q=dm+r$, $0 \leq r < d$.
Then $x^r=1$; minimality of d forces $r=0$.

Pre-run repair:
Use corrected published modulus p ; original exam typo caused this part to be ungraded.

JEV / CORRECT

C. Write $q=dm+r$, $0 \leq r < d$.
Then $x^r=1$; minimality of d forces $r=0$.

API confidence: 1.00
Option probabilities:
{ "D": 0.0, "A": 0.0, "C": 1.0, "B": 0.0 }

Section batch: 348 ms
Not per-question latency

QUESTION + OPTIONS

RSA modulus $N=15$, unknown valid encryption exponent e . Ciphertext is 10. Recover the plaintext x in $0..14$ and justify without e .

A. Impossible: even with N factored, different valid exponents give different plaintexts here.

B. $x=1$: every nonzero ciphertext decrypts to one when e is unknown.

C. $x=10$: for any positive decryption exponent d , 10^d is $0 \bmod 5$ and $1 \bmod 3$, hence $10 \bmod 15$ by CRT.

D. $x=5$: divide the ciphertext by the number of prime factors.

REFERENCE ANSWER

C. $x=10$: for any positive decryption exponent d , 10^d is $0 \bmod 5$ and $1 \bmod 3$, hence $10 \bmod 15$ by CRT.

JEV / CORRECT

C. $x=10$: for any positive decryption exponent d , 10^d is $0 \bmod 5$ and $1 \bmod 3$, hence $10 \bmod 15$ by CRT.

API confidence: 0.95
Option probabilities:
{ "D": 0.0, "B": 0.0, "A": 0.03, "C": 0.97 }

Section batch: 406 ms
Not per-question latency

QUESTION + OPTIONS

A line over GF(5) passes through (1,1),(2,3). Secret at x=0?

- A. 4
- B. 3
- C. 2
- D. 1

REFERENCE ANSWER

A. 4

JEV / INCORRECT

B. 3

API confidence: 0.36
Option probabilities:
{ "C": 0.07, "B": 0.51, "D": 0.03, "A": 0.39 }

Section batch: 311 ms
Not per-question latency

QUESTION + OPTIONS

Nonzero formal polynomials P, Q over a field have degrees $\deg P \geq \deg Q \geq 1$. Euclidean division gives $P = DQ + R$, with R zero or $\deg R < \deg Q$.

Degree of PQ ?

- A. $\max(\deg P, \deg Q)$
- B. $\deg P + \deg Q$
- C. $\deg P - \deg Q$
- D. $\deg P + \deg Q$

REFERENCE ANSWER

D. $\deg P + \deg Q$

JEV / CORRECT

D. $\deg P + \deg Q$

API confidence: 1.00
Option probabilities:
{ $"C"$: 0.0, $"D"$: 1.0, $"B"$: 0.0, $"A"$: 0.0}

Section batch: 311 ms
Not per-question latency

QUESTION + OPTIONS

Nonzero formal polynomials P, Q over a field have degrees $\deg P \geq \deg Q \geq 1$. Euclidean division gives $P = DQ + R$, with R zero or $\deg R < \deg Q$.

Degree of D ?

A. $\deg P - \deg Q$

B. $\deg Q - 1$

C. $\deg P + \deg Q$

D. $\deg P / \deg Q$

REFERENCE ANSWER

A. $\deg P - \deg Q$

Pre-run repair:
Specify $\deg P \geq \deg Q$, required for the nonzero quotient degree formula.

JEV / CORRECT

A. $\deg P - \deg Q$

API confidence: 1.00
Option probabilities:
{ $"C"$: 0.0, $"D"$: 0.0, $"B"$: 0.0, $"A"$: 1.0}

Section batch: 311 ms
Not per-question latency

QUESTION + OPTIONS

Nonzero formal polynomials P, Q over a field have degrees $\deg P \geq \deg Q \geq 1$. Euclidean division gives $P = DQ + R$, with R zero or $\deg R < \deg Q$.

Sharp upper bound for nonzero R 's degree?

- A. $\deg Q$
- B. $\deg Q - 1$
- C. $\deg P - 1$
- D. $\deg P - \deg Q$

REFERENCE ANSWER

B. $\deg Q - 1$

JEV / CORRECT

B. $\deg Q - 1$

API confidence: 1.00
Option probabilities:
{ $"C"$: 0.0, $"B"$: 1.0, $"D"$: 0.0, $"A"$: 0.0}

Section batch: 311 ms
Not per-question latency

QUESTION + OPTIONS

If $P=DQ$ exactly, every root of Q is a root of P .

A. True

B. False

REFERENCE ANSWER

A. True

JEV / CORRECT

A. True

API confidence: 0.93
Option probabilities:
{"B": 0.04, "A": 0.96}

Section batch: 311 ms
Not per-question latency

QUESTION + OPTIONS

If $P=DQ$ exactly, every root of D is a root of P .

A. True

B. False

REFERENCE ANSWER

A. True

JEV / CORRECT

A. True

API confidence: 0.95
Option probabilities:
{`"B"`: 0.03, `"A"`: 0.97}

Section batch: 311 ms
Not per-question latency

QUESTION + OPTIONS

A one-symbol message is encoded by a constant polynomial over $GF(5)$; up to one evaluation is corrupted. Received $R(1)=2,R(2)=1,R(3)=2$.

Find the monic minimal error polynomial E .

- A. $x-1$
- B. $x-3$
- C. $x-2$
- D. x

REFERENCE ANSWER

C. $x-2$

JEV / CORRECT

C. $x-2$

API confidence: 0.59
Option probabilities:
{**"C"**: 0.7, "B": 0.16, "D": 0.02, "A": 0.12}

Section batch: 311 ms
Not per-question latency

QUESTION + OPTIONS

A one-symbol message is encoded by a constant polynomial over GF(5); up to one evaluation is corrupted. Received $R(1)=2,R(2)=1,R(3)=2$.

Find $Q=PE$.

A. $2x+1$

B. $2x+2$

C. $2x+3$

D. $x+3$

REFERENCE ANSWER

A. $2x+1$

JEV / CORRECT

A. $2x+1$

API confidence: 0.36
Option probabilities:
{ $"C"$: 0.25, $"B"$: 0.13, $"D"$: 0.1, $"A"$: 0.52}

Section batch: 311 ms
Not per-question latency

QUESTION + OPTIONS

Distribute n distinct balls to named bins A,B,C. Ball-by-ball gives (a) assignments. Bin-by-bin: choose (c) balls for A in (b) ways; (d) remain. Choose (f) for B in (e) ways; put (g) remaining balls in C in (h) ways. This proves $\sum_i C(n,i) \sum_j C(n-i,j)=3^n$.

Fill the counting proof as one tuple (a,b,c,d,e,f,g,h).

- A. (3^n , $C(n,i)$, i , $n-i$, $C(n-i,j)$, j , $n-i-j$, 1)
- B. (3^n , n^i , i , n , n^j , j , $n-i-j$, 1)
- C. (3^n , $C(n,i)$, i , $n-i$, $C(n-i,j)$, j , $n-j$, 3)
- D. (n^3 , $C(n,i)$, i , $n-i$, $C(n,j)$, j , $n-i-j$, 1)

REFERENCE ANSWER

A. (3^n , $C(n,i)$, i , $n-i$, $C(n-i,j)$, j , $n-i-j$, 1)

JEV / CORRECT

A. (3^n , $C(n,i)$, i , $n-i$, $C(n-i,j)$, j , $n-i-j$, 1)

API confidence: 1.00
Option probabilities:
{ "B": 0.0, "D": 0.0, "A": 1.0, "C": 0.0 }

Section batch: 279 ms
Not per-question latency

QUESTION + OPTIONS

Two conditions must both hold to reveal $P(0)$. One point of P is shared via Q , reconstructible by all 14 TAs or any 10 TAs plus Alec. A second point of P is shared via R , requiring 20 readers. All share coordinates within each scheme are distinct and nonzero; fields are sufficiently large.

Choose (degree P ; degree Q ; shares per TA; shares for Alec; degree R ; shares per reader).

- A. (1;13;1;3;19;1)
- B. (1;13;1;4;19;1)
- C. (2;13;1;4;19;1)
- D. (1;12;1;4;19;1)

REFERENCE ANSWER

B. (1;13;1;4;19;1)

JEV / CORRECT

B. (1;13;1;4;19;1)

API confidence: 0.51
Option probabilities:
{`"D"`: 0.01, `"B"`: 0.64, `"A"`: 0.01, `"C"`: 0.34}

Section batch: 279 ms
Not per-question latency

QUESTION + OPTIONS

Number of ordered outcomes of three six-sided die rolls?

- A. 216
- B. 36
- C. 56
- D. 18

REFERENCE ANSWER

A. 216

JEV / CORRECT

A. 216

API confidence: 1.00
Option probabilities:
{ "B": 0.0, "A": 1.0, "D": 0.0, "C": 0.0 }

Section batch: 368 ms
Not per-question latency

QUESTION + OPTIONS

Three die rolls: number of strictly increasing sequences?

- A. 20
- B. 120
- C. 56
- D. 216

REFERENCE ANSWER

A. 20

JEV / CORRECT

A. 20

API confidence: 0.84
Option probabilities:
{ "B": 0.03, "A": 0.89, "D": 0.0, "C": 0.08 }

Section batch: 368 ms
Not per-question latency

QUESTION + OPTIONS

Three die rolls: number of nondecreasing sequences?

A. 36

B. 56

C. 216

D. 20

REFERENCE ANSWER

B. 56

JEV / INCORRECT

D. 20

API confidence: 0.41
Option probabilities:
{"B": 0.39, "A": 0.05, "D": 0.56, "C": 0.0}

Section batch: 368 ms
Not per-question latency

QUESTION + OPTIONS

Three die rolls: number of sequences with no 1?

- A. 215
- B. 125
- C. 150
- D. 91

REFERENCE ANSWER

B. 125

JEV / CORRECT

B. 125

API confidence: 0.99
Option probabilities:
{ "B": 1.0, "A": 0.0, "D": 0.0, "C": 0.0 }

Section batch: 368 ms
Not per-question latency

QUESTION + OPTIONS

Three die rolls: number with at least one 1 among the first two positions?

- A. 91
- B. 72
- C. 36
- D. 66

REFERENCE ANSWER

D. 66

JEV / CORRECT

D. 66

API confidence: 0.17
Option probabilities:
{"B": 0.18, "A": 0.3, "D": 0.38, "C": 0.14}

Section batch: 368 ms
Not per-question latency

QUESTION + OPTIONS

Three die rolls: number with even product?

- A. 189
- B. 27
- C. 108
- D. 144

REFERENCE ANSWER

A. 189

JEV / INCORRECT

D. 144

API confidence: 0.19
Option probabilities:
{ "B": 0.03, "A": 0.22, "D": 0.39, "C": 0.36 }

Section batch: 368 ms
Not per-question latency

QUESTION + OPTIONS

- Prove that the irrational real numbers are uncountable.
- A. Removing any countable set from any set leaves an uncountable set.
 - B. If irrationals were countable, their union with the countable rationals would make all reals countable, contradicting uncountability of $\mathbb{R}$.
 - C. The irrationals are infinite, and all infinite sets are uncountable.
 - D. Every irrational has infinitely many digits, and all infinite strings represent different real numbers.

REFERENCE ANSWER

B. If irrationals were countable, their union with the countable rationals would make all reals countable, contradicting uncountability of $\mathbb{R}$.

JEV / CORRECT

B. If irrationals were countable, their union with the countable rationals would make all reals countable, contradicting uncountability of $\mathbb{R}$.

API confidence: 1.00
Option probabilities:
{`"B"`: 1.0, `"C"`: 0.0, `"D"`: 0.0, `"A"`: 0.0}

Section batch: 361 ms
Not per-question latency

QUESTION + OPTIONS

Is NOT True always true?

A. Yes

B. No

REFERENCE ANSWER

B. No

JEV / CORRECT

B. No

API confidence: 0.86
Option probabilities:
{ "B": 0.93, "A": 0.07 }

Section batch: 312 ms
Not per-question latency

QUESTION + OPTIONS

Is $P \text{ OR } [(P \text{ implies } Q) \text{ AND } (P \text{ implies NOT } Q)]$ always true?

A. Yes

B. No

REFERENCE ANSWER

A. Yes

JEV / INCORRECT

B. No

API confidence: 0.88
Option probabilities:
{ "B": 0.94, "A": 0.06 }

Section batch: 312 ms
Not per-question latency

QUESTION + OPTIONS

Is NOT(P implies Q) equivalent to P AND NOT Q?

A. Yes

B. No

REFERENCE ANSWER

A. Yes

JEV / CORRECT

A. Yes

API confidence: 0.98
Option probabilities:
{ "B": 0.01, "A": 0.99 }

Section batch: 312 ms
Not per-question latency

QUESTION + OPTIONS

S is nonempty. Consider [forall y in S, exists x in S, Q(x) AND P(y)] implies [(exists x in S, Q(x)) AND (forall y in S, P(y))].

Is this implication always true?

A. No

B. Yes

REFERENCE ANSWER

B. Yes

JEV / CORRECT

B. Yes

API confidence: 0.85
Option probabilities:
{ "B": 0.93, "A": 0.07 }

Section batch: 312 ms
Not per-question latency

QUESTION + OPTIONS

S is nonempty. Consider $[\text{forall } y \text{ in } S, \text{ exists } x \text{ in } S, Q(x) \text{ AND } P(y)] \text{ implies } [(\text{exists } x \text{ in } S, Q(x)) \text{ AND } (\text{forall } y \text{ in } S, P(y))]$.

Choose a valid justification.

- A. The premise ensures $P(y)$ for every y . Choose any y in nonempty S ; its witness x supplies $Q(x)$, yielding both conjuncts.
- B. The implication fails when P and Q are both always true.
- C. The implication fails because existential and universal quantifiers can never be exchanged.
- D. The premise requires the same x for every y , so it is always false.

REFERENCE ANSWER

A. The premise ensures $P(y)$ for every y . Choose any y in nonempty S ; its witness x supplies $Q(x)$, yielding both conjuncts.

JEV / CORRECT

A. The premise ensures $P(y)$ for every y . Choose any y in nonempty S ; its witness x supplies $Q(x)$, yielding both conjuncts.

API confidence: 1.00
Option probabilities:
{ "B": 0.0, "A": 1.0, "C": 0.0, "D": 0.0 }

Section batch: 312 ms
Not per-question latency

QUESTION + OPTIONS

Prove n divides $(n-1)!$ for composite $n > 4$. Hint: separate square and nonsquare factorizations.

- A. Write $n=ab$ with $1 < a, b < n$. If $a \neq b$, both appear in the factorial. If $a=b$, $a > 2$ and $a, 2a < n$ are distinct factors in it, whose product $2n$ is divisible by n .
- B. Since n is composite, $n-1$ is divisible by each prime factor of n .
- C. Every proper divisor appears once in the factorial, so all repeated prime factors are automatically accounted for without further argument.
- D. Wilson’s theorem says every integer n divides $(n-1)!$, including primes.

REFERENCE ANSWER

A. Write $n=ab$ with $1 < a, b < n$. If $a \neq b$, both appear in the factorial. If $a=b$, $a > 2$ and $a, 2a < n$ are distinct factors in it, whose product $2n$ is divisible by n .

JEV / CORRECT

A. Write $n=ab$ with $1 < a, b < n$. If $a \neq b$, both appear in the factorial. If $a=b$, $a > 2$ and $a, 2a < n$ are distinct factors in it, whose product $2n$ is divisible by n .

API confidence: 1.00
Option probabilities:
{ "C": 0.0, "A": 1.0, "D": 0.0, "B": 0.0 }

Section batch: 357 ms
Not per-question latency

QUESTION + OPTIONS

For real r , prove r^2 irrational implies r irrational.

- A. The square root of every rational is rational; take the converse.
- B. Contrapositive: $r=a/b$ with integers a,b and $b\neq 0$ implies $r^2=a^2/b^2$, a ratio of integers with nonzero denominator.
- C. If r is irrational, r^2 cannot be an integer, proving the claim.
- D. Every irrational squared remains irrational; reverse the implication.

REFERENCE ANSWER

B. Contrapositive: $r=a/b$ with integers a,b and $b\neq 0$ implies $r^2=a^2/b^2$, a ratio of integers with nonzero denominator.

JEV / CORRECT

B. Contrapositive: $r=a/b$ with integers a,b and $b\neq 0$ implies $r^2=a^2/b^2$, a ratio of integers with nonzero denominator.

API confidence: 1.00
Option probabilities:
{ "C": 0.0, "A": 0.0, "D": 0.0, "B": 1.0 }

Section batch: 357 ms
Not per-question latency

QUESTION + OPTIONS

- Prove $A_n=3^{(2n+1)}+2^{(n-1)}$ is divisible by 7 for $n \geq 1$.
- A. Checking the first seven n proves the rest by periodicity over the integers.
 - B. $A_1=28$. Both exponential terms are independently divisible by 7.
 - C. $A_1=28$. If 7 divides A_n , then $A_{(n+1)}=7 \cdot 3^{(2n+1)}+2A_n$ is divisible by 7.
 - D. $A_1=28$. The recurrence is $A_{(n+1)}=9A_n$, so the result follows.

REFERENCE ANSWER

C. $A_1=28$. If 7 divides A_n , then $A_{(n+1)}=7 \cdot 3^{(2n+1)}+2A_n$ is divisible by 7.

JEV / CORRECT

C. $A_1=28$. If 7 divides A_n , then $A_{(n+1)}=7 \cdot 3^{(2n+1)}+2A_n$ is divisible by 7.

API confidence: 0.98
Option probabilities:
{ "B": 0.0, "C": 0.99, "A": 0.0, "D": 0.01 }

Section batch: 372 ms
Not per-question latency

QUESTION + OPTIONS

Jobs: A:1>2>3, B:2>3>1, C:2>3>1. Candidates: 1:B>C>A, 2:C>A>B, 3:C>A>B.

Job-optimal matching?

A. A-3, B-1, C-2

B. A-1, B-2, C-3

C. A-1, B-3, C-2

D. A-2, B-3, C-1

REFERENCE ANSWER

C. A-1, B-3, C-2

JEV / INCORRECT

A. A-3, B-1, C-2

API confidence: 0.25
Option probabilities:
{ "C": 0.23, "A": 0.44, "D": 0.09, "B": 0.24 }

Section batch: 337 ms
Not per-question latency

QUESTION + OPTIONS

Jobs: A:1>2>3, B:2>3>1, C:2>3>1. Candidates: 1:B>C>A, 2:C>A>B, 3:C>A>B.

Candidate-optimal matching?

A. A-1, B-3, C-2

B. A-3, B-1, C-2

C. A-1, B-2, C-3

D. A-2, B-3, C-1

REFERENCE ANSWER

B. A-3, B-1, C-2

JEV / CORRECT

B. A-3, B-1, C-2

API confidence: 0.40
Option probabilities:
{ "C": 0.13, "A": 0.23, "D": 0.09, "B": 0.55 }

Section batch: 337 ms
Not per-question latency

QUESTION + OPTIONS

Jobs: A:1>2>3, B:2>3>1, C:2>3>1. Candidates: 1:B>C>A, 2:C>A>B, 3:C>A>B.

Another stable matching beyond the two proposer-optimal ones?

A. A-2, B-1, C-3

B. A-3, B-2, C-1

C. A-1, B-2, C-3

D. None

REFERENCE ANSWER

D. None

JEV / CORRECT

D. None

API confidence: 0.20
Option probabilities:
{ "C": 0.06, "A": 0.32, "D": 0.4, "B": 0.22 }

Section batch: 337 ms
Not per-question latency

QUESTION + OPTIONS

A job receiving its least-preferred candidate in the job-optimal matching must be every candidate’s least-preferred job.

A. False

B. True

REFERENCE ANSWER

A. False

JEV / CORRECT

A. False

API confidence: 0.32
Option probabilities:
{ "A": 0.66, "B": 0.34 }

Section batch: 337 ms
Not per-question latency

QUESTION + OPTIONS

If a job has the same candidate in every stable matching, that candidate must be its first choice.

A. True

B. False

REFERENCE ANSWER

B. False

JEV / CORRECT

B. False

API confidence: 0.02
Option probabilities:
{ "B": 0.51, "A": 0.49 }

Section batch: 337 ms
Not per-question latency

QUESTION + OPTIONS

If a candidate rejects all offers one day instead of retaining its favorite in job-proposing deferred acceptance, any resulting complete matching must be worse for that candidate.

A. True

B. False

REFERENCE ANSWER

B. False

JEV / INCORRECT

A. True

API confidence: 0.30
Option probabilities:
{ "A": 0.65, "B": 0.35 }

Section batch: 337 ms
Not per-question latency

QUESTION + OPTIONS

A job-candidate pair present in both proposer-optimal matchings is present in every stable matching.

A. True

B. False

REFERENCE ANSWER

A. True

JEV / CORRECT

A. True

API confidence: 0.55
Option probabilities:
{ "A": 0.77, "B": 0.23 }

Section batch: 337 ms
Not per-question latency

QUESTION + OPTIONS

A graph with n vertices and $m \geq n-1$ edges must be connected.

A. False

B. True

REFERENCE ANSWER

A. False

JEV / CORRECT

A. False

API confidence: 0.98
Option probabilities:
{ "A": 0.99, "B": 0.01 }

Section batch: 402 ms
Not per-question latency

QUESTION + OPTIONS

A graph with n vertices and $m \leq n-1$ edges must be acyclic.

A. True

B. False

REFERENCE ANSWER

B. False

JEV / CORRECT

B. False

API confidence: 0.88
Option probabilities:
{ "A": 0.06, "B": 0.94 }

Section batch: 402 ms
Not per-question latency

QUESTION + OPTIONS

Number of edges in K_n ?

- A. $C(n,2)$
- B. n^2
- C. $2n$
- D. $n-1$

REFERENCE ANSWER

A. $C(n,2)$

JEV / CORRECT

A. $C(n,2)$

API confidence: 1.00
Option probabilities:
{ "A": 1.0, "B": 0.0, "C": 0.0, "D": 0.0 }

Section batch: 402 ms
Not per-question latency

QUESTION + OPTIONS

A hypercube has n vertices. Number of edges?

A. $n \log_2(n)$

B. $n \log_2(n)/2$

C. $n/2$

D. 2^n

REFERENCE ANSWER

B. $n \log_2(n)/2$

JEV / CORRECT

B. $n \log_2(n)/2$

API confidence: 0.89
Option probabilities:
{ "A": 0.08, "B": 0.91, "C": 0.01, "D": 0.0 }

Section batch: 402 ms
Not per-question latency

QUESTION + OPTIONS

A graph with an Eulerian tour must have an even number of edges.

A. True

B. False

REFERENCE ANSWER

B. False

JEV / CORRECT

B. False

API confidence: 0.60
Option probabilities:
{ "A": 0.2, "B": 0.8 }

Section batch: 402 ms
Not per-question latency

QUESTION + OPTIONS

Minimum possible connected components for a simple graph with $n \geq 1$ vertices and feasible edge count m ?

- A. $\max(1, n-m)$
- B. $n-m$
- C. $n-1$
- D. $\max(1, m-n)$

REFERENCE ANSWER

A. $\max(1, n-m)$

JEV / CORRECT

A. $\max(1, n-m)$

API confidence: 0.96
Option probabilities:
{ "A": 0.97, "B": 0.03, "C": 0.0, "D": 0.0 }

Section batch: 402 ms
Not per-question latency

QUESTION + OPTIONS

A connected acyclic graph with at least two vertices has at least how many degree-one vertices? Give the sharp universal bound.

- A. 3
- B. 1
- C. 2
- D. n-1

REFERENCE ANSWER

C. 2

Pre-run repair:
Require at least two vertices to exclude the one-vertex tree.

JEV / CORRECT

C. 2

API confidence: 1.00
Option probabilities:
{ "A": 0.0, "B": 0.0, "C": 1.0, "D": 0.0 }

Section batch: 402 ms
Not per-question latency

QUESTION + OPTIONS

A forest has n vertices and c components. Number of edges?

A. $c-1$

B. $n-1$

C. $n+c$

D. $n-c$

REFERENCE ANSWER

D. $n-c$

JEV / CORRECT

D. $n-c$

API confidence: 1.00
Option probabilities:
{**"A"**: 0.0, "B": 0.0, "C": 0.0, "D": 1.0}

Section batch: 402 ms
Not per-question latency

QUESTION + OPTIONS

Every graph has an even number of odd-degree vertices.

A. True

B. False

REFERENCE ANSWER

A. True

JEV / CORRECT

A. True

API confidence: 0.99
Option probabilities:
{ "A": 0.99, "B": 0.01 }

Section batch: 402 ms
Not per-question latency

QUESTION + OPTIONS

Minimum edge colors for a d-dimensional hypercube?

- A. $d+1$
- B. d
- C. 2^d
- D. $2d$

REFERENCE ANSWER

B. d

JEV / CORRECT

B. d

API confidence: 0.92
Option probabilities:
{**"A"**: 0.05, **"B"**: 0.94, "C": 0.0, "D": 0.01}

Section batch: 402 ms
Not per-question latency

QUESTION + OPTIONS

Minimum edge colors for an odd cycle?

- A. 4
- B. 2
- C. 1
- D. 3

REFERENCE ANSWER

D. 3

JEV / CORRECT

D. 3

API confidence: 0.96
Option probabilities:
{ "A": 0.01, "B": 0.02, "C": 0.0, "D": 0.97 }

Section batch: 402 ms
Not per-question latency

QUESTION + OPTIONS

A simple graph has n vertices and $n+1$ edges. Largest constant degree guaranteed for at least one vertex?

- A. 3
- B. 2
- C. 4
- D. $n-1$

REFERENCE ANSWER

A. 3

JEV / CORRECT

A. 3

Pre-run repair:
Make n -vertex premise explicit; source omitted it in the local sentence.

API confidence: 0.60
Option probabilities:
{`"A": 0.71, "B": 0.21, "C": 0.08, "D": 0.0`}

Section batch: 402 ms
Not per-question latency

QUESTION + OPTIONS

A connected simple planar drawing has $v > 2$ vertices and $e < 3v - 6$. Prove some face has boundary length at least 4, counting repeated edge sides.

A. If every face had length 3, then $3f = 2e$. Euler's $v - e + f = 2$ would force $e = 3v - 6$, a contradiction; each face has length at least 3.

B. Since $e < 3v - 6$, every vertex has degree at most two, and every face is a quadrilateral.

C. A planar graph can have only triangular or quadrilateral faces; fewer edges forbid triangles.

D. Euler says $f = 3$ for every planar graph, so one face has four sides.

REFERENCE ANSWER

A. If every face had length 3, then $3f = 2e$. Euler's $v - e + f = 2$ would force $e = 3v - 6$, a contradiction; each face has length at least 3.

JEV / CORRECT

A. If every face had length 3, then $3f = 2e$. Euler's $v - e + f = 2$ would force $e = 3v - 6$, a contradiction; each face has length at least 3.

API confidence: 1.00
Option probabilities:
{ "D": 0.0, "A": 1.0, "C": 0.0, "B": 0.0 }

Section batch: 371 ms
Not per-question latency

QUESTION + OPTIONS

Partition the edges of a bipartite Eulerian graph into two spanning subgraphs with half of each vertex’s degree.

- A. Color a spanning tree one color and all remaining edges the other; this halves each degree.
- B. Alternate the edges of an Euler tour between the two sets. The tour has even length because the graph is bipartite; paired arrival/departure edges, including the wraparound, receive opposite colors at every vertex.
- C. Assign every edge incident to the left bipartition to the first set and all others to the second.
- D. Take any half of the edges; equal edge counts imply equal degrees at every vertex.

REFERENCE ANSWER

B. Alternate the edges of an Euler tour between the two sets. The tour has even length because the graph is bipartite; paired arrival/departure edges, including the wraparound, receive opposite colors at every vertex.

JEV / CORRECT

B. Alternate the edges of an Euler tour between the two sets. The tour has even length because the graph is bipartite; paired arrival/departure edges, including the wraparound, receive opposite colors at every vertex.

API confidence: 1.00
Option probabilities:
{ "D": 0.0, "C": 0.0, "A": 0.0, "B": 1.0 }

Section batch: 371 ms
Not per-question latency

QUESTION + OPTIONS

For integers a, x, y , $\gcd(x, y) = 1$ and a divides xy imply a divides x or a divides y .

A. True

B. False

REFERENCE ANSWER

B. False

JEV / CORRECT

B. False

API confidence: 0.12
Option probabilities:
{"B": 0.56, "A": 0.44}

Section batch: 338 ms
Not per-question latency

QUESTION + OPTIONS

Choose a counterexample to: $\gcd(x,y)=1$ and $a|xy$ imply $a|x$ or $a|y$.

- A. $a=3,x=9,y=4$
- B. $a=6,x=9,y=4$
- C. $a=6,x=6,y=5$
- D. $a=5,x=9,y=4$

REFERENCE ANSWER

B. $a=6,x=9,y=4$

JEV / CORRECT

B. $a=6,x=9,y=4$

API confidence: 0.96
Option probabilities:
{**"B"**: 0.97, "D": 0.02, "C": 0.0, "A": 0.01}

Section batch: 338 ms
Not per-question latency

QUESTION + OPTIONS

$N=pqr$ for three distinct primes p,q,r .

Number of residues $x \bmod N$ satisfying $qx=0 \bmod N$?

A. 1

B. pqr

C. q

D. pr

REFERENCE ANSWER

C. q

JEV / INCORRECT

D. pr

API confidence: 0.82
Option probabilities:
{**"B"**: 0.01, **"D"**: 0.86, **"C"**: 0.11, **"A"**: 0.02}

Section batch: 338 ms
Not per-question latency

QUESTION + OPTIONS

$N=pqr$ for three distinct primes p,q,r .

If $\gcd(x,N)=1$, what is $x^{((p-1)(q-1)(r-1))} \bmod N$?

- A. $N-1$
- B. x
- C. 0
- D. 1

REFERENCE ANSWER

D. 1

JEV / CORRECT

D. 1

API confidence: 0.98
Option probabilities:
{**"B"**: 0.01, **"D"**: 0.99, "C": 0.0, "A": 0.0}

Section batch: 338 ms
Not per-question latency

QUESTION + OPTIONS

- $N=pqr$ for three distinct primes p,q,r .
- Why is $x^{((p-1)(q-1)(r-1))}=1 \bmod N$ when $\gcd(x,N)=1$?
- A. Being coprime to N means $x=1 \bmod N$.
 - B. Fermat applies directly to the composite modulus pqr with exponent $pqr-1$.
 - C. Fermat gives value 1 modulo each prime because the exponent is a multiple of each prime minus one. CRT makes their common solution 1 modulo pqr .
 - D. The exponent is zero modulo every prime, so the power is one.

REFERENCE ANSWER

C. Fermat gives value 1 modulo each prime because the exponent is a multiple of each prime minus one. CRT makes their common solution 1 modulo pqr .

JEV / CORRECT

C. Fermat gives value 1 modulo each prime because the exponent is a multiple of each prime minus one. CRT makes their common solution 1 modulo pqr .

API confidence: 1.00
Option probabilities:
{`"B": 0.0, "D": 0.0, "C": 1.0, "A": 0.0`}

Section batch: 338 ms
Not per-question latency

QUESTION + OPTIONS

Multiplicative order of 3 modulo 5?

- A. 3
- B. 5
- C. 2
- D. 4

REFERENCE ANSWER

D. 4

JEV / CORRECT

D. 4

API confidence: 0.91
Option probabilities:
{**"C"**: 0.06, "B": 0.0, "A": 0.0, "D": 0.94000000000000001}

Section batch: 351 ms
Not per-question latency

QUESTION + OPTIONS

Let t be the order of a modulo n , $\gcd(a,n)=1$. Prove $a^m=1 \bmod n$ iff t divides m .

- A. Multiples of t give powers of $a^t=1$. Conversely write $m=qt+r$, $0\leq r<t$; $a^m=a^r=1$ forces $r=0$ by minimality of t .
- B. Every exponent m is divisible by the order, because a is invertible.
- C. Fermat gives $t=n-1$ for every modulus n and every a , proving the claim.
- D. If $a^m=1$ then $m=t$, since the order is unique.

REFERENCE ANSWER

A. Multiples of t give powers of $a^t=1$. Conversely write $m=qt+r$, $0\leq r<t$; $a^m=a^r=1$ forces $r=0$ by minimality of t .

JEV / CORRECT

A. Multiples of t give powers of $a^t=1$. Conversely write $m=qt+r$, $0\leq r<t$; $a^m=a^r=1$ forces $r=0$ by minimality of t .

API confidence: 1.00
Option probabilities:
{ "B": 0.0, "C": 0.0, "A": 1.0, "D": 0.0 }

Section batch: 351 ms
Not per-question latency

QUESTION + OPTIONS

- Prime p does not divide a . Why does $\text{ord}_p(a)$ divide $p-1$?
- A. The order divides p by Lagrange, and hence also $p-1$.
 - B. Fermat gives $a^{(p-1)}=1$, and the order divides every exponent yielding one.
 - C. All nonzero residues have order exactly $p-1$.
 - D. Because $p-1$ divides every nonzero residue a .

REFERENCE ANSWER

B. Fermat gives $a^{(p-1)}=1$, and the order divides every exponent yielding one.

JEV / CORRECT

B. Fermat gives $a^{(p-1)}=1$, and the order divides every exponent yielding one.

API confidence: 1.00
Option probabilities:
{ "C": 0.0, "B": 1.0, "A": 0.0, "D": 0.0 }

Section batch: 351 ms
Not per-question latency

QUESTION + OPTIONS

Prove there is no integer $n > 1$ with n dividing $2^n - 1$.

- A. Since $2^n - 1$ is odd, no integer n can divide it.
- B. If n divides $2^n - 1$, then n divides 2 and n divides 1 separately.
- C. Such n is odd. Let p be its smallest prime factor and $t = \text{ord}_p(2) > 1$. Then t divides n and $p - 1$, so a prime factor of t is a prime factor of n smaller than p , a contradiction.
- D. Fermat says $2^n \equiv 2 \pmod n$ even for composite n , so the remainder is always one.

REFERENCE ANSWER

C. Such n is odd. Let p be its smallest prime factor and $t = \text{ord}_p(2) > 1$. Then t divides n and $p - 1$, so a prime factor of t is a prime factor of n smaller than p , a contradiction.

JEV / CORRECT

C. Such n is odd. Let p be its smallest prime factor and $t = \text{ord}_p(2) > 1$. Then t divides n and $p - 1$, so a prime factor of t is a prime factor of n smaller than p , a contradiction.

API confidence: 1.00
Option probabilities:
{ "C": 1.0, "B": 0.0, "A": 0.0, "D": 0.0 }

Section batch: 351 ms
Not per-question latency

QUESTION + OPTIONS

7^26 modulo 10?

- A. 1
- B. 9
- C. 3
- D. 7

REFERENCE ANSWER

B. 9

JEV / CORRECT

B. 9

API confidence: 0.44
Option probabilities:
{ "D": 0.18, "A": 0.08, "B": 0.59, "C": 0.15 }

Section batch: 466 ms
Not per-question latency

QUESTION + OPTIONS

Inverse of 7 modulo 68 in 0..67?

- A. 29
- B. 39
- C. 10
- D. 61

REFERENCE ANSWER

B. 39

JEV / CORRECT

B. 39

API confidence: 0.66
Option probabilities:
{ "D": 0.03, "A": 0.21, "B": 0.75, "C": 0.01 }

Section batch: 466 ms
Not per-question latency

QUESTION + OPTIONS

Distinct integers x,y are congruent modulo positive m and n , $\gcd(m,n)=d$. Sharp lower bound on $|x-y|$?

- A. mn
- B. $m+n$
- C. mn/d
- D. d

REFERENCE ANSWER

C. mn/d

JEV / CORRECT

C. mn/d

API confidence: 0.85
Option probabilities:
{ $"D"$: 0.1, $"A"$: 0.01, $"B"$: 0.0, $"C"$: 0.89}

Section batch: 466 ms
Not per-question latency

QUESTION + OPTIONS

Number of x in $0..504$ solving $10x \equiv 5 \pmod{505}$?

- A. 1
- B. 5
- C. 10
- D. 0

REFERENCE ANSWER

B. 5

JEV / INCORRECT

A. 1

API confidence: 0.51
Option probabilities:
{ $"D"$: 0.13, $"A"$: 0.64, $"B"$: 0.18, $"C"$: 0.05}

Section batch: 466 ms
Not per-question latency

QUESTION + OPTIONS

For valid textbook RSA encryption E and decryption D , $D(E(x))=E(D(x))$ modulo N for every message x .

- A. True
- B. False

REFERENCE ANSWER

A. True

JEV / INCORRECT

B. False

API confidence: 0.30
Option probabilities:
{ "A": 0.35, "B": 0.65 }

Section batch: 466 ms
Not per-question latency

QUESTION + OPTIONS

Given $y=E(E(x))$ in valid RSA, which expression recovers x ?

- A. $D(D(y))$
- B. $E(E(y))$
- C. $E(D(y))$
- D. $D(y)$

REFERENCE ANSWER

A. $D(D(y))$

JEV / CORRECT

A. $D(D(y))$

API confidence: 0.95
Option probabilities:
{ $"D"$: 0.02, $"A"$: 0.96, $"B"$: 0.0, $"C"$: 0.02}

Section batch: 466 ms
Not per-question latency

QUESTION + OPTIONS

In valid textbook RSA, $a=E(x)$, $b=E(y)$. What is $D(ab)$ modulo N ?

- A. xy
- B. x^y
- C. $x+y$
- D. x/y

REFERENCE ANSWER

A. xy

JEV / CORRECT

A. xy

API confidence: 0.98
Option probabilities:
{ $"D"$: 0.0, $"A"$: 0.99, $"B"$: 0.01, $"C"$: 0.0}

Section batch: 466 ms
Not per-question latency

QUESTION + OPTIONS

Over $\text{GF}(5)$, give a degree-at-most-2 polynomial through $(0,1),(1,0),(3,0)$.

A. $2(x-1)(x-3)$

B. $3(x-1)(x-3)$

C. $(x-1)(x-3)$

D. $2(x+1)(x+3)$

REFERENCE ANSWER

A. $2(x-1)(x-3)$

JEV / CORRECT

A. $2(x-1)(x-3)$

API confidence: 0.58
Option probabilities:
{`"D"`: 0.02, `"B"`: 0.21, `"A"`: 0.68, `"C"`: 0.09}

Section batch: 332 ms
Not per-question latency

QUESTION + OPTIONS

Over $\text{GF}(5)$, ax^2+bx+c passes through $(0,0),(1,1),(2,4)$. Give (a,b,c) .

- A. $(1,1,0)$
- B. $(2,4,0)$
- C. $(1,0,0)$
- D. $(0,1,0)$

REFERENCE ANSWER

C. $(1,0,0)$

JEV / CORRECT

C. $(1,0,0)$

API confidence: 0.71
Option probabilities:
{ $"D"$: 0.03, $"B"$: 0.03, $"A"$: 0.16, $"C"$: 0.78}

Section batch: 332 ms
Not per-question latency

QUESTION + OPTIONS

Over $\text{GF}(p)$, $p \geq 5$, four points have distinct x-coordinates. Number of degree-at-most-4 polynomials through them?

- A. p^2
- B. 1
- C. p
- D. $p-1$

REFERENCE ANSWER

C. p

Pre-run repair:
Specify distinct x-coordinates.

JEV / INCORRECT

A. p^2

API confidence: 0.59
Option probabilities:
{ $"D"$: 0.01, $"A"$: 0.69, $"B"$: 0.05, $"C"$: 0.25}

Section batch: 332 ms
Not per-question latency

QUESTION + OPTIONS

Polynomial division over a field: $P=QD+R$, $\deg P=d$, $\deg D=d'$, with $1\leq d'<d$ and remainder degree minimized.

Exact degree of Q ?

- A. $d-d'$
- B. $d'-1$
- C. $d+d'$
- D. d/d'

REFERENCE ANSWER

A. $d-d'$

JEV / CORRECT

A. $d-d'$

API confidence: 1.00
Option probabilities:
{`"D"`: 0.0, `"B"`: 0.0, `"A"`: 1.0, `"C"`: 0.0}

Section batch: 332 ms
Not per-question latency

QUESTION + OPTIONS

Polynomial division over a field: $P=QD+R$, $\deg P=d$, $\deg D=d'$, with $1\leq d'<d$ and remainder degree minimized.

Tight upper bound on nonzero R 's degree?

- A. $d'-1$
- B. $d-d'$
- C. $d-1$
- D. d'

REFERENCE ANSWER

A. $d'-1$

JEV / CORRECT

A. $d'-1$

API confidence: 0.98
Option probabilities:
{ $"D"$: 0.0, $"A"$: 0.99, $"B"$: 0.0, $"C"$: 0.01}

Section batch: 332 ms
Not per-question latency

QUESTION + OPTIONS

Five TAs each hold a nonzero-coordinate share of P , three professors a share of Q ; $P(0)=Q(0)=s$. A strict majority of either group should reconstruct, and smaller coalitions within that group should not.

Degree of P ?

- A. 4
- B. 3
- C. 1
- D. 2

REFERENCE ANSWER

D. 2

JEV / INCORRECT

B. 3

API confidence: 0.30
Option probabilities:
{ $"B"$: 0.47, $"D"$: 0.1, $"A"$: 0.42, $"C"$: 0.01}

Section batch: 394 ms
Not per-question latency

QUESTION + OPTIONS

Five TAs each hold a nonzero-coordinate share of P , three professors a share of Q ; $P(0)=Q(0)=s$. A strict majority of either group should reconstruct, and smaller coalitions within that group should not.

Degree of Q ?

- A. 2
- B. 1
- C. 0
- D. 3

REFERENCE ANSWER

B. 1

JEV / INCORRECT

A. 2

API confidence: 0.48
Option probabilities:
{ $"B"$: 0.04, $"D"$: 0.34, $"A"$: 0.61, $"C"$: 0.01}

Section batch: 394 ms
Not per-question latency

QUESTION + OPTIONS

Five TAs each hold a nonzero-coordinate share of P , three professors a share of Q ; $P(0)=Q(0)=s$. A strict majority of either group should reconstruct, and smaller coalitions within that group should not.

For nonnegative integer secret s , sufficient prime size for distinct share coordinates?

- A. $p \geq \max(s+1, 6)$
- B. $p \geq s$
- C. $p \geq 3$
- D. $p \geq \max(s, 5)$

REFERENCE ANSWER

A. $p \geq \max(s+1, 6)$

JEV / CORRECT

A. $p \geq \max(s+1, 6)$

API confidence: 0.79
Option probabilities:
{"B": 0.02, "D": 0.11, "A": 0.85, "C": 0.02}

Section batch: 394 ms
Not per-question latency

QUESTION + OPTIONS

$P(x)=2x^2+3x+3$ over $GF(5)$; evaluations at 0,1,2,3,4 are sent and only the value at $x=1$ is corrupted. Monic $E(x)=x+b_0$ and $Q=PE$.

What is b_0 in $0..4$?

- A. 1
- B. 0
- C. 4
- D. 2

REFERENCE ANSWER

C. 4

JEV / CORRECT

C. 4

API confidence: 0.11
Option probabilities:
{ "B": 0.14, "D": 0.28, "A": 0.25, "C": 0.33 }

Section batch: 394 ms
Not per-question latency

QUESTION + OPTIONS

$P(x)=2x^2+3x+3$ over $GF(5)$; evaluations at $0,1,2,3,4$ are sent and only the value at $x=1$ is corrupted. Monic $E(x)=x+b_0$ and $Q=PE$.

Degree d of Q ?

- A. 3
- B. 4
- C. 2
- D. 1

REFERENCE ANSWER

A. 3

JEV / CORRECT

A. 3

API confidence: 0.98
Option probabilities:
{**"B"**: 0.02, "D": 0.0, "C": 0.0, "A": 0.98}

Section batch: 394 ms
Not per-question latency

QUESTION + OPTIONS

$P(x)=2x^2+3x+3$ over $GF(5)$; evaluations at 0,1,2,3,4 are sent and only the value at $x=1$ is corrupted. Monic $E(x)=x+b_0$ and $Q=PE$.

Leading coefficient qd of Q ?

- A. 1
- B. 4
- C. 3
- D. 2

REFERENCE ANSWER

D. 2

JEV / CORRECT

D. 2

API confidence: 0.76
Option probabilities:
{**"B"**: 0.1, **"D"**: 0.82, **"C"**: 0.02, **"A"**: 0.06}

Section batch: 394 ms
Not per-question latency

QUESTION + OPTIONS

$P(x)=2x^2+3x+3$ over $GF(5)$; evaluations at 0,1,2,3,4 are sent and only the value at $x=1$ is corrupted. Monic $E(x)=x+b_0$ and $Q=PE$.

Constant coefficient q_0 in terms of b_0 ?

- A. $2b_0$
- B. $3b_0$
- C. b_0
- D. $3+b_0$

REFERENCE ANSWER

B. $3b_0$

JEV / CORRECT

B. $3b_0$

API confidence: 0.86
Option probabilities:
{**"B"**: 0.9, "D": 0.05, "C": 0.02, "A": 0.03}

Section batch: 394 ms
Not per-question latency

QUESTION + OPTIONS

Number of formal polynomials of degree exactly d over $\text{GF}(p)$?

- A. $(p-1)p^d$
- B. $(p-1)^{(d+1)}$
- C. p^d
- D. $p^{(d+1)}$

REFERENCE ANSWER

A. $(p-1)p^d$

JEV / CORRECT

A. $(p-1)p^d$

API confidence: 0.99
Option probabilities:
{**"B"**: 0.0, **"C"**: 0.01, **"A"**: 0.99, **"D"**: 0.0}

Section batch: 403 ms
Not per-question latency

QUESTION + OPTIONS

Every degree-exactly-one polynomial over a field has exactly one root.

A. False

B. True

REFERENCE ANSWER

B. True

JEV / CORRECT

B. True

API confidence: 0.73
Option probabilities:
{ "B": 0.86, "A": 0.14 }

Section batch: 403 ms
Not per-question latency

QUESTION + OPTIONS

Choose a quadratic over $\text{GF}(p)$ having $x=1$ as its only distinct root, for every prime p .

- A. x^2-1
- B. $(x-1)^2$
- C. x^2+1
- D. $x(x-1)$

REFERENCE ANSWER

B. $(x-1)^2$

JEV / CORRECT

B. $(x-1)^2$

API confidence: 0.99
Option probabilities:
{**"B"**: 0.99, "C": 0.0, "A": 0.01, "D": 0.0}

Section batch: 403 ms
Not per-question latency

QUESTION + OPTIONS

Number of distinct formal polynomials $a(x-r)^2$ over $GF(p)$, a nonzero?

- A. $(p-1)C(p,2)$
- B. $(p-1)p$
- C. $p-1$
- D. p^2

REFERENCE ANSWER

B. $(p-1)p$

JEV / CORRECT

B. $(p-1)p$

API confidence: 0.70
Option probabilities:
{ "B": 0.78, "C": 0.04, "A": 0.17, "D": 0.01 }

Section batch: 403 ms
Not per-question latency

QUESTION + OPTIONS

Number of $a(x-r)(x-s)$, a nonzero and $r \neq s$, over $GF(p)$?

- A. $C(p,2)$
- B. p^2
- C. $(p-1)p(p-1)$
- D. $(p-1)C(p,2)$

REFERENCE ANSWER

D. $(p-1)C(p,2)$

JEV / CORRECT

D. $(p-1)C(p,2)$

API confidence: 0.79
Option probabilities:
{`"B"`: 0.01, `"C"`: 0.14, `"A"`: 0.01, `"D"`: 0.84}

Section batch: 403 ms
Not per-question latency

QUESTION + OPTIONS

Number of degree-exactly-two polynomials over $\text{GF}(p)$ with no field roots?

- A. $(p-1)(p^2-C(p,2)-p)$
- B. $(p-1)C(p,2)-p$
- C. $(p-1)(p^2-C(p,2))$
- D. $(p-1)p^2$

REFERENCE ANSWER

A. $(p-1)(p^2-C(p,2)-p)$

JEV / CORRECT

A. $(p-1)(p^2-C(p,2)-p)$

API confidence: 0.25
Option probabilities:
{**"B"**: 0.2, "C": 0.31, "A": 0.45, "D": 0.04}

Section batch: 403 ms
Not per-question latency

QUESTION + OPTIONS

For fixed distinct field elements $r_1, \dots, r_k$, count polynomials product $(x-r_i)^{b_i}$ with each $b_i \geq 1$ and $\sum b_i = d \geq k$.

- A. $C(d,k)$
- B. k^d
- C. $C(d+k-1,k-1)$
- D. $C(d-1,k-1)$

REFERENCE ANSWER

D. $C(d-1,k-1)$

Pre-run repair:
Require distinct roots so different exponent tuples give distinct formal polynomials.

JEV / CORRECT

D. $C(d-1,k-1)$

API confidence: 0.95
Option probabilities:
{ "B": 0.0, "C": 0.01, "A": 0.03, "D": 0.96 }

Section batch: 403 ms
Not per-question latency

QUESTION + OPTIONS

Number of unordered 13-card hands from 52 cards?

- A. $C(64,13)$
- B. $C(52,13)$
- C. $52!/39!$
- D. 52^{13}

REFERENCE ANSWER

B. $C(52,13)$

JEV / CORRECT

B. $C(52,13)$

API confidence: 1.00
Option probabilities:
{**"A"**: 0.0, **"B"**: 1.0, "C": 0.0, "D": 0.0}

Section batch: 391 ms
Not per-question latency

QUESTION + OPTIONS

Deal all 52 distinct cards to four named players, 13 each, unordered within each hand. Number of deals?

- A. $C(52,13)$
- B. $52!/(4! \cdot (13!)^4)$
- C. $52!/(13!)^4$
- D. 4^{52}

REFERENCE ANSWER

C. $52!/(13!)^4$

JEV / CORRECT

C. $52!/(13!)^4$

API confidence: 0.85
Option probabilities:
{ "A": 0.0, "B": 0.11, "C": 0.89, "D": 0.0 }

Section batch: 391 ms
Not per-question latency

QUESTION + OPTIONS

Count integer k -tuples with $x_i \geq -1$ and $\sum x_i = n$, $n \geq 0$, $k \geq 1$.

- A. $C(n+2k-1, k-1)$
- B. $C(n+k-1, k-1)$
- C. k^n
- D. $C(n-1, k-1)$

REFERENCE ANSWER

A. $C(n+2k-1, k-1)$

JEV / CORRECT

A. $C(n+2k-1, k-1)$

API confidence: 0.86
Option probabilities:
{ "A": 0.9, "B": 0.1, "C": 0.0, "D": 0.0 }

Section batch: 391 ms
Not per-question latency

QUESTION + OPTIONS

Number of anagrams of CANTSTANFURD?

- A. $12!/2!$
- B. $11!/(2!2!2!)$
- C. $12!/(3!3!)$
- D. $12!/(2!2!2!)$

REFERENCE ANSWER

D. $12!/(2!2!2!)$

JEV / CORRECT

D. $12!/(2!2!2!)$

API confidence: 0.69
Option probabilities:
{ "A": 0.16, "B": 0.06, "C": 0.01, "D": 0.77 }

Section batch: 391 ms
Not per-question latency

QUESTION + OPTIONS

Let x be the number of anagrams of CANTSTANFURD. How many put C before S before D, without an adjacency requirement?

- A. $x/2$
- B. $x/12$
- C. $x/6$
- D. $x/3$

REFERENCE ANSWER

C. $x/6$

JEV / CORRECT

C. $x/6$

API confidence: 0.92
Option probabilities:
{ "A": 0.0, "B": 0.04, "C": 0.94, "D": 0.02 }

Section batch: 391 ms
Not per-question latency

QUESTION + OPTIONS

Let x be the number of anagrams of CANTSTANFURD. How many put both As before S, without an adjacency requirement?

A. $x/2$

B. $2x/3$

C. $x/6$

D. $x/3$

REFERENCE ANSWER

D. $x/3$

JEV / INCORRECT

A. $x/2$

API confidence: 0.31
Option probabilities:
{ "A": 0.48, "B": 0.06, "C": 0.14, "D": 0.32 }

Section batch: 391 ms
Not per-question latency

QUESTION + OPTIONS

Number of length- n bitstrings with k ones?

- A. $C(n,k)$
- B. 2^k
- C. $n!/k!$
- D. n^k

REFERENCE ANSWER

A. $C(n,k)$

JEV / CORRECT

A. $C(n,k)$

API confidence: 1.00
Option probabilities:
{**"A"**: 1.0, "B": 0.0, "C": 0.0, "D": 0.0}

Section batch: 391 ms
Not per-question latency

QUESTION + OPTIONS

Distribute five identical dollar bills among four named people, allowing zero.
Number of allocations?

- A. $C(5,4)$
- B. $C(8,3)$
- C. 5^4
- D. 4^5

REFERENCE ANSWER

B. $C(8,3)$

JEV / CORRECT

B. $C(8,3)$

API confidence: 1.00
Option probabilities:
{**"A"**: 0.0, **"B"**: 1.0, **"C"**: 0.0, **"D"**: 0.0}

Section batch: 391 ms
Not per-question latency

QUESTION + OPTIONS

If 6 is prime, then trees can walk.

A. True

B. False

REFERENCE ANSWER

A. True

JEV / CORRECT

A. True

API confidence: 0.51
Option probabilities:
{ "A": 0.76, "B": 0.24 }

Section batch: 371 ms
Not per-question latency

QUESTION + OPTIONS

Is NOT(P implies Q) equivalent to (NOT P) AND (NOT Q)?

A. False

B. True

REFERENCE ANSWER

A. False

JEV / CORRECT

A. False

API confidence: 0.98
Option probabilities:
{ "A": 0.99, "B": 0.01 }

Section batch: 371 ms
Not per-question latency

QUESTION + OPTIONS

For integers a, m, n , prove: if a does not divide mn , then a divides neither m nor n . Which argument is valid?

- A. Contrapositive: if $m=ak$ or $n=ak$ for an integer k , then respectively $mn=a(kn)$ or $mn=a(km)$, so a divides mn .
- B. If a does not divide m or n , their product cannot be divisible by a .
- C. If a divides mn , it must divide both m and n ; take the converse.
- D. Since a does not divide mn , neither m nor n can have any divisor in common with a .

REFERENCE ANSWER

A. Contrapositive: if $m=ak$ or $n=ak$ for an integer k , then respectively $mn=a(kn)$ or $mn=a(km)$, so a divides mn .

JEV / CORRECT

A. Contrapositive: if $m=ak$ or $n=ak$ for an integer k , then respectively $mn=a(kn)$ or $mn=a(km)$, so a divides mn .

API confidence: 1.00
Option probabilities:
{ "D": 0.0, "A": 1.0, "B": 0.0, "C": 0.0 }

Section batch: 371 ms
Not per-question latency

QUESTION + OPTIONS

J means jumping, G on ground, M in motion, H healing, W touching a wall.

Express: Bloof is not healing unless it is not in motion.

A. NOT M implies NOT H

B. M implies NOT H

C. NOT H implies M

D. H implies M

REFERENCE ANSWER

B. M implies NOT H

JEV / CORRECT

B. M implies NOT H

API confidence: 0.98
Option probabilities:
{ "B": 0.98, "D": 0.01, "A": 0.0, "C": 0.01 }

Section batch: 385 ms
Not per-question latency

QUESTION + OPTIONS

J means jumping, G on ground, M in motion, H healing, W touching a wall.

Give the contrapositive of J implies (NOT G AND M).

A. (G OR NOT M) implies NOT J

B. (NOT G AND M) implies J

C. (G AND NOT M) implies NOT J

D. NOT J implies (G OR NOT M)

REFERENCE ANSWER

A. (G OR NOT M) implies NOT J

JEV / CORRECT

A. (G OR NOT M) implies NOT J

API confidence: 1.00
Option probabilities:
{ "B": 0.0, "D": 0.0, "A": 1.0, "C": 0.0 }

Section batch: 385 ms
Not per-question latency

QUESTION + OPTIONS

J means jumping, G on ground, M in motion, H healing, W touching a wall. Rules: H implies NOT M; J implies (NOT G AND M); NOT(G AND W); NOT G implies (M OR J).

H is true. What can be concluded about W?

- A. True
- B. Could be either
- C. False

REFERENCE ANSWER

C. False

JEV / INCORRECT

B. Could be either

API confidence: 0.88
Option probabilities:
{ "B": 0.92, "A": 0.02, "C": 0.06 }

Section batch: 385 ms
Not per-question latency

QUESTION + OPTIONS

Which proves that an integer n is odd iff $5n+3$ is even?

- A. If $n=2k+1$, then $5n+3$ is even; this alone proves both implications.
- B. For $n=2k+1$, $5n+3=2(5k+4)$. Conversely, if $n=2k$ then $5n+3=2(5k+1)+1$ is odd, proving the reverse implication by contrapositive.
- C. An odd integer plus 3 is always even, regardless of the factor 5; therefore every integer n is odd.
- D. If $5n+3=2k$, then $n=2(k-3)/5$ is even, so n is odd.

REFERENCE ANSWER

B. For $n=2k+1$, $5n+3=2(5k+4)$.
Conversely, if $n=2k$ then $5n+3=2(5k+1)+1$ is odd, proving the reverse implication by contrapositive.

JEV / CORRECT

B. For $n=2k+1$, $5n+3=2(5k+4)$.
Conversely, if $n=2k$ then $5n+3=2(5k+1)+1$ is odd, proving the reverse implication by contrapositive.

API confidence: 1.00
Option probabilities:
{ "B": 1.0, "C": 0.0, "D": 0.0, "A": 0.0 }

Section batch: 342 ms
Not per-question latency

QUESTION + OPTIONS

Prove 7 divides $A_n=2^{(n+2)}+3^{(2n+1)}$, for integers $n \geq 0$. Which induction works?

- A. $A_0=7$. If 7 divides A_k , then $A_{(k+1)}=2A_k+7 \cdot 3^{(2k+1)}$, so 7 also divides $A_{(k+1)}$.
- B. $A_0=7$ and $A_{(k+1)}=9A_k+7$, so divisibility follows.
- C. Check $n=0$ and $n=1$; two successful cases establish every n .
- D. $A_0=7$ and $A_{(k+1)}=2A_k$, so divisibility follows.

REFERENCE ANSWER

A. $A_0=7$. If 7 divides A_k , then $A_{(k+1)}=2A_k+7 \cdot 3^{(2k+1)}$, so 7 also divides $A_{(k+1)}$.

JEV / CORRECT

A. $A_0=7$. If 7 divides A_k , then $A_{(k+1)}=2A_k+7 \cdot 3^{(2k+1)}$, so 7 also divides $A_{(k+1)}$.

API confidence: 0.93
Option probabilities:
{ "B": 0.04, "C": 0.0, "D": 0.0, "A": 0.96 }

Section batch: 342 ms
Not per-question latency

QUESTION + OPTIONS

Jobs prefer A:2>3>1, B:2>3>1, C:1>3>2. Candidates prefer 1:A>B>C, 2:A>C>B, 3:C>A>B.

Is matching A-1, B-2, C-3 stable? Include a valid reason.

A. No; C and 2 form a blocking pair.

B. No; A and 2 form a blocking pair.

C. Yes; every candidate has a different job.

D. Yes; candidate 3 has its top choice.

REFERENCE ANSWER

B. No; A and 2 form a blocking pair.

JEV / CORRECT

B. No; A and 2 form a blocking pair.

API confidence: 0.53
Option probabilities:
{ "C": 0.02, "A": 0.3, "B": 0.64, "D": 0.04 }

Section batch: 327 ms
Not per-question latency

QUESTION + OPTIONS

Jobs prefer A:2>3>1, B:2>3>1, C:1>3>2. Candidates prefer 1:A>B>C, 2:A>C>B, 3:C>A>B.

Which matching is stable?

- A. A-1, B-3, C-2
- B. A-3, B-2, C-1
- C. A-1, B-2, C-3
- D. A-2, B-1, C-3

REFERENCE ANSWER

D. A-2, B-1, C-3

JEV / INCORRECT

C. A-1, B-2, C-3

API confidence: 0.30
Option probabilities:
{ "C": 0.48, "A": 0.23, "B": 0.25, "D": 0.04 }

Section batch: 327 ms
Not per-question latency

QUESTION + OPTIONS

In a stable matching, it is impossible for two partners to be each other’s least preferred option.

- A. True
- B. False

REFERENCE ANSWER

B. False

JEV / INCORRECT

A. True

API confidence: 0.11
Option probabilities:
{ "A": 0.55, "B": 0.45 }

Section batch: 327 ms
Not per-question latency

QUESTION + OPTIONS

If a job has the same partner in every stable matching, that partner must be its first choice.

A. True

B. False

REFERENCE ANSWER

B. False

JEV / CORRECT

B. False

API confidence: 0.13
Option probabilities:
{ "A": 0.43, "B": 0.57 }

Section batch: 327 ms
Not per-question latency

QUESTION + OPTIONS

Job-proposing and candidate-proposing deferred acceptance produce the same matching. How many stable matchings exist?

- A. Exactly one
- B. None
- C. Cannot be determined
- D. More than one

REFERENCE ANSWER

A. Exactly one

JEV / CORRECT

A. Exactly one

API confidence: 0.84
Option probabilities:
{ "C": 0.12, "A": 0.88, "B": 0.0, "D": 0.0 }

Section batch: 327 ms
Not per-question latency

QUESTION + OPTIONS

K4 has an Eulerian tour.

A. False

B. True

REFERENCE ANSWER

A. False

JEV / CORRECT

A. False

API confidence: 0.67
Option probabilities:
{ "B": 0.16, "A": 0.84 }

Section batch: 297 ms
Not per-question latency

QUESTION + OPTIONS

K6 is planar.

A. False

B. True

REFERENCE ANSWER

A. False

JEV / CORRECT

A. False

API confidence: 0.99
Option probabilities:
{ "B": 0.0, "A": 1.0 }

Section batch: 297 ms
Not per-question latency

QUESTION + OPTIONS

A graph has vertex degrees 4,3,3,2,1,1. How many edges?

- A. 8
- B. 14
- C. 6
- D. 7

REFERENCE ANSWER

D. 7

JEV / INCORRECT

C. 6

API confidence: 0.44
Option probabilities:
{ "B": 0.0, "C": 0.59, "D": 0.34, "A": 0.07 }

Section batch: 297 ms
Not per-question latency

QUESTION + OPTIONS

In the 5-dimensional hypercube, what is the distance between 10010 and 01000?

- A. 4
- B. 3
- C. 5
- D. 2

REFERENCE ANSWER

B. 3

JEV / CORRECT

B. 3

API confidence: 0.62
Option probabilities:
{ "B": 0.71, "C": 0.0, "D": 0.09, "A": 0.2 }

Section batch: 297 ms
Not per-question latency

QUESTION + OPTIONS

The undirected train graph has exactly these edges: Oakland-Berkeley, Berkeley-Richmond, Oakland-Orinda, Orinda-Walnut Creek, Oakland-Market Street, Market Street-Mission Street, Mission Street-Daly City, Oakland-Coliseum, Coliseum-Fremont.

Is this graph a tree?

A. No

B. Yes

REFERENCE ANSWER

B. Yes

JEV / CORRECT

B. Yes

API confidence: 0.51
Option probabilities:
{ "A": 0.24, "B": 0.76 }

Section batch: 562 ms
Not per-question latency

QUESTION + OPTIONS

The undirected train graph has exactly these edges: Oakland-Berkeley, Berkeley-Richmond, Oakland-Orinda, Orinda-Walnut Creek, Oakland-Market Street, Market Street-Mission Street, Mission Street-Daly City, Oakland-Coliseum, Coliseum-Fremont.

Is this graph bipartite?

A. No

B. Yes

REFERENCE ANSWER

B. Yes

JEV / CORRECT

B. Yes

API confidence: 0.23
Option probabilities:
{ "A": 0.39, "B": 0.61 }

Section batch: 562 ms
Not per-question latency

QUESTION + OPTIONS

The undirected train graph has exactly these edges: Oakland-Berkeley, Berkeley-Richmond, Oakland-Orinda, Orinda-Walnut Creek, Oakland-Market Street, Market Street-Mission Street, Mission Street-Daly City, Oakland-Coliseum, Coliseum-Fremont.

What is the minimum number of colors for a proper edge coloring?

- A. 3
- B. 5
- C. 4
- D. 2

REFERENCE ANSWER

C. 4

JEV / CORRECT

C. 4

API confidence: 0.20
Option probabilities:
{ "D": 0.01, "A": 0.25, "B": 0.34, "C": 0.4 }

Section batch: 562 ms
Not per-question latency

QUESTION + OPTIONS

The undirected train graph has exactly these edges: Oakland-Berkeley, Berkeley-Richmond, Oakland-Orinda, Orinda-Walnut Creek, Oakland-Market Street, Market Street-Mission Street, Mission Street-Daly City, Oakland-Coliseum, Coliseum-Fremont.

Does the graph have an Eulerian walk? If not, choose an edge to add that creates one.

- A. No; add Berkeley-Coliseum.
- B. Yes; no added edge needed.
- C. No; add Oakland-Daly City.
- D. No; add Walnut Creek-Fremont.

REFERENCE ANSWER

D. No; add Walnut Creek-Fremont.

JEV / INCORRECT

C. No; add Oakland-Daly City.

API confidence: 0.07
Option probabilities:
{ "D": 0.21, "A": 0.24, "B": 0.25, "C": 0.3 }

Section batch: 562 ms
Not per-question latency

QUESTION + OPTIONS

The undirected train graph has exactly these edges: Oakland-Berkeley, Berkeley-Richmond, Oakland-Orinda, Orinda-Walnut Creek, Oakland-Market Street, Market Street-Mission Street, Mission Street-Daly City, Oakland-Coliseum, Coliseum-Fremont.

Does the graph have an Eulerian tour? If not, choose two edges that create one.

- A. No; add Walnut Creek-Fremont and Daly City-Richmond.
- B. No; add Oakland-Fremont and Oakland-Richmond.
- C. Yes; no added edges needed.
- D. No; add Berkeley-Coliseum and Orinda-Mission Street.

REFERENCE ANSWER

A. No; add Walnut Creek-Fremont and Daly City-Richmond.

JEV / CORRECT

A. No; add Walnut Creek-Fremont and Daly City-Richmond.

API confidence: 0.46
Option probabilities:
{**"D"**: 0.12, "A": 0.59, "B": 0.23, "C": 0.06}

Section batch: 562 ms
Not per-question latency

QUESTION + OPTIONS

The undirected train graph has exactly these edges: Oakland-Berkeley, Berkeley-Richmond, Oakland-Orinda, Orinda-Walnut Creek, Oakland-Market Street, Market Street-Mission Street, Mission Street-Daly City, Oakland-Coliseum, Coliseum-Fremont.

A new OAK station and edge OAK-Coliseum are added. Further added edges cannot touch OAK. If an Eulerian walk is then possible, what must hold?

- A. OAK must be an interior vertex, since it is newly added.
- B. OAK can be anywhere on a closed Eulerian tour.
- C. OAK must be visited twice, since it has degree one.
- D. OAK is an endpoint, because its only incident edge cannot be used to both enter and leave without repetition.

REFERENCE ANSWER

D. OAK is an endpoint, because its only incident edge cannot be used to both enter and leave without repetition.

JEV / CORRECT

D. OAK is an endpoint, because its only incident edge cannot be used to both enter and leave without repetition.

API confidence: 0.93
Option probabilities:
{"D": 0.95, "A": 0.01, "B": 0.02, "C": 0.02}

Section batch: 562 ms
Not per-question latency

QUESTION + OPTIONS

Which induction proves the sum of vertex degrees is twice the edge count?

- A. Induct on vertices. A graph on k vertices has degree sum $2k$. Adding any vertex adds exactly two to that sum.
- B. Removing a vertex always removes one edge and decreases the degree sum by two.
- C. Every edge touches two vertices, so each vertex has degree two and the sum is twice the vertex count.
- D. Induct on edges. With zero edges the sum is zero. Remove one edge from a graph with $k+1$ edges; the remaining degree sum is $2k$. Restoring the edge adds one degree at each endpoint, yielding $2k+2$.

REFERENCE ANSWER

D. Induct on edges. With zero edges the sum is zero. Remove one edge from a graph with $k+1$ edges; the remaining degree sum is $2k$. Restoring the edge adds one degree at each endpoint, yielding $2k+2$.

JEV / CORRECT

D. Induct on edges. With zero edges the sum is zero. Remove one edge from a graph with $k+1$ edges; the remaining degree sum is $2k$. Restoring the edge adds one degree at each endpoint, yielding $2k+2$.

API confidence: 1.00
Option probabilities:
{ "D": 1.0, "A": 0.0, "C": 0.0, "B": 0.0 }

Section batch: 434 ms
Not per-question latency

QUESTION + OPTIONS

For every positive integer n , 5 divides $6^n - 1$.

A. False

B. True

REFERENCE ANSWER

B. True

JEV / INCORRECT

A. False

API confidence: 0.14
Option probabilities:
{ "A": 0.57, "B": 0.43 }

Section batch: 392 ms
Not per-question latency

QUESTION + OPTIONS

If $xy=0$ modulo 6, then $x=0$ or $y=0$ modulo 6.

A. False

B. True

REFERENCE ANSWER

A. False

JEV / CORRECT

A. False

API confidence: 0.99
Option probabilities:
{**"A"**: 0.99, "B": 0.01}

Section batch: 392 ms
Not per-question latency

QUESTION + OPTIONS

For every positive odd m , 9 divides $4^m + 5^m$.

A. True

B. False

REFERENCE ANSWER

A. True

JEV / CORRECT

A. True

API confidence: 0.64
Option probabilities:
{ "A": 0.82, "B": 0.18 }

Section batch: 392 ms
Not per-question latency

QUESTION + OPTIONS

If $p > 3$ and both p and $p+2$ are prime, what is p modulo 3?

- A. 0
- B. 2
- C. 1
- D. Not determined

REFERENCE ANSWER

B. 2

JEV / CORRECT

B. 2

API confidence: 0.39
Option probabilities:
{`"C"`: 0.41, `"A"`: 0.04, `"D"`: 0.01, `"B"`: 0.54}

Section batch: 392 ms
Not per-question latency

QUESTION + OPTIONS

What is the last decimal digit of 9^{68} ?

- A. 1
- B. 8
- C. 6
- D. 9

REFERENCE ANSWER

A. 1

JEV / CORRECT

A. 1

API confidence: 0.86
Option probabilities:
{**"C"**: 0.05, **"A"**: 0.89, **"D"**: 0.06, **"B"**: 0.0}

Section batch: 392 ms
Not per-question latency

QUESTION + OPTIONS

RSA has $p=5$, $q=7$ and public exponent $e=5$. Which is a valid decryption exponent d ?

- A. 24
- B. 7
- C. 12
- D. 5

REFERENCE ANSWER

D. 5

JEV / CORRECT

D. 5

API confidence: 0.66
Option probabilities:
{**"C"**: 0.07, "A": 0.09, "D": 0.75, "B": 0.09}

Section batch: 392 ms
Not per-question latency

QUESTION + OPTIONS

In valid textbook RSA, $a = x^e \bmod N$ and $b = y^e \bmod N$. Does decrypting ab recover xy modulo N ? Choose the justification.

- A. No; RSA only preserves multiplication when $x=y$.
- B. Yes; $(ab)^d = a^d b^d = xy \bmod N$.
- C. Yes; because $ed=1$ as an equality of integers.
- D. No; decryption recovers $x+y$ because ciphertext multiplication becomes addition.

REFERENCE ANSWER

B. Yes; $(ab)^d = a^d b^d = xy \bmod N$.

JEV / CORRECT

B. Yes; $(ab)^d = a^d b^d = xy \bmod N$.

API confidence: 0.99
Option probabilities:
{*"C"*: 0.01, *"A"*: 0.0, *"D"*: 0.0, *"B"*: 0.99}

Section batch: 392 ms
Not per-question latency

QUESTION + OPTIONS

Positive integers p, q are coprime; c, d are positive. How many residues x modulo $cdpq$ solve $cx \equiv ca \pmod{cp}$ and $dx \equiv db \pmod{dq}$?

- A. cd : cancel the integer factors to get $x \equiv a \pmod{p}$ and $x \equiv b \pmod{q}$; CRT gives one class mod pq , which has cd lifts mod $cdpq$.
- B. 1: CRT always gives one class regardless of the requested modulus.
- C. $\gcd(c, d)$: the two scaling factors determine all compatibility constraints.
- D. pq : each residue mod cd gives one solution.

REFERENCE ANSWER

A. cd : cancel the integer factors to get $x \equiv a \pmod{p}$ and $x \equiv b \pmod{q}$; CRT gives one class mod pq , which has cd lifts mod $cdpq$.

JEV / CORRECT

A. cd : cancel the integer factors to get $x \equiv a \pmod{p}$ and $x \equiv b \pmod{q}$; CRT gives one class mod pq , which has cd lifts mod $cdpq$.

API confidence: 0.99
Option probabilities:
{ $"D"$: 0.0, $"B"$: 0.0, $"A"$: 1.0, $"C"$: 0.0}

Section batch: 384 ms
Not per-question latency

QUESTION + OPTIONS

Polynomials f, g over a field have degrees $k > j$. What is $\deg(f+g)$?

- A. Could be any value below k
- B. $k+j$
- C. j
- D. k

REFERENCE ANSWER

D. k

JEV / CORRECT

D. k

API confidence: 0.71
Option probabilities:
{ $"D"$: 0.79, $"B"$: 0.0, $"A"$: 0.21, $"C"$: 0.0}

Section batch: 311 ms
Not per-question latency

QUESTION + OPTIONS

Nonzero polynomials f, g over a field have degrees k, j . What is $\deg(fg)$?

- A. $k-j$
- B. $k*j$
- C. $k+j$
- D. $\max(k, j)$

REFERENCE ANSWER

C. $k+j$

JEV / CORRECT

C. $k+j$

API confidence: 1.00
Option probabilities:
{`"D"`: 0.0, `"B"`: 0.0, `"A"`: 0.0, `"C"`: 1.0}

Section batch: 311 ms
Not per-question latency

QUESTION + OPTIONS

Over $\text{GF}(5)$, which degree-at-most-4 polynomial is equal as a function to $4x^{84}+x^{23}+2x^5+3$?

- A. $4x^4+x^3+2x+3$
- B. $4x^4+x^2+2x+3$
- C. $4x+x^3+2x+3$
- D. $4+x^3+2x+3$

REFERENCE ANSWER

A. $4x^4+x^3+2x+3$

JEV / CORRECT

A. $4x^4+x^3+2x+3$

API confidence: 0.79
Option probabilities:
{**"D"**: 0.03, "A": 0.84, "B": 0.05, "C": 0.08}

Section batch: 311 ms
Not per-question latency

QUESTION + OPTIONS

A degree-2 polynomial over $\text{GF}(7)$ passes through $(0,1),(3,0),(4,0)$. Which is it?

- A. $4(x-3)(x-4)$
- B. $3(x-3)(x-4)$
- C. $3(x-2)(x-4)$
- D. $(x-3)(x-4)$

REFERENCE ANSWER

B. $3(x-3)(x-4)$

JEV / CORRECT

B. $3(x-3)(x-4)$

API confidence: 0.45
Option probabilities:
{`"D": 0.17, "B": 0.58, "A": 0.25, "C": 0.0`}

Section batch: 311 ms
Not per-question latency

QUESTION + OPTIONS

How many formal polynomials of degree at most 4 over GF(5) pass through two given points with distinct x-coordinates?

- A. 5
- B. 625
- C. 125
- D. 25

REFERENCE ANSWER

C. 125

Pre-run repair:
Specify distinct x-coordinates, needed for independent constraints.

JEV / INCORRECT

B. 625

API confidence: 0.58
Option probabilities:
{**"D"**: 0.05, **"B"**: 0.6799999999999999, **"A"**: 0.02, **"C"**: 0.25}

Section batch: 311 ms
Not per-question latency

QUESTION + OPTIONS

There are 2 professors, 4 head TAs, 7 TAs. Allowed coalitions contain both professors, or one professor and at least three heads, or one professor, two heads and at least four TAs. No other coalition should reconstruct. Each share uses a distinct nonzero field coordinate.

Choose a valid Shamir configuration (degree; shares per professor, head TA, TA; sufficient prime bound). Secret s is a nonnegative integer.

- A. (23; 12,3,1; prime $p \geq \max(s+1,44)$)
- B. (23; 11,4,1; prime $p \geq \max(s+1,46)$)
- C. (22; 12,4,1; prime $p \geq \max(s+1,48)$)
- D. (23; 12,4,1; prime $p \geq \max(s+1,48)$)

REFERENCE ANSWER

D. (23; 12,4,1; prime $p \geq \max(s+1,48)$)

JEV / CORRECT

D. (23; 12,4,1; prime $p \geq \max(s+1,48)$)

API confidence: 0.82
Option probabilities:
{ "B": 0.03, "A": 0.07, "C": 0.04, "D": 0.86 }

Section batch: 350 ms
Not per-question latency

QUESTION + OPTIONS

A polynomial of degree 9 is transmitted by evaluations. At most two values are corrupted. How many evaluations suffice for unique recovery?

- A. 12
- B. 13
- C. 18
- D. 14

REFERENCE ANSWER

D. 14

JEV / INCORRECT

B. 13

API confidence: 0.70
Option probabilities:
{ "B": 0.77, "A": 0.08, "C": 0.01, "D": 0.14 }

Section batch: 350 ms
Not per-question latency

QUESTION + OPTIONS

How many length-30 bit strings contain exactly 12 ones?

- A. $C(30,12)$
- B. 30^{12}
- C. 2^{12}
- D. $30!/12!$

REFERENCE ANSWER

A. $C(30,12)$

JEV / CORRECT

A. $C(30,12)$

API confidence: 1.00
Option probabilities:
{**"B"**: 0.0, **"C"**: 0.0, **"D"**: 0.0, **"A"**: 1.0}

Section batch: 374 ms
Not per-question latency

QUESTION + OPTIONS

How many formal polynomials of degree exactly d over $\text{GF}(p)$, where $0 \leq d < p$?

- A. p^d
- B. $(p-1)p^d$
- C. $p^{(d+1)}$
- D. $(p-1)^{(d+1)}$

REFERENCE ANSWER

B. $(p-1)p^d$

JEV / CORRECT

B. $(p-1)p^d$

API confidence: 0.98
Option probabilities:
{**"B"**: 0.99, "A": 0.01, "D": 0.0, "C": 0.0}

Section batch: 374 ms
Not per-question latency

QUESTION + OPTIONS

How many 6-digit PINs use distinct digits from 0 through 9? Leading zero is allowed.

- A. $10!/4!$
- B. 10^6
- C. $9 \cdot 9 \cdot 8 \cdot 7 \cdot 6 \cdot 5$
- D. $C(10,6)$

REFERENCE ANSWER

A. $10!/4!$

JEV / CORRECT

A. $10!/4!$

API confidence: 1.00
Option probabilities:
{**"B"**: 0.0, **"A"**: 1.0, **"D"**: 0.0, **"C"**: 0.0}

Section batch: 374 ms
Not per-question latency

QUESTION + OPTIONS

Choose 10 meals from 5 dish types, with repetition allowed and order irrelevant.
How many selections?

- A. $C(10,5)$
- B. 5^{10}
- C. $C(15,5)$
- D. $C(14,4)$

REFERENCE ANSWER

D. $C(14,4)$

JEV / CORRECT

D. $C(14,4)$

API confidence: 0.98
Option probabilities:
{`"B": 0.0, "A": 0.0, "D": 0.99, "C": 0.01`}

Section batch: 374 ms
Not per-question latency

QUESTION + OPTIONS

(NOT Q implies (P implies Q)) is equivalent to (P implies Q).

A. False

B. True

REFERENCE ANSWER

B. True

JEV / CORRECT

B. True

API confidence: 0.70
Option probabilities:
{ "B": 0.85, "A": 0.15 }

Section batch: 348 ms
Not per-question latency

QUESTION + OPTIONS

(NOT P OR (P implies Q)) is equivalent to (P implies Q).

A. True

B. False

REFERENCE ANSWER

A. True

JEV / CORRECT

A. True

API confidence: 0.96
Option probabilities:
{ "B": 0.02, "A": 0.98 }

Section batch: 348 ms
Not per-question latency

QUESTION + OPTIONS

Rewrite NOT forall x in S [P(x) implies NOT Q(x)] without negation.

- A. exists x in S [P(x) AND Q(x)]
- B. forall x in S [P(x) OR Q(x)]
- C. forall x in S [P(x) AND Q(x)]
- D. exists x in S [P(x) OR Q(x)]

REFERENCE ANSWER

A. exists x in S [P(x) AND Q(x)]

JEV / CORRECT

A. exists x in S [P(x) AND Q(x)]

API confidence: 1.00
Option probabilities:
{ "B": 0.0, "D": 0.0, "C": 0.0, "A": 1.0 }

Section batch: 348 ms
Not per-question latency

QUESTION + OPTIONS

S is nonempty. Consider [forall y in S exists x in S (Q(x) AND P(y))] implies [exists x in S forall y in S (Q(x) AND P(y))].

Is the given implication always true?

A. False

B. True

REFERENCE ANSWER

B. True

JEV / CORRECT

B. True

API confidence: 0.16
Option probabilities:
{ "B": 0.58, "A": 0.42 }

Section batch: 348 ms
Not per-question latency

QUESTION + OPTIONS

S is nonempty. Consider [forall y in S exists x in S (Q(x) AND P(y))] implies [exists x in S forall y in S (Q(x) AND P(y))].

Choose a valid explanation.

- A. Existential quantifiers can always move outside universal ones, regardless of dependence.
- B. The premise gives P(y) for every y and some witness x with Q(x); because Q does not depend on y, that witness works for all y.
- C. The implication is false whenever S has two elements and both predicates are true.
- D. The premise is contradictory on every nonempty domain.

REFERENCE ANSWER

B. The premise gives P(y) for every y and some witness x with Q(x); because Q does not depend on y, that witness works for all y.

JEV / CORRECT

B. The premise gives P(y) for every y and some witness x with Q(x); because Q does not depend on y, that witness works for all y.

API confidence: 1.00
Option probabilities:
{ "B": 1.0, "D": 0.0, "C": 0.0, "A": 0.0 }

Section batch: 348 ms
Not per-question latency

QUESTION + OPTIONS

Prove that an integer with remainder 2 or 3 modulo 4 is not a square.

- A. Every square is divisible by four.
- B. All nonsquares are odd, so their remainders are 1 or 3.
- C. Taking a square root preserves every modular residue.
- D. Contrapositive: an even integer squared is 0 mod 4, and an odd integer squared is 1 mod 4.

REFERENCE ANSWER

D. Contrapositive: an even integer squared is 0 mod 4, and an odd integer squared is 1 mod 4.

JEV / CORRECT

D. Contrapositive: an even integer squared is 0 mod 4, and an odd integer squared is 1 mod 4.

API confidence: 1.00
Option probabilities:
{ "B": 0.0, "D": 1.0, "A": 0.0, "C": 0.0 }

Section batch: 425 ms
Not per-question latency

QUESTION + OPTIONS

For any $N > 0$ integers, prove some nonempty subset has sum divisible by N . Hint: prefix sums.

- A. Each integer has a distinct residue, so one must be zero.
- B. The sum of N integers is always divisible by N .
- C. If a prefix sum is $0 \bmod N$, use that prefix. Otherwise N prefix sums occupy $N-1$ nonzero residues, so two coincide; their difference is a nonempty block with sum $0 \bmod N$.
- D. Take the empty subset, whose sum is zero.

REFERENCE ANSWER

C. If a prefix sum is $0 \bmod N$, use that prefix. Otherwise N prefix sums occupy $N-1$ nonzero residues, so two coincide; their difference is a nonempty block with sum $0 \bmod N$.

Pre-run repair:
Require nonempty subset explicitly, as intended by the supplied proof.

JEV / CORRECT

C. If a prefix sum is $0 \bmod N$, use that prefix. Otherwise N prefix sums occupy $N-1$ nonzero residues, so two coincide; their difference is a nonempty block with sum $0 \bmod N$.

API confidence: 1.00
Option probabilities:
{ "B": 0.0, "D": 0.0, "A": 0.0, "C": 1.0 }

Section batch: 425 ms
Not per-question latency

QUESTION + OPTIONS

$F_1=F_2=1$, $F_j=F_{(j-1)}+F_{(j-2)}$ for $j\geq 3$. To prove every natural m is a sum of distinct nonconsecutive-index Fibonacci numbers, assume the claim for all smaller naturals and choose largest k with $F_k\leq m$, $m\geq 2$.

Why is $m-F_k<F_{(k-1)}$?

- A. Because the Fibonacci numbers differ by one.
- B. Otherwise $m\geq F_k+F_{(k-1)}=F_{(k+1)}$, contradicting maximality of k .
- C. Because every Fibonacci number is greater than m .
- D. Because $m=F_k$ by the definition of largest k .

REFERENCE ANSWER

B. Otherwise $m\geq F_k+F_{(k-1)}=F_{(k+1)}$, contradicting maximality of k .

JEV / CORRECT

B. Otherwise $m\geq F_k+F_{(k-1)}=F_{(k+1)}$, contradicting maximality of k .

API confidence: 1.00
Option probabilities:
{ "B": 1.0, "C": 0.0, "A": 0.0, "D": 0.0 }

Section batch: 308 ms
Not per-question latency

QUESTION + OPTIONS

$F_1=F_2=1$, $F_j=F_{(j-1)}+F_{(j-2)}$ for $j\geq 3$. To prove every natural m is a sum of distinct nonconsecutive-index Fibonacci numbers, assume the claim for all smaller naturals and choose largest k with $F_k\leq m$, $m\geq 2$. It has been established that $m-F_k<F_{(k-1)}$.

How does this finish the induction?

- A. The inequality shows $m-F_k=0$, so every natural is itself Fibonacci.
- B. Represent $m-F_k$ and append $F_{(k-1)}$, whose value equals F_k .
- C. Allow a repeated F_k ; repeated indices are permitted by the theorem.
- D. Represent $m-F_k$ using the hypothesis. Since its value is less than $F_{(k-1)}$, its nonnegative summands have indices at most $k-2$; adjoining F_k preserves distinct, nonconsecutive indices.

REFERENCE ANSWER

D. Represent $m-F_k$ using the hypothesis. Since its value is less than $F_{(k-1)}$, its nonnegative summands have indices at most $k-2$; adjoining F_k preserves distinct, nonconsecutive indices.

JEV / CORRECT

D. Represent $m-F_k$ using the hypothesis. Since its value is less than $F_{(k-1)}$, its nonnegative summands have indices at most $k-2$; adjoining F_k preserves distinct, nonconsecutive indices.

API confidence: 1.00
Option probabilities:
{ "B": 0.0, "C": 0.0, "A": 0.0, "D": 1.0 }

Section batch: 308 ms
Not per-question latency

QUESTION + OPTIONS

For $n \geq 2$ define $R_n = \sqrt{n}$ and $R_k = \sqrt{k \cdot R_{k+1}}$ for $k < n$. Prove $R_2 < 3$. Hint: prove $R_k < k+1$.

A. Replace every factor by n ; the resulting expression is always less than three.

B. Descend on k : $\sqrt{n} < n+1$. If $R_k < k+1$, then $R_{k-1} < \sqrt{(k-1)(k+1)} < k$, proving the stronger bound.

C. Since the innermost radical is at most three, all outer radicals are too.

D. Use $R_k < k$ because square roots always decrease their arguments, even below one.

REFERENCE ANSWER

B. Descend on k : $\sqrt{n} < n+1$.
If $R_k < k+1$, then
 $R_{k-1} < \sqrt{(k-1)(k+1)} < k$,
proving the stronger bound.

JEV / CORRECT

B. Descend on k : $\sqrt{n} < n+1$.
If $R_k < k+1$, then
 $R_{k-1} < \sqrt{(k-1)(k+1)} < k$,
proving the stronger bound.

API confidence: 1.00
Option probabilities:
{"B": 1.0, "D": 0.0, "C": 0.0, "A": 0.0}

Section batch: 294 ms
Not per-question latency

QUESTION + OPTIONS

The only stable matchings are the job-optimal and candidate-optimal matchings.

A. True

B. False

REFERENCE ANSWER

B. False

JEV / CORRECT

B. False

API confidence: 0.74
Option probabilities:
{ "B": 0.87, "A": 0.13 }

Section batch: 388 ms
Not per-question latency

QUESTION + OPTIONS

A candidate matched to its first-choice job cannot belong to a blocking pair.

A. True

B. False

REFERENCE ANSWER

A. True

JEV / CORRECT

A. True

API confidence: 0.50
Option probabilities:
{"B": 0.25, "A": 0.75}

Section batch: 388 ms
Not per-question latency

QUESTION + OPTIONS

A candidate matched to its last-choice job must belong to a blocking pair.

A. True

B. False

REFERENCE ANSWER

B. False

JEV / CORRECT

B. False

API confidence: 0.54
Option probabilities:
{**"B"**: 0.77, "A": 0.23}

Section batch: 388 ms
Not per-question latency

QUESTION + OPTIONS

A candidate receives its k th-ranked job in a stable matching. It must not be ranked first by at least how many jobs?

- A. $n-1$
- B. $k-1$
- C. $n-k$
- D. k

REFERENCE ANSWER

B. $k-1$

JEV / CORRECT

B. $k-1$

API confidence: 0.68
Option probabilities:
{**"B"**: 0.76, "D": 0.05, "A": 0.03, "C": 0.16}

Section batch: 388 ms
Not per-question latency

QUESTION + OPTIONS

Why are there at most $n(n-1)$ rejections in job-proposing deferred acceptance?

- A. Every candidate rejects all n jobs exactly once.
- B. Each candidate can reject at most $n-1$ distinct jobs while retaining its final partner; a rejected job never proposes to it again.
- C. Each job proposes at most once in total.
- D. Each day contains exactly n rejections and there are $n-1$ days.

REFERENCE ANSWER

B. Each candidate can reject at most $n-1$ distinct jobs while retaining its final partner; a rejected job never proposes to it again.

JEV / CORRECT

B. Each candidate can reject at most $n-1$ distinct jobs while retaining its final partner; a rejected job never proposes to it again.

API confidence: 1.00
Option probabilities:
{ "B": 1.0, "D": 0.0, "A": 0.0, "C": 0.0 }

Section batch: 388 ms
Not per-question latency

QUESTION + OPTIONS

The three-dimensional hypercube has an odd number of vertices.

A. False

B. True

REFERENCE ANSWER

A. False

JEV / CORRECT

A. False

API confidence: 0.98
Option probabilities:
{ "A": 0.99, "B": 0.01 }

Section batch: 313 ms
Not per-question latency

QUESTION + OPTIONS

Number of faces, including the unbounded face, in a planar drawing of a tree?

- A. $n-1$
- B. 1
- C. 0
- D. 2

REFERENCE ANSWER

B. 1

JEV / CORRECT

B. 1

API confidence: 0.96
Option probabilities:
{`"D"`: 0.03, `"A"`: 0.0, `"C"`: 0.0, `"B"`: 0.97}

Section batch: 313 ms
Not per-question latency

QUESTION + OPTIONS

Faces in a planar drawing of a connected graph with exactly one cycle?

- A. n
- B. 2
- C. 3
- D. 1

REFERENCE ANSWER

B. 2

JEV / CORRECT

B. 2

API confidence: 0.47
Option probabilities:
{`"D"`: 0.37, `"A"`: 0.02, `"C"`: 0.01, `"B"`: 0.6}

Section batch: 313 ms
Not per-question latency

QUESTION + OPTIONS

Minimum vertex degree in a tree with $n \geq 2$ vertices?

- A. 1
- B. $n-1$
- C. 2
- D. 0

REFERENCE ANSWER

A. 1

JEV / CORRECT

A. 1

API confidence: 0.99
Option probabilities:
{`"D": 0.0, "A": 1.0, "C": 0.0, "B": 0.0`}

Section batch: 313 ms
Not per-question latency

QUESTION + OPTIONS

Maximum edges in a bipartite graph with fixed parts A,B?

- A. $C(|A|+|B|,2)$
- B. $|A|*|B|$
- C. $\min(|A|,|B|)$
- D. $|A|+|B|-1$

REFERENCE ANSWER

B. $|A|*|B|$

JEV / CORRECT

B. $|A|*|B|$

API confidence: 1.00
Option probabilities:
{"D": 0.0, "A": 0.0, "C": 0.0, "B": 1.0}

Section batch: 313 ms
Not per-question latency

QUESTION + OPTIONS

Every graph of maximum degree at most two is bipartite.

A. True

B. False

REFERENCE ANSWER

B. False

JEV / CORRECT

B. False

API confidence: 0.90
Option probabilities:
{ "A": 0.05, "B": 0.95 }

Section batch: 313 ms
Not per-question latency

QUESTION + OPTIONS

Smallest constant D such that every nonempty bipartite planar graph has a vertex of degree at most D ?

- A. 4
- B. 3
- C. 5
- D. 2

REFERENCE ANSWER

B. 3

JEV / CORRECT

B. 3

API confidence: 0.46
Option probabilities:
{`"D"`: 0.02, `"A"`: 0.21, `"C"`: 0.17, `"B"`: 0.6}

Section batch: 313 ms
Not per-question latency

QUESTION + OPTIONS

For the three-dimensional hypercube, choose one side A of a bipartition.

- A. {001,011,101,111}
- B. {000,011,110,101}
- C. {000,001,010,011}
- D. {000,111}

REFERENCE ANSWER

B. {000,011,110,101}

JEV / CORRECT

B. {000,011,110,101}

API confidence: 0.47
Option probabilities:
{ "D": 0.01, "A": 0.38, "C": 0.01, "B": 0.6 }

Section batch: 313 ms
Not per-question latency

QUESTION + OPTIONS

Largest possible vertex degree in a simple planar graph on n vertices?

- A. 6
- B. 5
- C. $3n-6$
- D. $n-1$

REFERENCE ANSWER

D. $n-1$

JEV / INCORRECT

B. 5

API confidence: 0.28
Option probabilities:
{"D": 0.45, "A": 0.04, "C": 0.05, "B": 0.46}

Section batch: 313 ms
Not per-question latency

QUESTION + OPTIONS

In a simple n -vertex graph, $n \geq 3$, what sharp threshold on $d_u + d_v$ guarantees distinct vertices u, v share a neighbor?

- A. $n-1$
- B. n
- C. $2n-2$
- D. $n+1$

REFERENCE ANSWER

D. $n+1$

JEV / INCORRECT

A. $n-1$

API confidence: 0.49
Option probabilities:
{`"D"`: 0.05, `"A"`: 0.61, `"C"`: 0.07, `"B"`: 0.27}

Section batch: 313 ms
Not per-question latency

QUESTION + OPTIONS

Must a connected planar graph with more than 100 vertices have at least three vertices of degree below six?

- A. Yes: every vertex of a planar graph has degree below six.
- B. Yes: if at most two have degree below six, the degree sum is at least $6(n-2)+2=6n-10$, exceeding the planar bound $6n-12$.
- C. No: a planar complete graph on 101 vertices is a counterexample.
- D. No: any long path has fewer than three such vertices.

REFERENCE ANSWER

B. Yes: if at most two have degree below six, the degree sum is at least $6(n-2)+2=6n-10$, exceeding the planar bound $6n-12$.

JEV / CORRECT

B. Yes: if at most two have degree below six, the degree sum is at least $6(n-2)+2=6n-10$, exceeding the planar bound $6n-12$.

API confidence: 0.99
Option probabilities:
{`"D"`: 0.0, `"A"`: 0.0, `"C"`: 0.0, `"B"`: 1.0}

Section batch: 313 ms
Not per-question latency

QUESTION + OPTIONS

Remove a degree- d vertex v from G . The rest has a given k -coloring. What bound follows when restoring v ?

- A. $k+d$
- B. $\max(k, 1+\min(d,k))$
- C. $\min(k,d)$
- D. $k-1$

REFERENCE ANSWER

B. $\max(k, 1+\min(d,k))$

JEV / CORRECT

B. $\max(k, 1+\min(d,k))$

API confidence: 0.83
Option probabilities:
{ $"D"$: 0.01, $"A"$: 0.11, $"C"$: 0.01, $"B"$: 0.87}

Section batch: 313 ms
Not per-question latency

QUESTION + OPTIONS

Every 3-regular graph has an even number of vertices.

A. False

B. True

REFERENCE ANSWER

B. True

JEV / CORRECT

B. True

API confidence: 0.93
Option probabilities:
{ "B": 0.97, "A": 0.03 }

Section batch: 288 ms
Not per-question latency

QUESTION + OPTIONS

Justify the parity constraint for a 3-regular graph on n vertices.

- A. Every vertex can be paired with a unique neighbor, without needing a matching theorem.
- B. Every 3-regular graph is bipartite with equal parts.
- C. The handshake lemma gives $3n=2e$, so n is even.
- D. All graphs with odd maximum degree have even order.

REFERENCE ANSWER

C. The handshake lemma gives $3n=2e$, so n is even.

JEV / CORRECT

C. The handshake lemma gives $3n=2e$, so n is even.

API confidence: 1.00
Option probabilities:
{ "D": 0.0, "A": 0.0, "B": 0.0, "C": 1.0 }

Section batch: 288 ms
Not per-question latency

QUESTION + OPTIONS

Every 4-regular graph has an odd number of vertices.

A. False

B. True

REFERENCE ANSWER

A. False

JEV / CORRECT

A. False

API confidence: 0.87
Option probabilities:
{"B": 0.06, "A": 0.94}

Section batch: 288 ms
Not per-question latency

QUESTION + OPTIONS

Give a counterexample to the claim that every 4-regular graph has an odd number of vertices.

- A. K5: five vertices, each degree four.
- B. K6 with the three edges of a perfect matching removed: six vertices, each degree four.
- C. K6: six vertices, each degree five.
- D. A six-cycle: six vertices, each degree two.

REFERENCE ANSWER

B. K6 with the three edges of a perfect matching removed: six vertices, each degree four.

JEV / CORRECT

B. K6 with the three edges of a perfect matching removed: six vertices, each degree four.

API confidence: 1.00
Option probabilities:
{ "D": 0.0, "A": 0.0, "B": 1.0, "C": 0.0 }

Section batch: 288 ms
Not per-question latency

QUESTION + OPTIONS

- Prove any simple n -vertex graph, $n \geq 2$, has two equal degrees.
- A. The degree sum is even, so every individual degree is even.
 - B. Every simple graph has two leaves.
 - C. Degrees lie in $0..n-1$, but 0 and $n-1$ cannot both occur. At most $n-1$ possible values remain for n vertices, so pigeonhole applies.
 - D. There are n possible degrees and n vertices, which alone forces a repetition.

REFERENCE ANSWER

C. Degrees lie in $0..n-1$, but 0 and $n-1$ cannot both occur. At most $n-1$ possible values remain for n vertices, so pigeonhole applies.

JEV / CORRECT

C. Degrees lie in $0..n-1$, but 0 and $n-1$ cannot both occur. At most $n-1$ possible values remain for n vertices, so pigeonhole applies.

API confidence: 1.00
Option probabilities:
{ "D": 0.0, "A": 0.0, "B": 0.0, "C": 1.0 }

Section batch: 288 ms
Not per-question latency

QUESTION + OPTIONS

A function is k -uniform when each output has either zero or exactly k distinct preimages.

$A=\{0,1,2,3\}$, $B=\{0,1,2\}$; $f(0)=f(1)=0$ and $f(2)=f(3)=1$. Find k .

A. Unknown

B. 1

C. 2

D. 3

REFERENCE ANSWER

C. 2

JEV / CORRECT

C. 2

API confidence: 0.89
Option probabilities:
{`"D": 0.0, "A": 0.07, "C": 0.92, "B": 0.01`}

Section batch: 459 ms
Not per-question latency

QUESTION + OPTIONS

A function is k -uniform when each output has either zero or exactly k distinct preimages.

g is k_1 -uniform and h is k_2 -uniform. What k is guaranteed for g composed with h ?

- A. k_1+k_2
- B. k_1*k_2
- C. Unknown; the composition need not be uniform.
- D. $\max(k_1,k_2)$

REFERENCE ANSWER

C. Unknown; the composition need not be uniform.

JEV / INCORRECT

B. k_1*k_2

API confidence: 0.61
Option probabilities:
{`"D"`: 0.0, `"A"`: 0.0, `"C"`: 0.29, `"B"`: 0.71}

Section batch: 459 ms
Not per-question latency

QUESTION + OPTIONS

A function is k -uniform when each output has either zero or exactly k distinct preimages.

$f(x) = ax \bmod \text{prime } m$, a nonzero, domain and codomain all residues. Find k .

- A. 1
- B. a
- C. m
- D. Unknown

REFERENCE ANSWER

A. 1

JEV / CORRECT

A. 1

API confidence: 0.99
Option probabilities:
{`"D": 0.0, "A": 1.0, "C": 0.0, "B": 0.0`}

Section batch: 459 ms
Not per-question latency

QUESTION + OPTIONS

A function is k -uniform when each output has either zero or exactly k distinct preimages.

$f(x)=ax \bmod m$, $\gcd(a,m)=d$, domain and codomain all residues. Find k .

A. Unknown

B. 1

C. d

D. m/d

REFERENCE ANSWER

C. d

JEV / CORRECT

C. d

API confidence: 0.84
Option probabilities:
{`"D"`: 0.05, `"C"`: 0.88, `"A"`: 0.06, `"B"`: 0.01}

Section batch: 459 ms
Not per-question latency

QUESTION + OPTIONS

A function is k -uniform when each output has either zero or exactly k distinct preimages.

$m=pq$ for distinct primes; $f(x)=ax \bmod m$ on the unit residues, $\gcd(a,m)=1$. Find k .

- A. Unknown
- B. $(p-1)(q-1)$
- C. 1
- D. $p-1$

REFERENCE ANSWER

C. 1

JEV / CORRECT

C. 1

API confidence: 0.92
Option probabilities:
{`"D"`: 0.0, `"C"`: 0.94, `"A"`: 0.04, `"B"`: 0.02}

Section batch: 459 ms
Not per-question latency

QUESTION + OPTIONS

A function is k -uniform when each output has either zero or exactly k distinct preimages.

$m=pq$ for distinct primes; $f(x)=ax \bmod m$ on unit residues, $\gcd(a,m)=p$. Codomain all residues. Find k .

- A. $q-1$
- B. p
- C. $p-1$
- D. 1

REFERENCE ANSWER

C. $p-1$

Pre-run repair:
Specify finite residue domain and distinct primes.

JEV / INCORRECT

A. $q-1$

API confidence: 0.09
Option probabilities:
{ $"D"$: 0.3, $"A"$: 0.32, $"C"$: 0.3, $"B"$: 0.08}

Section batch: 459 ms
Not per-question latency

QUESTION + OPTIONS

$x \equiv 3 \pmod{5}$ and $x \equiv 2 \pmod{11}$. Find $x \pmod{55}$ in $0..54$.

- A. 13
- B. 23
- C. 2
- D. 3

REFERENCE ANSWER

A. 13

JEV / INCORRECT

B. 23

API confidence: 0.65
Option probabilities:
{`"C"`: 0.01, `"D"`: 0.02, `"A"`: 0.23, `"B"`: 0.74}

Section batch: 341 ms
Not per-question latency

QUESTION + OPTIONS

$x \equiv a \pmod{10}$ and $x \equiv b \pmod{15}$, where $b - a$ is divisible by 5. Number of solutions modulo 150?

- A. 0
- B. 5
- C. 1
- D. 10

REFERENCE ANSWER

B. 5

JEV / INCORRECT

C. 1

API confidence: 0.16
Option probabilities:
{ "C": 0.37, "D": 0.33, "A": 0.02, "B": 0.28 }

Section batch: 341 ms
Not per-question latency

QUESTION + OPTIONS

$x \equiv a \pmod{10}$ and $x \equiv b \pmod{15}$, where $b - a$ is not divisible by 5. Number of solutions modulo 150?

- A. 0
- B. 5
- C. 1
- D. 15

REFERENCE ANSWER

A. 0

JEV / CORRECT

A. 0

API confidence: 0.89
Option probabilities:
{ "C": 0.05, "D": 0.01, "A": 0.91, "B": 0.03 }

Section batch: 341 ms
Not per-question latency

QUESTION + OPTIONS

For every integer a and prime p , p divides $a^p - a$.

A. False

B. True

REFERENCE ANSWER

B. True

JEV / CORRECT

B. True

API confidence: 0.91
Option probabilities:
{ "A": 0.04, "B": 0.96 }

Section batch: 341 ms
Not per-question latency

QUESTION + OPTIONS

For distinct primes p, q and every integer a , choose a guaranteed divisor of $a^{(a^{((p-1)(q-1))}-1)}$.

- A. pq
- B. p^2q
- C. $p+q$
- D. p^2q^2

REFERENCE ANSWER

A. pq

JEV / CORRECT

A. pq

Pre-run repair:
Ask guaranteed divisor among alternatives.
Original largest-divisor wording can fail: e.g.
 $p=3, q=5$ gives an extra universal factor 2.

API confidence: 0.98
Option probabilities:
{ $"C"$: 0.0, $"D"$: 0.0, $"A"$: 0.99, $"B"$: 0.01}

Section batch: 341 ms
Not per-question latency

QUESTION + OPTIONS

RSA ciphertexts are $y_1 = x_1^e$ and $y_2 = x_2^e$ modulo N . Ciphertext of $x_1 \cdot x_2$?

- A. $(y_1 \cdot y_2)^d \bmod N$
- B. $y_1 \cdot y_2 \bmod N$
- C. $y_1 + y_2 \bmod N$
- D. $(y_1 + y_2)^e \bmod N$

REFERENCE ANSWER

B. $y_1 \cdot y_2 \bmod N$

JEV / CORRECT

B. $y_1 \cdot y_2 \bmod N$

API confidence: 0.99
Option probabilities:
{**"C"**: 0.0, **"D"**: 0.0, **"A"**: 0.01, **"B"**: 0.99}

Section batch: 341 ms
Not per-question latency

QUESTION + OPTIONS

In valid RSA, $y_1 = x_1^e$ and $y_2 = x_2^e$ modulo N , with decryption exponent d . Express $x_1 \cdot x_2$ modulo N .

- A. $(y_1 \cdot y_2)^e \bmod N$
- B. $(y_1 \cdot y_2)^d \bmod N$
- C. $y_1 \cdot y_2 \bmod N$
- D. $(y_1 + y_2)^d \bmod N$

REFERENCE ANSWER

B. $(y_1 \cdot y_2)^d \bmod N$

JEV / CORRECT

B. $(y_1 \cdot y_2)^d \bmod N$

API confidence: 1.00
Option probabilities:
{**"C"**: 0.0, "A": 0.0, "D": 0.0, "B": 1.0}

Section batch: 341 ms
Not per-question latency

QUESTION + OPTIONS

$p=2^n-1$ is a Mersenne prime, $n \geq 2$.

Least nonnegative residue of 2^n modulo p ?

- A. 2
- B. 0
- C. 1
- D. $p-1$

REFERENCE ANSWER

C. 1

JEV / INCORRECT

A. 2

API confidence: 0.69
Option probabilities:
{**"B"**: 0.0, **"D"**: 0.01, **"C"**: 0.22, **"A"**: 0.77}

Section batch: 302 ms
Not per-question latency

QUESTION + OPTIONS

$p=2^n-1$ is a Mersenne prime, $n \geq 2$.

For positive integer a , least nonnegative residue of $(2^a)^n$ modulo p ?

- A. 0
- B. 1
- C. a
- D. 2^a

REFERENCE ANSWER

B. 1

JEV / INCORRECT

D. 2^a

API confidence: 0.48
Option probabilities:
{**"B"**: 0.34, **"D"**: 0.61, "C": 0.02, "A": 0.03}

Section batch: 302 ms
Not per-question latency

QUESTION + OPTIONS

$p=2^n-1$ is a Mersenne prime, $n \geq 2$.

Show there are at least n distinct residues x with $x^n \equiv 1 \pmod p$.

- A. Use $x=2^j$ for $j=0,\dots,n-1$. They are distinct positive integers below p and each n th power is $(2^n)^j \equiv 1 \pmod p$.
- B. Use $x=2^{jn}$, $j=1,\dots,n$; these are all distinct modulo p .
- C. A degree- n polynomial must have at least n roots over every field.
- D. Use all residues $0,\dots,n-1$; every small residue has n th power one.

REFERENCE ANSWER

A. Use $x=2^j$ for $j=0,\dots,n-1$. They are distinct positive integers below p and each n th power is $(2^n)^j \equiv 1 \pmod p$.

JEV / CORRECT

A. Use $x=2^j$ for $j=0,\dots,n-1$. They are distinct positive integers below p and each n th power is $(2^n)^j \equiv 1 \pmod p$.

API confidence: 1.00
Option probabilities:
{ "B": 0.0, "D": 0.0, "C": 0.0, "A": 1.0 }

Section batch: 302 ms
Not per-question latency

QUESTION + OPTIONS

Choose a polynomial over GF(7) through (1,0),(2,5).

- A. $5x+1$
- B. $5x+2$
- C. $x-1$
- D. $2x+5$

REFERENCE ANSWER

B. $5x+2$

JEV / CORRECT

B. $5x+2$

API confidence: 0.79
Option probabilities:
{ "A": 0.1, "C": 0.01, "B": 0.84, "D": 0.05 }

Section batch: 415 ms
Not per-question latency

QUESTION + OPTIONS

Over $\text{GF}(p)$, $p > d$, how many formal polynomials of degree at most d pass through $d-1$ points with distinct x -coordinates?

- A. p^2
- B. $p^{(d-1)}$
- C. p
- D. 1

REFERENCE ANSWER

A. p^2

JEV / CORRECT

A. p^2

Pre-run repair:
Distinct x -coordinates explicitly required.

API confidence: 0.81
Option probabilities:
{ $"A"$: 0.86, $"C"$: 0.09, $"B"$: 0.05, $"D"$: 0.0}

Section batch: 415 ms
Not per-question latency

QUESTION + OPTIONS

The normalized Lagrange basis polynomials $\Delta_1, \dots, \Delta_{d+1}$ correspond to $d+1$ points with distinct x -coordinates over a sufficiently large field, $d \geq 1$.

How many distinct roots does Δ_1 have?

- A. d
- B. $d+1$
- C. $d-1$
- D. Unknown

REFERENCE ANSWER

A. d

JEV / CORRECT

A. d

API confidence: 0.97
Option probabilities:
{ "A": 0.98, "C": 0.0, "B": 0.0, "D": 0.02 }

Section batch: 415 ms
Not per-question latency

QUESTION + OPTIONS

The normalized Lagrange basis polynomials $\Delta_1, \dots, \Delta_{d+1}$ correspond to $d+1$ points with distinct x -coordinates over a sufficiently large field, $d \geq 1$.

Formal degree of $\Delta_1 \cdot \Delta_2$?

- A. $d+1$
- B. $2d$
- C. d
- D. Unknown

REFERENCE ANSWER

B. $2d$

JEV / CORRECT

B. $2d$

API confidence: 0.78
Option probabilities:
{ "A": 0.02, "C": 0.13, "B": 0.83, "D": 0.02 }

Section batch: 415 ms
Not per-question latency

QUESTION + OPTIONS

The normalized Lagrange basis polynomials $\Delta_1, \dots, \Delta_{d+1}$ correspond to $d+1$ points with distinct x -coordinates over a sufficiently large field, $d \geq 1$.

Number of distinct roots of $\Delta_1 \cdot \Delta_2$?

- A. $d+1$
- B. $2d$
- C. d
- D. Unknown

REFERENCE ANSWER

A. $d+1$

JEV / INCORRECT

B. $2d$

API confidence: 0.42
Option probabilities:
{ "A": 0.09, "C": 0.27, "B": 0.56, "D": 0.07 }

Section batch: 415 ms
Not per-question latency

QUESTION + OPTIONS

Every real polynomial of degree d has exactly d distinct real roots.

A. True

B. False

REFERENCE ANSWER

B. False

JEV / CORRECT

B. False

API confidence: 0.99
Option probabilities:
{ "A": 0.0, "B": 1.0 }

Section batch: 415 ms
Not per-question latency

QUESTION + OPTIONS

Packets sufficient to recover n message symbols with at most e erased packets and k corruptions?

- A. $n+2e+k$
- B. $n+e+2k$
- C. $n+e+k$
- D. $n+2(e+k)$

REFERENCE ANSWER

B. $n+e+2k$

JEV / CORRECT

B. $n+e+2k$

API confidence: 0.44
Option probabilities:
{`"D": 0.2, "A": 0.21, "C": 0.01, "B": 0.58`}

Section batch: 312 ms
Not per-question latency

QUESTION + OPTIONS

Minimal error locator is x^2-1 over $GF(13)$. Give the error coordinates in $0..12$.

- A. {1,2}
- B. {0,1}
- C. {1,12}
- D. {1,6}

REFERENCE ANSWER

C. {1,12}

Pre-run repair:
Specify minimal error locator, excluding arbitrary extra roots from padding.

JEV / CORRECT

C. {1,12}

API confidence: 0.99
Option probabilities:
{ "D": 0.0, "A": 0.0, "C": 1.0, "B": 0.0 }

Section batch: 312 ms
Not per-question latency

QUESTION + OPTIONS

Shamir shares secret 5 with ten participants, any three reconstruct. Smallest prime modulus, with nonzero distinct share coordinates?

- A. 7
- B. 5
- C. 11
- D. 13

REFERENCE ANSWER

C. 11

JEV / CORRECT

C. 11

API confidence: 0.24
Option probabilities:
{ "D": 0.42, "A": 0.14, "C": 0.43, "B": 0.01 }

Section batch: 312 ms
Not per-question latency

QUESTION + OPTIONS

Design a scheme requiring a strict majority of both a five-person group and a seven-person group.

- A. Use a random degree-one master polynomial with secret at zero. Share one of its nonzero-coordinate values using degree two among the five people, and another using degree three among the seven; use one sufficiently large field.
- B. Use one degree-two polynomial and give all twelve people one share each.
- C. Use a degree-one master polynomial and give every participant both required master points.
- D. Use two independent polynomials of degrees two and three, each with the full secret at zero; either group then suffices.

REFERENCE ANSWER

A. Use a random degree-one master polynomial with secret at zero. Share one of its nonzero-coordinate values using degree two among the five people, and another using degree three among the seven; use one sufficiently large field.

JEV / CORRECT

A. Use a random degree-one master polynomial with secret at zero. Share one of its nonzero-coordinate values using degree two among the five people, and another using degree three among the seven; use one sufficiently large field.

API confidence: 0.57
Option probabilities:
{ "C": 0.05, "A": 0.68, "D": 0.24, "B": 0.03 }

Section batch: 312 ms
Not per-question latency

QUESTION + OPTIONS

The set of finite subsets of a countably infinite set is uncountable.

A. False

B. True

REFERENCE ANSWER

A. False

JEV / CORRECT

A. False

API confidence: 0.98
Option probabilities:
{"B": 0.01, "A": 0.99}

Section batch: 338 ms
Not per-question latency

QUESTION + OPTIONS

The set of all subsets of a countably infinite set is uncountable.

A. True

B. False

REFERENCE ANSWER

A. True

JEV / CORRECT

A. True

API confidence: 1.00
Option probabilities:
{ "B": 0.0, "A": 1.0 }

Section batch: 338 ms
Not per-question latency

QUESTION + OPTIONS

Every real number has a finite program that halts on input n and returns its n th digit.

A. False

B. True

REFERENCE ANSWER

A. False

JEV / CORRECT

A. False

API confidence: 0.95
Option probabilities:
{`"B"`: 0.03, `"A"`: 0.97}

Section batch: 338 ms
Not per-question latency

QUESTION + OPTIONS

- Why are some real numbers not computable digit-by-digit?
- A. Every real has infinitely many digits, so none is computable.
 - B. There are countably many finite programs but uncountably many reals, so programs cannot cover all reals.
 - C. A program can output only finitely many digits over all inputs.
 - D. Uncomputable reals must all be rational.

REFERENCE ANSWER

B. There are countably many finite programs but uncountably many reals, so programs cannot cover all reals.

JEV / CORRECT

B. There are countably many finite programs but uncountably many reals, so programs cannot cover all reals.

API confidence: 1.00
Option probabilities:
{ "B": 1.0, "D": 0.0, "C": 0.0, "A": 0.0 }

Section batch: 338 ms
Not per-question latency

QUESTION + OPTIONS

Distinct anagrams of ABRACADABRA?

- A. $11!/5!$
- B. $11!/(5!2!2!)$
- C. $11!/(4!2!2!)$
- D. $10!/(5!2!2!)$

REFERENCE ANSWER

B. $11!/(5!2!2!)$

JEV / CORRECT

B. $11!/(5!2!2!)$

API confidence: 0.97
Option probabilities:
{`"D": 0.0, "A": 0.01, "C": 0.02, "B": 0.97`}

Section batch: 353 ms
Not per-question latency

QUESTION + OPTIONS

Strings with exactly four As and three Bs?

- A. $4! \cdot 3!$
- B. $C(7,3)$
- C. 2^7
- D. $7!$

REFERENCE ANSWER

B. $C(7,3)$

JEV / CORRECT

B. $C(7,3)$

API confidence: 0.99
Option probabilities:
{`"B"`: 0.99, `"A"`: 0.01, `"D"`: 0.0, `"C"`: 0.0}

Section batch: 353 ms
Not per-question latency

QUESTION + OPTIONS

Distribute n_1 identical apples and n_2 identical bananas among k named people, allowing zero. Count?

- A. $C(n_1+n_2+k-1, k-1)$
- B. $C(n_1+k-1, k-1) \cdot C(n_2+k-1, k-1)$
- C. $k^{(n_1+n_2)}$
- D. $C(n_1, k) \cdot C(n_2, k)$

REFERENCE ANSWER

B.
 $C(n_1+k-1, k-1) \cdot C(n_2+k-1, k-1)$

JEV / CORRECT

B.
 $C(n_1+k-1, k-1) \cdot C(n_2+k-1, k-1)$

API confidence: 0.99
Option probabilities:
{ "B": 1.0, "A": 0.0, "D": 0.0, "C": 0.0 }

Section batch: 353 ms
Not per-question latency

QUESTION + OPTIONS

Walk starts at 0 and ends at $n \geq 0$ after $n+2k$ unit steps, each ± 1 , unrestricted positions. Number of step sequences?

- A. $2^{(n+2k)}$
- B. $C(n+2k,n)$
- C. $C(n+k,k)$
- D. $C(n+2k,k)$

REFERENCE ANSWER

D. $C(n+2k,k)$

JEV / CORRECT

D. $C(n+2k,k)$

API confidence: 0.29
Option probabilities:
{**"B"**: 0.29, "A": 0.21, "D": 0.45999999999999996, "C": 0.04}

Section batch: 353 ms
Not per-question latency

QUESTION + OPTIONS

S_n counts ordered sums of ones and twos equaling n . Give a summation.

- A. $\sum_{i=0..n} C(n,i)$
- B. $\sum_{i=0..floor(n/2)} C(n-i,i)$
- C. $\sum_{i=0..floor(n/2)} 2^i$
- D. $\sum_{i=0..floor(n/2)} C(n,i)$

REFERENCE ANSWER

B. $\sum_{i=0..floor(n/2)} C(n-i,i)$

JEV / CORRECT

B. $\sum_{i=0..floor(n/2)} C(n-i,i)$

API confidence: 0.99
Option probabilities:
{ "A": 0.0, "B": 1.0, "D": 0.0, "C": 0.0 }

Section batch: 353 ms
Not per-question latency

QUESTION + OPTIONS

With $S_0=S_1=1$, recurrence for ordered sums of ones and twos equaling n , $n \geq 2$?

- A. $S_n=2S_{n-1}$
- B. $S_n=S_{n-1}+S_{n-2}$
- C. $S_n=S_{n-1}+1$
- D. $S_n=S_{n-1} \cdot S_{n-2}$

REFERENCE ANSWER

B. $S_n=S_{n-1}+S_{n-2}$

JEV / CORRECT

B. $S_n=S_{n-1}+S_{n-2}$

API confidence: 1.00
Option probabilities:
{**"B"**: 1.0, "A": 0.0, "D": 0.0, "C": 0.0}

Section batch: 353 ms
Not per-question latency

QUESTION + OPTIONS

A judge says: if Bob stole the diamonds, he did not act alone. A truthful attorney denies that statement. What must be true?

- A. Bob stole the diamonds, and did so alone.
- B. Bob may have stolen the diamonds, but we do not know for sure.
- C. Bob stole the diamonds with someone else.
- D. Bob did not steal the diamonds.
- E. None of the above.

REFERENCE ANSWER

A. Bob stole the diamonds, and did so alone.

JEV / CORRECT

A. Bob stole the diamonds, and did so alone.

API confidence: 0.95
Option probabilities:
{**"C"**: 0.0, **"E"**: 0.01, **"A"**: 0.96, **"B"**: 0.0, **"D"**: 0.03}

Section batch: 398 ms
Not per-question latency

QUESTION + OPTIONS

If the halting problem is computable, then pigs can fly.

A. False

B. True

REFERENCE ANSWER

B. True

JEV / CORRECT

B. True

API confidence: 0.66
Option probabilities:
{ "A": 0.17, "B": 0.83 }

Section batch: 318 ms
Not per-question latency

QUESTION + OPTIONS

forall x [P(x) implies Q(x)] is equivalent to NOT exists x [NOT P(x) AND Q(x)].

A. False

B. True

REFERENCE ANSWER

A. False

JEV / CORRECT

A. False

API confidence: 0.98
Option probabilities:
{ "A": 0.99, "B": 0.01 }

Section batch: 318 ms
Not per-question latency

QUESTION + OPTIONS

[Q(0) AND forall n>=0 ((P(n) implies Q(n+1)) AND (Q(n) implies P(n)))] implies forall n>=0 P(n).

A. False

B. True

REFERENCE ANSWER

B. True

JEV / CORRECT

B. True

API confidence: 0.43
Option probabilities:
{ "A": 0.29, "B": 0.71 }

Section batch: 318 ms
Not per-question latency

QUESTION + OPTIONS

[Q(0) AND forall n>=0 ((P(n) implies Q(n+1)) AND (Q(n) implies P(n+1)))] implies forall n>=0 P(n).

- A. True
- B. False

REFERENCE ANSWER

B. False

JEV / CORRECT

B. False

API confidence: 0.65
Option probabilities:
{ "A": 0.18, "B": 0.82 }

Section batch: 318 ms
Not per-question latency

QUESTION + OPTIONS

There is an algorithm deciding whether an input finite decimal string is the corresponding prefix of pi’s decimal expansion.

A. False

B. True

REFERENCE ANSWER

B. True

JEV / CORRECT

B. True

API confidence: 0.63
Option probabilities:
{ "A": 0.19, "B": 0.81 }

Section batch: 318 ms
Not per-question latency

QUESTION + OPTIONS

There is an algorithm deciding, for arbitrary program P and strings x,y , whether P on x outputs y .

- A. True
- B. False

REFERENCE ANSWER

B. False

JEV / CORRECT

B. False

API confidence: 0.98
Option probabilities:
{ $"A"$: 0.01, $"B"$: 0.99}

Section batch: 318 ms
Not per-question latency

QUESTION + OPTIONS

A pair present in both the job-proposing and candidate-proposing stable matchings is present in every stable matching.

A. True

B. False

REFERENCE ANSWER

A. True

JEV / CORRECT

A. True

API confidence: 0.82
Option probabilities:
{ "B": 0.09, "A": 0.91 }

Section batch: 350 ms
Not per-question latency

QUESTION + OPTIONS

For every n , there can be a job-optimal stable matching containing a pair who rank each other last.

- A. True
- B. False

REFERENCE ANSWER

A. True

JEV / CORRECT

A. True

API confidence: 0.62
Option probabilities:
{ "B": 0.19, "A": 0.81 }

Section batch: 350 ms
Not per-question latency

QUESTION + OPTIONS

Two participants who rank each other first must be paired in every stable matching.

A. True

B. False

REFERENCE ANSWER

A. True

JEV / CORRECT

A. True

API confidence: 0.95
Option probabilities:
{ "B": 0.03, "A": 0.97 }

Section batch: 350 ms
Not per-question latency

QUESTION + OPTIONS

Two disjoint pairs, each pair ranking one another last, cannot both occur in a stable matching.

A. False

B. True

REFERENCE ANSWER

B. True

JEV / CORRECT

B. True

API confidence: 0.15
Option probabilities:
{ "B": 0.57, "A": 0.43 }

Section batch: 350 ms
Not per-question latency

QUESTION + OPTIONS

If job J is ranked last by every candidate other than C, and C is ranked last by every job other than J, then J and C must be matched in every stable matching.

A. False

B. True

REFERENCE ANSWER

B. True

JEV / CORRECT

B. True

API confidence: 0.59
Option probabilities:
{ "B": 0.79, "A": 0.21 }

Section batch: 350 ms
Not per-question latency

QUESTION + OPTIONS

P: powered on. M: in motion. A: alarm activated. R: rerouting. S: senses an obstacle.

Express: the robot is not in motion unless powered on.

A. P AND M

B. NOT M implies NOT P

C. P implies M

D. M implies P

REFERENCE ANSWER

D. M implies P

JEV / CORRECT

D. M implies P

API confidence: 1.00
Option probabilities:
{ "D": 1.0, "B": 0.0, "C": 0.0, "A": 0.0 }

Section batch: 324 ms
Not per-question latency

QUESTION + OPTIONS

P: powered on. M: in motion. A: alarm activated. R: rerouting. S: senses an obstacle.

Contrapositive of: if powered on, it is in motion or its alarm is activated.

- A. NOT P implies (NOT M AND NOT A)
- B. (NOT M AND NOT A) implies NOT P
- C. (NOT M OR NOT A) implies NOT P
- D. (M OR A) implies P

REFERENCE ANSWER

B. (NOT M AND NOT A)
implies NOT P

JEV / CORRECT

B. (NOT M AND NOT A)
implies NOT P

API confidence: 1.00
Option probabilities:
{ "D": 0.0, "A": 0.0, "C": 0.0, "B": 1.0 }

Section batch: 324 ms
Not per-question latency

QUESTION + OPTIONS

P: powered on. M: in motion. A: alarm activated. R: rerouting. S: senses an obstacle. Rules: $M \Rightarrow P$; $(S \text{ AND } A) \Rightarrow (\text{NOT } R \text{ OR NOT } P)$; $(P \text{ AND } M \text{ AND } R) \Rightarrow S$; $(P \text{ AND } S) \Rightarrow (A \text{ OR NOT } M)$.

Given M true, what follows about R,S?

- A. R true; S could be either
- B. R false; S true
- C. R false; S could be either
- D. R true; S true
- E. R false; S false
- F. R true; S false

REFERENCE ANSWER

C. R false; S could be either

JEV / CORRECT

C. R false; S could be either

API confidence: 0.38
Option probabilities:
{`"D"`: 0.1, `"E"`: 0.18, `"B"`: 0.03, `"F"`: 0.08, `"A"`: 0.14, `"C"`: 0.47}

Section batch: 324 ms
Not per-question latency

QUESTION + OPTIONS

$L(t)$ means low battery at t , $C(t)$ means charging. Express: whenever battery is low, it charges at some strictly later time.

- A. forall $t \geq 0$, $C(t)$ implies exists $u > t$ $L(u)$
- B. forall $t \geq 0$, $L(t)$ implies exists $u > t$ $C(u)$
- C. forall $t \geq 0$, $L(t)$ implies $C(t)$
- D. exists $u \geq 0$, forall $t \geq 0$, $L(t)$ implies $C(u)$

REFERENCE ANSWER

B. forall $t \geq 0$, $L(t)$ implies exists $u > t$ $C(u)$

JEV / CORRECT

B. forall $t \geq 0$, $L(t)$ implies exists $u > t$ $C(u)$

API confidence: 1.00
Option probabilities:
{ $"D"$: 0.0, $"A"$: 0.0, $"C"$: 0.0, $"B"$: 1.0}

Section batch: 324 ms
Not per-question latency

QUESTION + OPTIONS

Find the fatal error and explanation in this attempted induction that $2^n=1$ for all $n \geq 0$: base $2^0=1$; write $n+1=i+j$ with positive $i,j \leq n$; apply strong induction to i,j ; multiply $2^i 2^j=1$.

- A. The base case is wrong because $2^0=0$.
- B. The multiplication identity $2^{(i+j)}=2^i \cdot 2^j$ is false.
- C. Strong induction cannot assume two earlier cases.
- D. The decomposition fails at $n=0$: 1 cannot be the sum of two positive integers.

REFERENCE ANSWER

D. The decomposition fails at $n=0$: 1 cannot be the sum of two positive integers.

JEV / CORRECT

D. The decomposition fails at $n=0$: 1 cannot be the sum of two positive integers.

API confidence: 1.00
Option probabilities:
{ "C": 0.0, "B": 0.0, "A": 0.0, "D": 1.0 }

Section batch: 295 ms
Not per-question latency

QUESTION + OPTIONS

Find the error: base triangle angle sum is 180; assume all n -gons have angle sum $180(n-2)$; add a triangle to an n -gon to make an $(n+1)$ -gon; the angle sum increases by 180; conclude all $(n+1)$ -gons satisfy the formula.

- A. The construction has not shown that every $(n+1)$ -gon is obtainable this way; start with an arbitrary larger polygon and justify removing a triangle.
- B. The base case fails because triangles have angle sum 360.
- C. Adding the three angles of a triangle gives 360, not 180.
- D. Induction can never prove a geometric statement.

REFERENCE ANSWER

A. The construction has not shown that every $(n+1)$ -gon is obtainable this way; start with an arbitrary larger polygon and justify removing a triangle.

JEV / CORRECT

A. The construction has not shown that every $(n+1)$ -gon is obtainable this way; start with an arbitrary larger polygon and justify removing a triangle.

API confidence: 1.00
Option probabilities:
{ "D": 0.0, "C": 0.0, "A": 1.0, "B": 0.0 }

Section batch: 295 ms
Not per-question latency

QUESTION + OPTIONS

$F_0=0, F_1=1, F_n=F_{(n-1)}+F_{(n-2)}$. Which induction proves $\sum(F_i^2, i=0..n)=F_n \cdot F_{(n+1)}$?

- A. Every Fibonacci number equals its index, so the claim reduces to the sum of squares formula.
- B. Square the recurrence and discard its cross term to make the sum telescope.
- C. Base $n=0$ gives zero on both sides. Add $F_{(k+1)}^2$ to $F_k \cdot F_{(k+1)}$, factor to $F_{(k+1)}[F_k+F_{(k+1)}]=F_{(k+1)}F_{(k+2)}$.
- D. Base $n=0$ holds. Add $F_{(k+1)}$ instead of its square, obtaining the next product.

REFERENCE ANSWER

C. Base $n=0$ gives zero on both sides. Add $F_{(k+1)}^2$ to $F_k \cdot F_{(k+1)}$, factor to $F_{(k+1)}[F_k+F_{(k+1)}]=F_{(k+1)}F_{(k+2)}$.

JEV / CORRECT

C. Base $n=0$ gives zero on both sides. Add $F_{(k+1)}^2$ to $F_k \cdot F_{(k+1)}$, factor to $F_{(k+1)}[F_k+F_{(k+1)}]=F_{(k+1)}F_{(k+2)}$.

API confidence: 1.00
Option probabilities:
{ "B": 0.0, "D": 0.0, "A": 0.0, "C": 1.0 }

Section batch: 581 ms
Not per-question latency

QUESTION + OPTIONS

Prove $\sum(i^3, i=1..n)=[\sum(i, i=1..n)]^2$. You may use $\sum(i)=n(n+1)/2$.

- A. Base $n=1$ holds. By induction, the next sum is $[k(k+1)/2]^2+(k+1)^3=(k+1)^2(k+2)^2/4$, the required next square.
- B. Cube the formula for $\sum(i)$, because the cube of a sum is the sum of cubes.
- C. The next difference between the squared sums is $(k+1)^2$, equal to the next cube.
- D. Checking $n=1$ and $n=2$ suffices, since both sides are polynomials of arbitrary degree.

REFERENCE ANSWER

A. Base $n=1$ holds. By induction, the next sum is $[k(k+1)/2]^2+(k+1)^3=(k+1)^2(k+2)^2/4$, the required next square.

JEV / CORRECT

A. Base $n=1$ holds. By induction, the next sum is $[k(k+1)/2]^2+(k+1)^3=(k+1)^2(k+2)^2/4$, the required next square.

API confidence: 1.00
Option probabilities:
{ "B": 0.0, "D": 0.0, "A": 1.0, "C": 0.0 }

Section batch: 581 ms
Not per-question latency

QUESTION + OPTIONS

Vertices a,b,c,d,e,f. Edges ab,af,bf,bc,fc,fe,ce,cd,de. There are no other edges.

Which one new edge creates an Eulerian tour?

- A. b-d
- B. a-e
- C. a-d
- D. b-e

REFERENCE ANSWER

D. b-e

JEV / INCORRECT

C. a-d

API confidence: 0.03
Option probabilities:
{ "C": 0.28, "D": 0.2, "A": 0.25, "B": 0.27 }

Section batch: 420 ms
Not per-question latency

QUESTION + OPTIONS

Vertices a,b,c,d,e,f,g. Edges ab,ad,bc,bf,ce,de,ef,fg,eg. There are no other edges.

Which one vertex must be removed so the remaining graph has a Hamiltonian cycle?

- A. g
- B. b
- C. c
- D. a

REFERENCE ANSWER

C. c

JEV / INCORRECT

D. a

API confidence: 0.22
Option probabilities:
{"C": 0.16, "D": 0.41, "A": 0.1, "B": 0.33}

Section batch: 420 ms
Not per-question latency

QUESTION + OPTIONS

Prove a tree with a degree- k vertex has at least k leaves.

- A. The handshake lemma says every tree has exactly k leaves regardless of its other degrees.
- B. All k neighbors must be leaves because trees have no cycles.
- C. For $k \geq 2$, remove that vertex; its k components each contain a leaf of the original tree, by following a longest path away from the removed vertex. The $k=0,1$ cases hold directly.
- D. Remove the vertex; all remaining vertices become isolated and therefore leaves.

REFERENCE ANSWER

C. For $k \geq 2$, remove that vertex; its k components each contain a leaf of the original tree, by following a longest path away from the removed vertex. The $k=0,1$ cases hold directly.

JEV / CORRECT

C. For $k \geq 2$, remove that vertex; its k components each contain a leaf of the original tree, by following a longest path away from the removed vertex. The $k=0,1$ cases hold directly.

API confidence: 1.00
Option probabilities:
{ "C": 1.0, "D": 0.0, "A": 0.0, "B": 0.0 }

Section batch: 420 ms
Not per-question latency

QUESTION + OPTIONS

A connected graph has 80 vertices, 135 edges and girth 5. Is it planar? Justify.

A. No. Euler and $5f \leq 2e$ imply $e \leq 5(v-2)/3 = 130$, violated by 135.

B. Yes. The inequality $e \leq 3v-6$ holds and is sufficient for planarity.

C. No. Any graph with a five-cycle is nonplanar.

D. Yes. Odd girth guarantees a planar embedding.

REFERENCE ANSWER

A. No. Euler and $5f \leq 2e$ imply $e \leq 5(v-2)/3 = 130$, violated by 135.

JEV / CORRECT

A. No. Euler and $5f \leq 2e$ imply $e \leq 5(v-2)/3 = 130$, violated by 135.

API confidence: 1.00
Option probabilities:
{ "C": 0.0, "D": 0.0, "A": 1.0, "B": 0.0 }

Section batch: 420 ms
Not per-question latency

QUESTION + OPTIONS

Compute $1!+3!+5!+\dots+99!$ modulo 24.

- A. 1
- B. 6
- C. 7
- D. 0

REFERENCE ANSWER

C. 7

JEV / CORRECT

C. 7

API confidence: 0.49
Option probabilities:
{"B": 0.18, "D": 0.05, "C": 0.61, "A": 0.16}

Section batch: 364 ms
Not per-question latency

QUESTION + OPTIONS

Solve $5x \equiv 7 \pmod{11}$, x in $0..10$.

- A. 2
- B. 5
- C. 9
- D. 8

REFERENCE ANSWER

D. 8

JEV / INCORRECT

C. 9

API confidence: 0.26
Option probabilities:
{ "B": 0.1, "D": 0.37, "C": 0.45, "A": 0.08 }

Section batch: 364 ms
Not per-question latency

QUESTION + OPTIONS

Units digit of 7^{96} ?

- A. 1
- B. 3
- C. 9
- D. 7

REFERENCE ANSWER

A. 1

JEV / CORRECT

A. 1

API confidence: 0.86
Option probabilities:
{**"B"**: 0.0, **"D"**: 0.0, **"C"**: 0.1, **"A"**: 0.9}

Section batch: 364 ms
Not per-question latency

QUESTION + OPTIONS

RSA uses primes $p=7, q=11$ and public exponent $e=11$.

Give the public key (N, e) .

A. $(77, 7)$

B. $(77, 11)$

C. $(60, 11)$

D. $(18, 11)$

REFERENCE ANSWER

B. $(77, 11)$

JEV / CORRECT

B. $(77, 11)$

API confidence: 1.00
Option probabilities:
{**"B"**: 1.0, "D": 0.0, "C": 0.0, "A": 0.0}

Section batch: 364 ms
Not per-question latency

QUESTION + OPTIONS

RSA uses primes $p=7, q=11$ and public exponent $e=11$.

Encrypt message 3.

A. 27

B. 11

C. 33

D. 47

REFERENCE ANSWER

D. 47

JEV / CORRECT

D. 47

API confidence: 0.31
Option probabilities:
{ "B": 0.06, "D": 0.48, "C": 0.13, "A": 0.33 }

Section batch: 364 ms
Not per-question latency

QUESTION + OPTIONS

RSA uses primes $p=7, q=11$ and public exponent $e=11$.

Decrypt ciphertext 47.

A. 3

B. 7

C. 47

D. 11

REFERENCE ANSWER

A. 3

JEV / INCORRECT

C. 47

API confidence: 0.23
Option probabilities:
{ "B": 0.21, "D": 0.04, "C": 0.43, "A": 0.32 }

Section batch: 364 ms
Not per-question latency

QUESTION + OPTIONS

Three products appear every 5,3,11 days and were last available 3,1,2 days ago respectively. Earliest number of days from today when all are available? Hint: CRT.

A. 97

B. 42

C. 165

D. 152

REFERENCE ANSWER

D. 152

JEV / INCORRECT

A. 97

API confidence: 0.32
Option probabilities:
{ "B": 0.16, "D": 0.23, "C": 0.12, "A": 0.49 }

Section batch: 364 ms
Not per-question latency

QUESTION + OPTIONS

Over $\text{GF}(p)$, prime $p > 20$, a polynomial P has degree at most 2. Treasure coordinates are $(P(10), P(20))$. Hints give values at distinct field coordinates other than 10 and 20.

Hints needed to determine the treasure location?

- A. 3
- B. 4
- C. 1
- D. 2

REFERENCE ANSWER

A. 3

JEV / INCORRECT

D. 2

Pre-run repair:
Use degree at most 2 to match the source’s interpolation/counting convention.

API confidence: 0.31
Option probabilities:
{"B": 0.01, "C": 0.16, "A": 0.35, "D": 0.48}

Section batch: 369 ms
Not per-question latency

QUESTION + OPTIONS

Over $\text{GF}(p)$, prime $p > 20$, a polynomial P has degree at most 2. Treasure coordinates are $(P(10), P(20))$. Hints give values at distinct field coordinates other than 10 and 20.

After one hint, number of still-possible treasure locations?

- A. $p-1$
- B. p^2
- C. p
- D. 1

REFERENCE ANSWER

B. p^2

JEV / INCORRECT

C. p

API confidence: 0.57
Option probabilities:
{ "B": 0.12, "C": 0.68, "A": 0.18, "D": 0.02 }

Section batch: 369 ms
Not per-question latency

QUESTION + OPTIONS

Over $\text{GF}(p)$, prime $p > 20$, a polynomial P has degree at most 2. Treasure coordinates are $(P(10), P(20))$. Hints give values at distinct field coordinates other than 10 and 20.

After two hints, number of still-possible treasure locations?

- A. $p-1$
- B. 1
- C. p^2
- D. p

REFERENCE ANSWER

D. p

JEV / INCORRECT

B. 1

API confidence: 0.79
Option probabilities:
{ "B": 0.85, "C": 0.02, "A": 0.03, "D": 0.1 }

Section batch: 369 ms
Not per-question latency

QUESTION + OPTIONS

Over $\text{GF}(p)$, prime $p > 20$, a polynomial P has degree at most 2. Treasure coordinates are $(P(10), P(20))$. Hints give values at distinct field coordinates other than 10 and 20.

Hints $P(0)=5, P(1)=5, P(3)=11$. Find P . Hint: solve for coefficients rather than use Lagrange.

- A. x^2-x+5
- B. x^2+x+5
- C. $x+5$
- D. $2x^2-2x+5$

REFERENCE ANSWER

A. x^2-x+5

Pre-run repair:
Allow coordinates 0 and 1, used by source despite its earlier $k \geq 2$ restriction.

JEV / CORRECT

A. x^2-x+5

API confidence: 0.65
Option probabilities:
{ "B": 0.05, "C": 0.07, "A": 0.73, "D": 0.15 }

Section batch: 369 ms
Not per-question latency

QUESTION + OPTIONS

Over $\text{GF}(p)$, prime $p > 20$, a polynomial P has degree at most 2. Treasure coordinates are $(P(10), P(20))$. Hints give values at distinct field coordinates other than 10 and 20.

For $p=89$ and hints $P(0)=5, P(1)=5, P(3)=11$, find the treasure coordinates.

- A. (16,69)
- B. (6,29)
- C. (5,11)
- D. (95,385)

REFERENCE ANSWER

B. (6,29)

JEV / INCORRECT

A. (16,69)

API confidence: 0.32
Option probabilities:
{ "B": 0.23, "C": 0.21, "A": 0.48, "D": 0.08 }

Section batch: 369 ms
Not per-question latency

QUESTION + OPTIONS

Over $\text{GF}(p)$, prime $p > 20$, a polynomial P has degree at most 2. Treasure coordinates are $(P(10), P(20))$. Hints give values at distinct field coordinates other than 10 and 20.

At most one hint is corrupted. Minimum hints to detect whether a corruption occurred, using only the hints and no visits to treasure locations?

- A. 5
- B. 2
- C. 3
- D. 4

REFERENCE ANSWER

D. 4

Pre-run repair:
Disallow physical location checks; source accepted an alternative three-hint strategy using extra observations.

JEV / INCORRECT

C. 3

API confidence: 0.44
Option probabilities:
{ "B": 0.12, "C": 0.58, "A": 0.12, "D": 0.18 }

Section batch: 369 ms
Not per-question latency

QUESTION + OPTIONS

Over $\text{GF}(p)$, prime $p > 20$, a polynomial P has degree at most 2. Treasure coordinates are $(P(10), P(20))$. Hints give values at distinct field coordinates other than 10 and 20.

One hint is corrupted at an unknown location. Minimum hints guaranteeing recovery of the correct polynomial?

- A. 6
- B. 4
- C. 3
- D. 5

REFERENCE ANSWER

D. 5

JEV / CORRECT

D. 5

API confidence: 0.26
Option probabilities:
{ "B": 0.33, "C": 0.11, "A": 0.12, "D": 0.44 }

Section batch: 369 ms
Not per-question latency

QUESTION + OPTIONS

Is the set of integer grid points (x,y) with $\gcd(x,y)=1$ countable? Justify.

- A. No; the plane is uncountable.
- B. No; coprimality prevents enumeration.
- C. Yes; it is a subset of the countable set $\mathbb{Z} \times \mathbb{Z}$.
- D. Yes; it is finite.

REFERENCE ANSWER

C. Yes; it is a subset of the countable set $\mathbb{Z} \times \mathbb{Z}$.

JEV / CORRECT

C. Yes; it is a subset of the countable set $\mathbb{Z} \times \mathbb{Z}$.

API confidence: 1.00
Option probabilities:
{ "B": 0.0, "D": 0.0, "A": 0.0, "C": 1.0 }

Section batch: 300 ms
Not per-question latency

QUESTION + OPTIONS

A vehicle starts at the origin facing up and chooses left, straight or right at each grid intersection. Are its finite routes countable?

- A. No; three choices at every step make even finite strings uncountable.
- B. No; routes may have arbitrary finite length.
- C. Yes; finite routes are finite strings over a three-symbol alphabet.
- D. Yes; there are only three possible routes.

REFERENCE ANSWER

C. Yes; finite routes are finite strings over a three-symbol alphabet.

JEV / CORRECT

C. Yes; finite routes are finite strings over a three-symbol alphabet.

API confidence: 0.99
Option probabilities:
{ "B": 0.0, "D": 0.0, "A": 0.0, "C": 1.0 }

Section batch: 300 ms
Not per-question latency

QUESTION + OPTIONS

A vehicle starts at the origin facing up and chooses left, straight or right at each grid intersection. Are all infinite routes countable?

- A. No; there are only finitely many infinite routes.
- B. Yes; the union of all finite routes contains every infinite route.
- C. No; restricting to two turn choices embeds all infinite binary sequences.
- D. Yes; each route visits only countably many intersections.

REFERENCE ANSWER

C. No; restricting to two turn choices embeds all infinite binary sequences.

JEV / CORRECT

C. No; restricting to two turn choices embeds all infinite binary sequences.

API confidence: 0.98
Option probabilities:
{**"B"**: 0.0, **"D"**: 0.01, **"A"**: 0.0, **"C"**: 0.99}

Section batch: 300 ms
Not per-question latency

QUESTION + OPTIONS

At each (x,y) in $\mathbb{Z}^2$ there are $|x|+|y|$ parking spaces. Is the set of all spaces countable?

- A. Yes; there is a finite total number of spaces.
- B. No; the number at an intersection is unbounded across the grid.
- C. Yes; a countable union of finite sets is countable.
- D. No; a union of infinitely many finite sets is always uncountable.

REFERENCE ANSWER

C. Yes; a countable union of finite sets is countable.

JEV / CORRECT

C. Yes; a countable union of finite sets is countable.

API confidence: 0.99
Option probabilities:
{ "B": 0.01, "D": 0.0, "A": 0.0, "C": 0.99 }

Section batch: 300 ms
Not per-question latency

QUESTION + OPTIONS

Another exam question says a valid RSA signature with public key (55,3) is attached to one of the possible TA counts, 12 or 13, with signature 23.

How many TAs are there this semester?

- A. 13
- B. 14
- C. 12
- D. 11

REFERENCE ANSWER

C. 12

JEV / INCORRECT

A. 13

Pre-run repair:
Supply original Q9.3 cross-question clue to avoid testing unavailable course attendance context.

API confidence: 0.38
Option probabilities:
{ "C": 0.43, "D": 0.01, "A": 0.55, "B": 0.01 }

Section batch: 347 ms
Not per-question latency

QUESTION + OPTIONS

(NOT P AND R) OR (NOT P AND Q) is equivalent to NOT P AND (R OR Q).

A. False

B. True

REFERENCE ANSWER

B. True

JEV / CORRECT

B. True

API confidence: 1.00
Option probabilities:
{ "B": 1.0, "A": 0.0 }

Section batch: 393 ms
Not per-question latency

QUESTION + OPTIONS

(P AND Q) AND (NOT P OR NOT Q) is equivalent to P AND NOT P.

A. False

B. True

REFERENCE ANSWER

B. True

JEV / INCORRECT

A. False

API confidence: 0.12
Option probabilities:
{"B": 0.44, "A": 0.56}

Section batch: 393 ms
Not per-question latency

QUESTION + OPTIONS

(P implies Q) AND (P implies NOT Q) is equivalent to NOT P.

A. True

B. False

REFERENCE ANSWER

A. True

JEV / CORRECT

A. True

API confidence: 0.98
Option probabilities:
{"B": 0.01, "A": 0.99}

Section batch: 393 ms
Not per-question latency

QUESTION + OPTIONS

(P implies R) AND (P implies NOT R) is equivalent to NOT R.

A. False

B. True

REFERENCE ANSWER

A. False

JEV / CORRECT

A. False

API confidence: 0.97
Option probabilities:
{ "B": 0.02, "A": 0.98 }

Section batch: 393 ms
Not per-question latency

QUESTION + OPTIONS

Negate forall n in N, P(n), without using forall.

- A. exists n in N, P(n)
- B. NOT exists n in N, P(n)
- C. exists n in N, NOT P(n)
- D. exists n in N, P(n) AND NOT P(n)

REFERENCE ANSWER

C. exists n in N, NOT P(n)

JEV / CORRECT

C. exists n in N, NOT P(n)

API confidence: 1.00
Option probabilities:
{ "B": 0.0, "D": 0.0, "A": 0.0, "C": 1.0 }

Section batch: 393 ms
Not per-question latency

QUESTION + OPTIONS

N includes zero. For every predicate P, [NOT(forall n P(n)) AND P(0)] implies exists n [P(n) AND NOT P(n+1)].

A. True

B. False

REFERENCE ANSWER

A. True

JEV / CORRECT

A. True

API confidence: 0.42
Option probabilities:
{ "B": 0.29, "A": 0.71 }

Section batch: 393 ms
Not per-question latency

QUESTION + OPTIONS

forall n [Q(n) AND P(n)] is equivalent to (forall n Q(n)) AND (forall n P(n)).

A. True

B. False

REFERENCE ANSWER

A. True

JEV / CORRECT

A. True

API confidence: 0.99
Option probabilities:
{ "B": 0.0, "A": 1.0 }

Section batch: 393 ms
Not per-question latency

QUESTION + OPTIONS

forall n [Q(n) implies P(n)] is equivalent to (forall n NOT Q(n)) OR (forall n P(n)).

A. False

B. True

REFERENCE ANSWER

A. False

JEV / CORRECT

A. False

API confidence: 0.97
Option probabilities:
{ "B": 0.01, "A": 0.99 }

Section batch: 393 ms
Not per-question latency

QUESTION + OPTIONS

Three people each like exactly one other person. Must someone be liked by nobody? Give a proof or counterexample.

- A. Yes: three preferences among three people force two preferences to share a target.
- B. No: A likes B, B likes C, and C likes A; everyone is liked once.
- C. Yes: whoever is least popular receives no preference.
- D. No: let everyone like themselves.

REFERENCE ANSWER

B. No: A likes B, B likes C, and C likes A; everyone is liked once.

JEV / CORRECT

B. No: A likes B, B likes C, and C likes A; everyone is liked once.

API confidence: 1.00
Option probabilities:
{ "C": 0.0, "D": 0.0, "A": 0.0, "B": 1.0 }

Section batch: 343 ms
Not per-question latency

QUESTION + OPTIONS

- Positive integers a, b, c satisfy $a^2 + b^2 = c^2$ and $\gcd(a, b, c) = 1$. Why must c be odd?
- A. Every square is odd, so the sum of two squares is odd.
 - B. If c is even, then $a + b = c$ and both legs are automatically even.
 - C. Squares are 0 or 1 mod 4. If c were even, both a, b would have to be even (two odd squares sum to 2 mod 4), contradicting the common gcd 1.
 - D. Since the gcd is 1, a, b, c must all be odd, proving the claim.

REFERENCE ANSWER

C. Squares are 0 or 1 mod 4. If c were even, both a, b would have to be even (two odd squares sum to 2 mod 4), contradicting the common gcd 1.

Pre-run repair:
Use the intended common-gcd definition explicitly, consistent with the official grading note.

JEV / CORRECT

C. Squares are 0 or 1 mod 4. If c were even, both a, b would have to be even (two odd squares sum to 2 mod 4), contradicting the common gcd 1.

API confidence: 1.00
Option probabilities:
{ "C": 1.0, "A": 0.0, "D": 0.0, "B": 0.0 }

Section batch: 343 ms
Not per-question latency

QUESTION + OPTIONS

Prove $\sum(i^3, i=1..n)=[n(n+1)/2]^2$ by induction. Which step is valid? You may use $\sum(i)=n(n+1)/2$.

- A. Cube the identity $\sum(i)=n(n+1)/2$; sums commute with cubing.
- B. Base $n=1$ holds. The next cube is $(n+1)^2$, so adding it gives the next square of a triangular number.
- C. Base $n=1$ holds. Adding $(n+1)^3$ to $[n(n+1)/2]^2$ gives $(n+1)^2[n^2+4(n+1)]/4=[(n+1)(n+2)/2]^2$.
- D. Because the formula holds for $n=1$ and $n=2$, it holds for all n without another step.

REFERENCE ANSWER

C. Base $n=1$ holds. Adding $(n+1)^3$ to $[n(n+1)/2]^2$ gives $(n+1)^2[n^2+4(n+1)]/4=[(n+1)(n+2)/2]^2$.

JEV / CORRECT

C. Base $n=1$ holds. Adding $(n+1)^3$ to $[n(n+1)/2]^2$ gives $(n+1)^2[n^2+4(n+1)]/4=[(n+1)(n+2)/2]^2$.

API confidence: 1.00
Option probabilities:
{ "D": 0.0, "A": 0.0, "C": 1.0, "B": 0.0 }

Section batch: 479 ms
Not per-question latency

QUESTION + OPTIONS

Among all preference instances with n jobs and n candidates, what is the maximum possible number of blocking pairs in a complete pairing?

- A. $n(n-1)$
- B. $n-1$
- C. n^2
- D. $n(n-1)/2$

REFERENCE ANSWER

A. $n(n-1)$

JEV / CORRECT

A. $n(n-1)$

API confidence: 0.71
Option probabilities:
{`"B": 0.0`, `"C": 0.06`, `"D": 0.16`, `"A": 0.78`}

Section batch: 421 ms
Not per-question latency

QUESTION + OPTIONS

If a stable matching gives one particular job its best attainable stable partner, must that candidate have its worst attainable stable partner?

A. False

B. True

REFERENCE ANSWER

B. True

JEV / CORRECT

B. True

API confidence: 0.16
Option probabilities:
{ "B": 0.58, "A": 0.42 }

Section batch: 421 ms
Not per-question latency

QUESTION + OPTIONS

In job-proposing deferred acceptance, if a candidate rejects $n-1$ distinct jobs, that candidate ends with its favorite job.

A. True

B. False

REFERENCE ANSWER

A. True

JEV / INCORRECT

B. False

API confidence: 0.16
Option probabilities:
{`"B"`: 0.58, `"A"`: 0.42}

Section batch: 421 ms
Not per-question latency

QUESTION + OPTIONS

If job J is rejected by C, and J’ ends with C, then J’s eventual partner has a worse rank in J’s list than C has in J’s list.

A. True

B. False

REFERENCE ANSWER

B. False

JEV / INCORRECT

A. True

API confidence: 0.20
Option probabilities:
{“B”: 0.4, “A”: 0.6}

Section batch: 421 ms
Not per-question latency

QUESTION + OPTIONS

If a job and candidate rank each other first, they are paired in every stable matching.

A. True

B. False

REFERENCE ANSWER

A. True

JEV / CORRECT

A. True

API confidence: 0.96
Option probabilities:
{ "B": 0.02, "A": 0.98 }

Section batch: 421 ms
Not per-question latency

QUESTION + OPTIONS

Construct, for each $n \geq 2$, an instance with exactly one stable matching.

- A. Let rankings be arbitrary; the deferred acceptance output proves uniqueness.
- B. Make every job rank C1 first; this alone uniquely determines every candidate's partner.
- C. Make J_i and C_i rank each other first for all i . Every such pair must be matched, otherwise it blocks; their combined matching is stable.
- D. Let each J_i rank C_i last and each C_i rank J_i last; these pairs must be stable.

REFERENCE ANSWER

C. Make J_i and C_i rank each other first for all i . Every such pair must be matched, otherwise it blocks; their combined matching is stable.

JEV / CORRECT

C. Make J_i and C_i rank each other first for all i . Every such pair must be matched, otherwise it blocks; their combined matching is stable.

API confidence: 0.98
Option probabilities:
{ "B": 0.0, "C": 0.99, "A": 0.01, "D": 0.0 }

Section batch: 421 ms
Not per-question latency

QUESTION + OPTIONS

Construct an instance with exactly two stable matchings for every $n \geq 2$.

A. Take two arbitrary complete pairings and declare both stable; preferences do not affect stability.

B. Give all jobs the same ranking and all candidates the same ranking; this yields exactly two stable matchings.

C. On the first two pairs use $J_1:C_2 > C_1$, $J_2:C_1 > C_2$, $C_1:J_1 > J_2$, $C_2:J_2 > J_1$; rank outsiders below these. For $i > 2$, J_i and C_i rank each other first. The forced outer pairs leave exactly the two stable pairings of the first block.

D. Make every J_i and C_i rank each other first; then both the identity and any swap are stable.

REFERENCE ANSWER

C. On the first two pairs use $J_1:C_2 > C_1$, $J_2:C_1 > C_2$, $C_1:J_1 > J_2$, $C_2:J_2 > J_1$; rank outsiders below these. For $i > 2$, J_i and C_i rank each other first. The forced outer pairs leave exactly the two stable pairings of the first block.

JEV / CORRECT

C. On the first two pairs use $J_1:C_2 > C_1$, $J_2:C_1 > C_2$, $C_1:J_1 > J_2$, $C_2:J_2 > J_1$; rank outsiders below these. For $i > 2$, J_i and C_i rank each other first. The forced outer pairs leave exactly the two stable pairings of the first block.

API confidence: 1.00
Option probabilities:
{ "B": 0.0, "C": 1.0, "A": 0.0, "D": 0.0 }

Section batch: 421 ms
Not per-question latency

QUESTION + OPTIONS

A connected simple planar graph has $v \geq 3$ vertices. Maximum number of faces?

- A. $3v-6$
- B. $2v-4$
- C. $2v-2$
- D. $v-2$

REFERENCE ANSWER

B. $2v-4$

JEV / CORRECT

B. $2v-4$

API confidence: 0.89
Option probabilities:
{**"B"**: 0.91, "C": 0.06, "A": 0.02, "D": 0.01}

Section batch: 312 ms
Not per-question latency

QUESTION + OPTIONS

A connected simple planar graph contains a cycle and has girth at least $g \geq 3$. Complete the bound $e \leq [g/(g-2)]v - \underline{\hspace{1cm}}$.

- A. $g/(g-2)$
- B. $g-2$
- C. 2
- D. $2g/(g-2)$

REFERENCE ANSWER

D. $2g/(g-2)$

Pre-run repair:
Require a cycle; without it a tiny tree can violate the stated girth bound for arbitrarily large g .

JEV / CORRECT

D. $2g/(g-2)$

API confidence: 0.40
Option probabilities:
{"B": 0.03, "C": 0.06, "A": 0.36, "D": 0.55}

Section batch: 312 ms
Not per-question latency

QUESTION + OPTIONS

- Why is every planar graph with no cycle shorter than six edges 3-colorable?
- A. The average degree is below three, so every vertex has degree at most two and the graph is a disjoint union of paths.
 - B. Every nonempty subgraph has a vertex of degree at most two: forests have leaves, and the planar girth bound gives average degree below three for cyclic components. Remove such a vertex, inductively 3-color the rest, then restore it using a color absent from its at most two neighbors.
 - C. Euler’s formula gives exactly three faces, which can be used as vertex colors.
 - D. Every planar graph is bipartite, so two colors suffice.

REFERENCE ANSWER

B. Every nonempty subgraph has a vertex of degree at most two: forests have leaves, and the planar girth bound gives average degree below three for cyclic components. Remove such a vertex, inductively 3-color the rest, then restore it using a color absent from its at most two neighbors.

JEV / CORRECT

B. Every nonempty subgraph has a vertex of degree at most two: forests have leaves, and the planar girth bound gives average degree below three for cyclic components. Remove such a vertex, inductively 3-color the rest, then restore it using a color absent from its at most two neighbors.

API confidence: 1.00
Option probabilities:
{“C”: 0.0, “B”: 1.0, “A”: 0.0, “D”: 0.0}

Section batch: 312 ms
Not per-question latency

QUESTION + OPTIONS

How many edges are in the complement of a tree on n vertices?

- A. $C(n,2)-n+1$
- B. $C(n-1,2)-1$
- C. $C(n,2)-n$
- D. $n-1$

REFERENCE ANSWER

A. $C(n,2)-n+1$

JEV / CORRECT

A. $C(n,2)-n+1$

API confidence: 1.00
Option probabilities:
{`"C"`: 0.0, `"B"`: 0.0, `"A"`: 1.0, `"D"`: 0.0}

Section batch: 312 ms
Not per-question latency

QUESTION + OPTIONS

How many edges are in the complement of a d -dimensional hypercube?

- A. $C(2^d, 2) - d \cdot 2^{d-1}$
- B. $2^d - d$
- C. $C(2^d, 2) - d \cdot 2^d$
- D. $C(d, 2) - 2^d$

REFERENCE ANSWER

A. $C(2^d, 2) - d \cdot 2^{d-1}$

JEV / CORRECT

A. $C(2^d, 2) - d \cdot 2^{d-1}$

API confidence: 0.99
Option probabilities:
{**"C"**: 0.0, "B": 0.0, "A": 1.0, "D": 0.0}

Section batch: 312 ms
Not per-question latency

QUESTION + OPTIONS

Doubling a graph means taking two disjoint copies and adding an edge between each original vertex and its corresponding copy.

If G has n vertices and m edges, how many edges does its double have?

- A. $m+2n$
- B. $2m+n$
- C. $2m+2n$
- D. $2m$

REFERENCE ANSWER

B. $2m+n$

JEV / CORRECT

B. $2m+n$

API confidence: 0.99
Option probabilities:
{`"B"`: 1.0, `"C"`: 0.0, `"A"`: 0.0, `"D"`: 0.0}

Section batch: 312 ms
Not per-question latency

QUESTION + OPTIONS

Doubling a graph means taking two disjoint copies and adding an edge between each original vertex and its corresponding copy.

If G is bipartite, its double is bipartite.

A. True

B. False

REFERENCE ANSWER

A. True

JEV / INCORRECT

B. False

API confidence: 0.25
Option probabilities:
{`"B"`: 0.62, `"A"`: 0.38}

Section batch: 312 ms
Not per-question latency

QUESTION + OPTIONS

Doubling a graph means taking two disjoint copies and adding an edge between each original vertex and its corresponding copy.

How many doublings turn a k -dimensional hypercube into a d -dimensional hypercube, $k < d$?

- A. $2^{(d-k)}$
- B. $d+k$
- C. $d-k$
- D. d/k

REFERENCE ANSWER

C. $d-k$

JEV / CORRECT

C. $d-k$

API confidence: 0.93
Option probabilities:
{`"B"`: 0.0, `"C"`: 0.95, `"A"`: 0.05, `"D"`: 0.0}

Section batch: 312 ms
Not per-question latency

QUESTION + OPTIONS

Doubling a graph means taking two disjoint copies and adding an edge between each original vertex and its corresponding copy.

Minimum edges to remove from the double of an n -vertex tree to make it acyclic?

- A. $n-1$
- B. $2n-2$
- C. n
- D. 1

REFERENCE ANSWER

A. $n-1$

JEV / INCORRECT

C. n

API confidence: 0.50
Option probabilities:
{**"B"**: 0.03, **"C"**: 0.62, **"A"**: 0.31, **"D"**: 0.04}

Section batch: 312 ms
Not per-question latency

QUESTION + OPTIONS

Doubling a graph means taking two disjoint copies and adding an edge between each original vertex and its corresponding copy.

If G is c -colorable, $c \geq 2$, what is the smallest universal upper bound on colors needed for its double?

- A. $2c$
- B. c
- C. $c+1$
- D. $c-1$

REFERENCE ANSWER

B. c

JEV / CORRECT

B. c

API confidence: 0.27
Option probabilities:
{ $"B"$: 0.46, $"C"$: 0.31, $"A"$: 0.23, $"D"$: 0.0}

Section batch: 312 ms
Not per-question latency

QUESTION + OPTIONS

Doubling a graph means taking two disjoint copies and adding an edge between each original vertex and its corresponding copy.

If G contains a Hamiltonian cycle, its double also contains a Hamiltonian cycle.

A. True

B. False

REFERENCE ANSWER

A. True

JEV / CORRECT

A. True

API confidence: 0.71
Option probabilities:
{`"B"`: 0.15, `"A"`: 0.85}

Section batch: 312 ms
Not per-question latency

QUESTION + OPTIONS

Doubling a graph means taking two disjoint copies and adding an edge between each original vertex and its corresponding copy.

If a graph with at least two vertices contains an Eulerian tour, its double contains an Eulerian tour.

A. False

B. True

REFERENCE ANSWER

A. False

JEV / INCORRECT

B. True

API confidence: 0.51
Option probabilities:
{ "B": 0.76, "A": 0.24 }

Section batch: 312 ms
Not per-question latency

QUESTION + OPTIONS

Prove the complement of a disconnected graph is connected.

- A. For vertices u,v in different original components, uv is a complement edge. For u,v in the same component, choose w in another component; uw and wv are complement edges, giving a path.
- B. Every original component becomes a complete graph, so all components join automatically.
- C. A disconnected graph always has an isolated vertex, which becomes adjacent to all vertices in the complement.
- D. The complement has more edges than the original, and any denser graph is connected.

REFERENCE ANSWER

A. For vertices u,v in different original components, uv is a complement edge. For u,v in the same component, choose w in another component; uw and wv are complement edges, giving a path.

JEV / CORRECT

A. For vertices u,v in different original components, uv is a complement edge. For u,v in the same component, choose w in another component; uw and wv are complement edges, giving a path.

API confidence: 1.00
Option probabilities:
{ "B": 0.0, "C": 0.0, "A": 1.0, "D": 0.0 }

Section batch: 384 ms
Not per-question latency

QUESTION + OPTIONS

Inverse of 5 modulo 24, in 0..23?

- A. 19
- B. 1
- C. 7
- D. 5

REFERENCE ANSWER

D. 5

JEV / INCORRECT

A. 19

API confidence: 0.80
Option probabilities:
{ "C": 0.01, "B": 0.01, "D": 0.13, "A": 0.85 }

Section batch: 379 ms
Not per-question latency

QUESTION + OPTIONS

Compute 2^{75} modulo 35. Hint: consider RSA with $p=7,q=5,e=5$.

- A. 2
- B. 1
- C. 8
- D. 32

REFERENCE ANSWER

C. 8

JEV / INCORRECT

D. 32

API confidence: 0.18
Option probabilities:
{ "A": 0.17, "B": 0.1, "C": 0.35, "D": 0.38 }

Section batch: 379 ms
Not per-question latency

QUESTION + OPTIONS

Public key is $(N,e)=(55,3)$. Received signed messages are $(12,23)$ and $(13,23)$, where the second value is the signature $m^d \bmod N$. Which verifies, and why?
Hint: CRT may help.

- A. Both, because they carry the same signature.
- B. Neither, because a signature must equal the message.
- C. 12, because $23^3=12 \bmod 55$.
- D. 13, because $23^3=13 \bmod 55$.

REFERENCE ANSWER

C. 12, because $23^3=12 \bmod 55$.

JEV / INCORRECT

D. 13, because $23^3=13 \bmod 55$.

API confidence: 0.29
Option probabilities:
{ "C": 0.42, "B": 0.04, "D": 0.47, "A": 0.07 }

Section batch: 379 ms
Not per-question latency

QUESTION + OPTIONS

For positive integers $y < x$, the remainder $x \bmod y$ is at most $x/2$.

A. False

B. True

REFERENCE ANSWER

B. True

JEV / CORRECT

B. True

API confidence: 0.79
Option probabilities:
{**"B"**: 0.89, "A": 0.11}

Section batch: 379 ms
Not per-question latency

QUESTION + OPTIONS

Positive x,y have $d=\gcd(x,y)=ax+by$, with integer coefficients a,b .

For fixed integer i , give a solution z to $zx=id \bmod y$.

- A. $a+i$
- B. di
- C. bi
- D. ai

REFERENCE ANSWER

D. ai

JEV / CORRECT

D. ai

API confidence: 0.91
Option probabilities:
{ $"D"$: 0.92, $"A"$: 0.02, $"C"$: 0.05, $"B"$: 0.01}

Section batch: 379 ms
Not per-question latency

QUESTION + OPTIONS

Positive x,y have $d=\gcd(x,y)=ax+by$, with integer coefficients a,b .

How many distinct residues z modulo y solve $zx=id \bmod y$?

- A. y
- B. 1
- C. d
- D. y/d

REFERENCE ANSWER

C. d

JEV / INCORRECT

B. 1

API confidence: 0.65
Option probabilities:
{ $"C"$: 0.13, $"B"$: 0.74, $"D"$: 0.13, $"A"$: 0.0}

Section batch: 379 ms
Not per-question latency

QUESTION + OPTIONS

Positive x,y have $d=\gcd(x,y)=ax+by$, with integer coefficients a,b .

If $d=1$, solve $z=i \bmod x$ and $z=j \bmod y$, as a residue modulo xy .

A. $iax+jby$

B. $ijab$

C. $i+j$

D. $iby+jax$

REFERENCE ANSWER

D. $iby+jax$

JEV / CORRECT

D. $iby+jax$

API confidence: 0.60
Option probabilities:
{ $"C"$: 0.0, $"B"$: 0.0, $"D"$: 0.7, $"A"$: 0.3}

Section batch: 379 ms
Not per-question latency

QUESTION + OPTIONS

Smallest positive k with $2^k \equiv 1 \pmod{7}$?

- A. 6
- B. 3
- C. 2
- D. 7

REFERENCE ANSWER

B. 3

JEV / CORRECT

B. 3

API confidence: 0.97
Option probabilities:
{ "A": 0.02, "B": 0.98, "C": 0.0, "D": 0.0 }

Section batch: 379 ms
Not per-question latency

QUESTION + OPTIONS

For nonzero a modulo prime p and integer $k \geq 0$, prove $a^k = a^{(k \bmod (p-1)) \bmod p}$.

- A. Write $k = q(p-1) + r$. Fermat gives $a^{(p-1)} = 1$, so $a^k = (a^{(p-1)})^q \cdot a^r = a^r$.
- B. Reduce the base modulo $p-1$ and retain the exponent; these are equivalent operations.
- C. Fermat gives $a^p = 1$, so exponents repeat modulo p .
- D. All powers of nonzero residues are equal, so the exponent is irrelevant.

REFERENCE ANSWER

A. Write $k = q(p-1) + r$. Fermat gives $a^{(p-1)} = 1$, so $a^k = (a^{(p-1)})^q \cdot a^r = a^r$.

Pre-run repair:
State a nonzero explicitly, needed for Fermat exponent reduction.

JEV / CORRECT

A. Write $k = q(p-1) + r$. Fermat gives $a^{(p-1)} = 1$, so $a^k = (a^{(p-1)})^q \cdot a^r = a^r$.

API confidence: 1.00
Option probabilities:
{"A": 1.0, "B": 0.0, "C": 0.0, "D": 0.0}

Section batch: 379 ms
Not per-question latency

QUESTION + OPTIONS

If $\gcd(k, p-1)=1$, multiplication by k permutes the residue classes modulo $p-1$.

A. True

B. False

REFERENCE ANSWER

A. True

JEV / CORRECT

A. True

API confidence: 0.98
Option probabilities:
{"B": 0.01, "A": 0.99}

Section batch: 379 ms
Not per-question latency

QUESTION + OPTIONS

Prime p , positive k , and $a^k \equiv 1 \pmod p$. Why must $\gcd(k, p-1) > 1$ or $a \equiv 1 \pmod p$?

- A. If $\gcd(k, p-1) = 1$, choose t with $kt \equiv 1 \pmod{p-1}$. Since a is nonzero, Fermat gives $a = a^{(kt)} = (a^k)^t \equiv 1 \pmod p$.
- B. If a is not one, it is a primitive root by definition.
- C. Fermat implies every k divides $p-1$, so their gcd exceeds one.
- D. The equation $a^k \equiv 1$ implies $a \equiv k \equiv 1$ as integers.

REFERENCE ANSWER

A. If $\gcd(k, p-1) = 1$, choose t with $kt \equiv 1 \pmod{p-1}$. Since a is nonzero, Fermat gives $a = a^{(kt)} = (a^k)^t \equiv 1 \pmod p$.

JEV / CORRECT

A. If $\gcd(k, p-1) = 1$, choose t with $kt \equiv 1 \pmod{p-1}$. Since a is nonzero, Fermat gives $a = a^{(kt)} = (a^k)^t \equiv 1 \pmod p$.

API confidence: 1.00
Option probabilities:
{ "C": 0.0, "B": 0.0, "D": 0.0, "A": 1.0 }

Section batch: 379 ms
Not per-question latency

QUESTION + OPTIONS

If $a^k \equiv 1 \pmod p$, $k > 0$, and $a \not\equiv 1 \pmod p$, then $\gcd(k, p-1) > 1$.

A. False

B. True

REFERENCE ANSWER

B. True

JEV / CORRECT

B. True

API confidence: 0.17
Option probabilities:
{`"A"`: 0.42, `"B"`: 0.58}

Section batch: 379 ms
Not per-question latency

QUESTION + OPTIONS

Over $\text{GF}(5)$, ax^2+bx+c passes through $(0,1),(1,2),(2,0)$. Give (a,b,c) .

- A. $(1,0,1)$
- B. $(1,1,0)$
- C. $(2,4,1)$
- D. $(0,1,1)$

REFERENCE ANSWER

A. $(1,0,1)$

JEV / INCORRECT

C. $(2,4,1)$

API confidence: 0.67
Option probabilities:
{**"B"**: 0.01, **"D"**: 0.01, **"A"**: 0.23, **"C"**: 0.75}

Section batch: 344 ms
Not per-question latency

QUESTION + OPTIONS

A degree-one polynomial over GF(5) was evaluated; received (0,1),(1,3),(2,1),(3,2), with at most one corrupted value.

Recover the polynomial.

- A. $3x+1$
- B. $2x+1$
- C. $x+1$
- D. $2x+3$

REFERENCE ANSWER

B. $2x+1$

JEV / CORRECT

B. $2x+1$

API confidence: 0.35
Option probabilities:
{ "B": 0.51, "D": 0.09, "A": 0.36, "C": 0.04 }

Section batch: 344 ms
Not per-question latency

QUESTION + OPTIONS

A degree-one polynomial over $\text{GF}(5)$ was evaluated; received $(0,1),(1,3),(2,1),(3,2)$, with at most one corrupted value.

Find the monic minimal error locator.

- A. x
- B. $x-3$
- C. $x-2$
- D. $x-1$

REFERENCE ANSWER

C. $x-2$

JEV / CORRECT

C. $x-2$

API confidence: 0.30
Option probabilities:
{ $"D"$: 0.26, $"B"$: 0.18, $"A"$: 0.09, $"C"$: 0.47}

Section batch: 344 ms
Not per-question latency

QUESTION + OPTIONS

Over $\text{GF}(p)$, P has degree exactly d with $0 < d < p$. Maximum distinct x satisfying $P(x)=2$?

- A. d
- B. p
- C. $2d$
- D. $d-1$

REFERENCE ANSWER

A. d

JEV / CORRECT

A. d

API confidence: 0.97
Option probabilities:
{ $"B"$: 0.0, $"D"$: 0.01, $"A"$: 0.98, $"C"$: 0.01}

Section batch: 344 ms
Not per-question latency

QUESTION + OPTIONS

Over $\text{GF}(p)$ with $p > 2d$ and $d \geq 1$, P and Q have degree exactly d , with r and s distinct roots respectively.

Maximum distinct roots of PQ ?

- A. $\max(r,s)$
- B. $r \cdot s$
- C. $\min(r,s)$
- D. $r+s$

REFERENCE ANSWER

D. $r+s$

Pre-run repair:
Quantify sufficiently large prime as $p > 2d$ to permit disjoint root sets.

JEV / CORRECT

D. $r+s$

API confidence: 0.98
Option probabilities:
{ $"B"$: 0.01, $"D"$: 0.98, $"A"$: 0.01, $"C"$: 0.0}

Section batch: 344 ms
Not per-question latency

QUESTION + OPTIONS

Over $\text{GF}(p)$ with $p > 2d$ and $d \geq 1$, P and Q have degree exactly d , with r and s distinct roots respectively.

Minimum distinct roots of PQ ?

- A. $r+s$
- B. $\max(r,s)$
- C. $\min(r,s)$
- D. 0

REFERENCE ANSWER

B. $\max(r,s)$

JEV / INCORRECT

A. $r+s$

API confidence: 0.33
Option probabilities:
{**"B"**: 0.44, "D": 0.03, "A": 0.49, "C": 0.04}

Section batch: 344 ms
Not per-question latency

QUESTION + OPTIONS

Over $\text{GF}(p)$ with $p > 2d$ and $d \geq 1$, P and Q have degree exactly d , with r and s distinct roots respectively.

Degree of PQ ?

- A. d^2
- B. d
- C. At most $d-1$
- D. $2d$

REFERENCE ANSWER

D. $2d$

JEV / CORRECT

D. $2d$

API confidence: 0.99
Option probabilities:
{**"B"**: 0.0, **"D"**: 1.0, "A": 0.0, "C": 0.0}

Section batch: 344 ms
Not per-question latency

QUESTION + OPTIONS

Over $\text{GF}(p)$ with $p > 2d$ and $d \geq 1$, P and Q have degree exactly d , with r and s distinct roots respectively.

Maximum degree of $P+Q$?

- A. 0
- B. $2d$
- C. $d-1$
- D. d

REFERENCE ANSWER

D. d

JEV / CORRECT

D. d

API confidence: 0.77
Option probabilities:
{ $"B"$: 0.07, $"D"$: 0.84, $"A"$: 0.0, $"C"$: 0.09}

Section batch: 344 ms
Not per-question latency

QUESTION + OPTIONS

Why does a degree-one polynomial over a field have exactly one root?

- A. All field elements have inverses, including zero, so every polynomial has a unique root.
- B. The root is always the constant coefficient b .
- C. Write $P(x)=mx+b$ with m nonzero. The equation has the unique solution $x=-m^{(-1)}b$.
- D. A degree-one polynomial has at most one root, which alone proves existence.

REFERENCE ANSWER

C. Write $P(x)=mx+b$ with m nonzero. The equation has the unique solution $x=-m^{(-1)}b$.

JEV / CORRECT

C. Write $P(x)=mx+b$ with m nonzero. The equation has the unique solution $x=-m^{(-1)}b$.

API confidence: 1.00
Option probabilities:
{ "B": 0.0, "D": 0.0, "A": 0.0, "C": 1.0 }

Section batch: 344 ms
Not per-question latency

QUESTION + OPTIONS

Over $\text{GF}(p)$, count degree-exactly-two polynomials that split into linear factors, including repeated roots.

- A. p^2
- B. $(p-1)C(p,2)$
- C. $(p-1)(C(p,2)+p)$
- D. $(p-1)p^2$

REFERENCE ANSWER

C. $(p-1)(C(p,2)+p)$

JEV / CORRECT

C. $(p-1)(C(p,2)+p)$

API confidence: 0.80
Option probabilities:
{ "B": 0.02, "D": 0.06, "A": 0.07, "C": 0.85 }

Section batch: 344 ms
Not per-question latency

QUESTION + OPTIONS

Over $\text{GF}(p)$, count all formal polynomials of degree exactly two.

- A. $(p-1)(C(p,2)+p)$
- B. $(p-1)^3$
- C. p^3
- D. $(p-1)p^2$

REFERENCE ANSWER

D. $(p-1)p^2$

JEV / CORRECT

D. $(p-1)p^2$

API confidence: 0.85
Option probabilities:
{`"B": 0.06, "D": 0.89, "A": 0.05, "C": 0.0`}

Section batch: 344 ms
Not per-question latency

QUESTION + OPTIONS

70 groups each hold one point of a degree-49 shared polynomial. Within each group, 10 delegates hold evaluations of a degree-5 polynomial encoding that group’s point. Adversaries know all polynomials and choose their groups. Berlekamp-Welch is applied at both levels.

What is the largest number of adversarial delegates guaranteed tolerable? Give the threshold argument.

- A. 32: each group corrects two bad shares, so corrupting a group needs three delegates; the outer code corrects ten bad groups, and defeating that guarantee needs eleven groups, costing 33 delegates.
- B. 30: three delegates per group times ten groups is the first failure.
- C. 22: the outer code tolerates eleven groups and each needs two delegates.
- D. 20: each of ten bad groups needs two delegates, so the 21st defeats the scheme.

REFERENCE ANSWER

A. 32: each group corrects two bad shares, so corrupting a group needs three delegates; the outer code corrects ten bad groups, and defeating that guarantee needs eleven groups, costing 33 delegates.

JEV / CORRECT

A. 32: each group corrects two bad shares, so corrupting a group needs three delegates; the outer code corrects ten bad groups, and defeating that guarantee needs eleven groups, costing 33 delegates.

API confidence: 0.79
Option probabilities:
{ "C": 0.01, "D": 0.11, "A": 0.85, "B": 0.03 }

Section batch: 284 ms
Not per-question latency

QUESTION + OPTIONS

Distinct arrangements of BAA?

- A. 3
- B. 1
- C. 6
- D. 2

REFERENCE ANSWER

A. 3

JEV / CORRECT

A. 3

API confidence: 0.82
Option probabilities:
{ "D": 0.12, "C": 0.01, "A": 0.86, "B": 0.01 }

Section batch: 401 ms
Not per-question latency

QUESTION + OPTIONS

Distinct arrangements of 126?

- A. 3
- B. 6
- C. 1
- D. 9

REFERENCE ANSWER

B. 6

JEV / CORRECT

B. 6

API confidence: 0.34
Option probabilities:
{ "D": 0.05, "C": 0.3, "A": 0.13, "B": 0.52 }

Section batch: 401 ms
Not per-question latency

QUESTION + OPTIONS

n distinct bears, k distinct children, $n > k$. Assign exactly one distinct bear to each child. How many assignments?

- A. k^n
- B. $C(n,k)$
- C. n^k
- D. $n!/(n-k)!$

REFERENCE ANSWER

D. $n!/(n-k)!$

JEV / CORRECT

D. $n!/(n-k)!$

API confidence: 0.99
Option probabilities:
{**"D"**: 1.0, "C": 0.0, "A": 0.0, "B": 0.0}

Section batch: 401 ms
Not per-question latency

QUESTION + OPTIONS

Number of positive integer n -tuples summing to k , $k \geq n \geq 1$?

- A. $C(k+n-1, n-1)$
- B. $C(k-1, n-1)$
- C. n^k
- D. $C(k, n)$

REFERENCE ANSWER

B. $C(k-1, n-1)$

JEV / CORRECT

B. $C(k-1, n-1)$

API confidence: 0.99
Option probabilities:
{`"D": 0.0, "C": 0.0, "A": 0.0, "B": 1.0`}

Section batch: 401 ms
Not per-question latency

QUESTION + OPTIONS

Number of n-bit strings with exactly k ones, $0 \leq k \leq n$?

- A. $n!/k!$
- B. $C(n,k)$
- C. 2^k
- D. n^k

REFERENCE ANSWER

B. $C(n,k)$

JEV / CORRECT

B. $C(n,k)$

API confidence: 1.00
Option probabilities:
{`"D": 0.0, "A": 0.0, "C": 0.0, "B": 1.0`}

Section batch: 401 ms
Not per-question latency

QUESTION + OPTIONS

Circular arrangements of n distinct beads, identifying rotations but not reflections?

- A. $(n-1)!$
- B. $(n-1)!/2$
- C. 2^n
- D. $n!$

REFERENCE ANSWER

A. $(n-1)!$

JEV / CORRECT

A. $(n-1)!$

Pre-run repair:
Explicitly identify rotations only, consistent with the source answer.

API confidence: 1.00
Option probabilities:
{`"D": 0.0, "C": 0.0, "A": 1.0, "B": 0.0`}

Section batch: 401 ms
Not per-question latency

QUESTION + OPTIONS

What is the truth status of (P AND NOT P) implies Q?

- A. Could be either
- B. True
- C. False

REFERENCE ANSWER

B. True

JEV / CORRECT

B. True

API confidence: 0.98
Option probabilities:
{ "B": 0.99, "C": 0.0, "A": 0.01 }

Section batch: 357 ms
Not per-question latency

QUESTION + OPTIONS

What is the truth status of P implies (Q OR NOT Q)?

- A. Could be either
- B. False
- C. True

REFERENCE ANSWER

C. True

JEV / CORRECT

C. True

API confidence: 0.98
Option probabilities:
{ "B": 0.0, "C": 0.99, "A": 0.01 }

Section batch: 357 ms
Not per-question latency

QUESTION + OPTIONS

What is the truth status of $(P \text{ OR NOT } P) \text{ implies } (Q \text{ AND NOT } Q)$?

- A. Could be either
- B. False
- C. True

REFERENCE ANSWER

B. False

JEV / CORRECT

B. False

API confidence: 0.82
Option probabilities:
{**"B"**: 0.88, "C": 0.01, "A": 0.11}

Section batch: 357 ms
Not per-question latency

QUESTION + OPTIONS

What is the truth status of (P OR Q) implies (P AND Q)?

- A. False
- B. Could be either
- C. True

REFERENCE ANSWER

B. Could be either

JEV / INCORRECT

A. False

API confidence: 0.35
Option probabilities:
{"B": 0.43, "C": 0.0, "A": 0.5700000000000001}

Section batch: 357 ms
Not per-question latency

QUESTION + OPTIONS

Over nonempty domains, are forall x [P(x) implies exists y Q(x,y)] and forall x exists y [P(x) implies Q(x,y)] equivalent?

A. Equivalent

B. Not equivalent

REFERENCE ANSWER

A. Equivalent

JEV / CORRECT

A. Equivalent

API confidence: 0.81
Option probabilities:
{ "B": 0.1, "A": 0.9 }

Section batch: 357 ms
Not per-question latency

QUESTION + OPTIONS

Are exists x [P(x) implies forall y R(x,y)] and forall x [P(x) OR exists y R(x,y)] equivalent?

- A. Not equivalent
- B. Equivalent

REFERENCE ANSWER

A. Not equivalent

JEV / CORRECT

A. Not equivalent

API confidence: 0.83
Option probabilities:
{ "B": 0.09, "A": 0.91 }

Section batch: 357 ms
Not per-question latency

QUESTION + OPTIONS

$R(x)=\text{NOT } P(x)$, $S(x,y)=\text{NOT } Q(x,y)$. Rewrite $\text{NOT}[(\text{forall } x \text{ } P(x)) \text{ AND } (\text{exists } x \text{ forall } y \text{ } Q(x,y))]$ without NOT.

- A. $(\text{exists } x \text{ } R(x)) \text{ AND } (\text{forall } x \text{ exists } y \text{ } S(x,y))$
- B. $(\text{exists } x \text{ } R(x)) \text{ OR } (\text{forall } x \text{ exists } y \text{ } S(x,y))$
- C. $(\text{forall } x \text{ } R(x)) \text{ OR } (\text{exists } x \text{ forall } y \text{ } S(x,y))$
- D. $(\text{forall } x \text{ } R(x)) \text{ AND } (\text{exists } x \text{ forall } y \text{ } S(x,y))$

REFERENCE ANSWER

B. $(\text{exists } x \text{ } R(x)) \text{ OR } (\text{forall } x \text{ exists } y \text{ } S(x,y))$

JEV / CORRECT

B. $(\text{exists } x \text{ } R(x)) \text{ OR } (\text{forall } x \text{ exists } y \text{ } S(x,y))$

API confidence: 0.93
Option probabilities:
{**"B"**: 0.95, "C": 0.05, "D": 0.0, "A": 0.0}

Section batch: 357 ms
Not per-question latency

QUESTION + OPTIONS

For integers a, b, c , prove a does not divide $2b+3c$ implies a does not divide b or a does not divide c .

- A. Contrapositive: $b=ak$ and $c=al$ imply $2b+3c=a(2k+3l)$, so a divides the sum.
- B. Since a does not divide the sum, it cannot divide either $2b$ or $3c$ individually.
- C. If a fails to divide b and c , it also fails to divide every linear combination.
- D. If a divides $2b+3c$, then it divides b and c separately; use the converse.

REFERENCE ANSWER

A. Contrapositive: $b=ak$ and $c=al$ imply $2b+3c=a(2k+3l)$, so a divides the sum.

JEV / CORRECT

A. Contrapositive: $b=ak$ and $c=al$ imply $2b+3c=a(2k+3l)$, so a divides the sum.

API confidence: 1.00
Option probabilities:
{ "C": 0.0, "D": 0.0, "B": 0.0, "A": 1.0 }

Section batch: 448 ms
Not per-question latency

QUESTION + OPTIONS

State AM-GM for two nonnegative numbers x,y .

- A. $\sqrt{x+y} \geq x \cdot y$
- B. $x+y \geq xy$
- C. $(x+y)/2 \geq \sqrt{xy}$
- D. $(x+y)/2 \leq \sqrt{xy}$

REFERENCE ANSWER

C. $(x+y)/2 \geq \sqrt{xy}$

JEV / CORRECT

C. $(x+y)/2 \geq \sqrt{xy}$

API confidence: 1.00
Option probabilities:
{**"C"**: 1.0, "D": 0.0, "B": 0.0, "A": 0.0}

Section batch: 448 ms
Not per-question latency

QUESTION + OPTIONS

Which proves AM-GM for nonnegative x,y ?

- A. $(x-y)^2 \geq 0$ gives $(x+y)^2 \geq 4xy$; both sides of $x+y \geq 2\sqrt{xy}$ are nonnegative, so taking square roots is valid.
- B. Since $x \geq y$ and $y \geq x$, adding yields equality in AM-GM.
- C. Squaring any inequality preserves its direction, even for negative sides; apply this to $\sqrt{xy}$.
- D. $x^2+y^2 \geq 0$ gives $x+y \geq 2\sqrt{xy}$ directly by distributing the square root over a sum.

REFERENCE ANSWER

A. $(x-y)^2 \geq 0$ gives $(x+y)^2 \geq 4xy$; both sides of $x+y \geq 2\sqrt{xy}$ are nonnegative, so taking square roots is valid.

JEV / CORRECT

A. $(x-y)^2 \geq 0$ gives $(x+y)^2 \geq 4xy$; both sides of $x+y \geq 2\sqrt{xy}$ are nonnegative, so taking square roots is valid.

API confidence: 1.00
Option probabilities:
{ "C": 0.0, "D": 0.0, "B": 0.0, "A": 1.0 }

Section batch: 448 ms
Not per-question latency

QUESTION + OPTIONS

$S_0=3, S_1=2, S_2=1$; for $n \geq 3, S_n=S(n-1)+S(n-2)+2S(n-3)$.

Smallest integer c with $S_n \leq c \cdot 2^n$ for all $n \geq 0$?

- A. 3
- B. 2
- C. 4
- D. 1

REFERENCE ANSWER

A. 3

JEV / INCORRECT

B. 2

API confidence: 0.10
Option probabilities:
{**"C"**: 0.07, "B": 0.33, "A": 0.31, "D": 0.29}

Section batch: 336 ms
Not per-question latency

QUESTION + OPTIONS

$S_0=3, S_1=2, S_2=1$; for $n \geq 3, S_n=S(n-1)+S(n-2)+2S(n-3)$.

Which is a valid induction proving $S_n \leq 3 \cdot 2^n$?

- A. Check $n=0,1,2$. Strong induction gives $S(k+1) \leq 3 \cdot 2^k + 3 \cdot 2^{(k-1)} + 6 \cdot 2^{(k-2)} = 3 \cdot 2^{(k+1)}$.
- B. Check the first three terms and use $S(k+1)=2S_k$.
- C. Every term is at most twice its predecessor, including S_3 , so ordinary induction is immediate.
- D. Check $n=0$ only. Assume $S_k \leq 3 \cdot 2^k$; this also establishes bounds on earlier terms without any additional hypothesis.

REFERENCE ANSWER

A. Check $n=0,1,2$. Strong induction gives $S(k+1) \leq 3 \cdot 2^k + 3 \cdot 2^{(k-1)} + 6 \cdot 2^{(k-2)} = 3 \cdot 2^{(k+1)}$.

JEV / CORRECT

A. Check $n=0,1,2$. Strong induction gives $S(k+1) \leq 3 \cdot 2^k + 3 \cdot 2^{(k-1)} + 6 \cdot 2^{(k-2)} = 3 \cdot 2^{(k+1)}$.

API confidence: 1.00
Option probabilities:
{ "C": 0.0, "A": 1.0, "B": 0.0, "D": 0.0 }

Section batch: 336 ms
Not per-question latency

QUESTION + OPTIONS

$S_0=3, S_1=2, S_2=1$; for $n \geq 3$, $S_n=S(n-1)+S(n-2)+2S(n-3)$.

Smallest integer c with $S_n \leq c \cdot 2^n$ for every $n \geq 4$?

- A. 1
- B. 3
- C. 2
- D. 0

REFERENCE ANSWER

A. 1

Pre-run repair:
Official intermediate terms miscomputed;
reference bound remains 1.

JEV / CORRECT

A. 1

API confidence: 0.49
Option probabilities:
{ "C": 0.19, "B": 0.16, "A": 0.62, "D": 0.03 }

Section batch: 336 ms
Not per-question latency

QUESTION + OPTIONS

Which induction proves 7 divides $11^n - 4^n$ for $n \geq 0$?

- A. Base $n=1$ is 7. Since both bases are odd, the difference must be divisible by 7.
- B. The first seven values suffice because every exponential sequence has period seven.
- C. Base $n=0$ is zero. Write $11^{(k+1)} - 4^{(k+1)} = 7 \cdot 11^k + 4(11^k - 4^k)$, so the inductive divisibility persists.
- D. Base $n=0$ is zero. Multiply the difference by 7 to obtain the next difference.

REFERENCE ANSWER

C. Base $n=0$ is zero. Write $11^{(k+1)} - 4^{(k+1)} = 7 \cdot 11^k + 4(11^k - 4^k)$, so the inductive divisibility persists.

JEV / CORRECT

C. Base $n=0$ is zero. Write $11^{(k+1)} - 4^{(k+1)} = 7 \cdot 11^k + 4(11^k - 4^k)$, so the inductive divisibility persists.

API confidence: 1.00
Option probabilities:
{ "C": 1.0, "B": 0.0, "A": 0.0, "D": 0.0 }

Section batch: 336 ms
Not per-question latency

QUESTION + OPTIONS

Jobs: A:3>1>2, B:2>3>1, C:3>2>1. Candidates: 1:B>C>A, 2:C>A>B, 3:A>C>B.

Find the job-optimal stable matching.

A. A-3, B-1, C-2

B. A-2, B-1, C-3

C. A-3, B-2, C-1

D. A-1, B-2, C-3

REFERENCE ANSWER

A. A-3, B-1, C-2

JEV / CORRECT

A. A-3, B-1, C-2

API confidence: 0.24
Option probabilities:
{ "B": 0.06, "D": 0.11, "A": 0.42, "C": 0.41 }

Section batch: 329 ms
Not per-question latency

QUESTION + OPTIONS

Jobs: A:3>1>2, B:2>3>1, C:3>2>1. Candidates: 1:B>C>A, 2:C>A>B, 3:A>C>B.

Find the candidate-optimal stable matching.

A. A-3, B-2, C-1

B. A-2, B-1, C-3

C. A-1, B-2, C-3

D. A-3, B-1, C-2

REFERENCE ANSWER

D. A-3, B-1, C-2

JEV / INCORRECT

A. A-3, B-2, C-1

API confidence: 0.52
Option probabilities:
{"D": 0.08, "B": 0.06, "A": 0.63, "C": 0.23}

Section batch: 329 ms
Not per-question latency

QUESTION + OPTIONS

Jobs: A:3>1>2, B:2>3>1, C:3>2>1. Candidates: 1:B>C>A, 2:C>A>B, 3:A>C>B.

Is there any other stable matching beyond the outputs of the two proposer directions?

A. No; the two extremes coincide.

B. Yes: A-2, B-1, C-3.

C. Yes: A-1, B-2, C-3.

D. Yes: A-3, B-2, C-1.

REFERENCE ANSWER

A. No; the two extremes coincide.

JEV / CORRECT

A. No; the two extremes coincide.

API confidence: 0.26
Option probabilities:
{ "B": 0.14, "D": 0.14, "A": 0.45, "C": 0.27 }

Section batch: 329 ms
Not per-question latency

QUESTION + OPTIONS

If every job has a different first-choice candidate, there must be exactly one stable matching.

A. False

B. True

REFERENCE ANSWER

A. False

JEV / CORRECT

A. False

API confidence: 0.09
Option probabilities:
{ "B": 0.45, "A": 0.55 }

Section batch: 329 ms
Not per-question latency

QUESTION + OPTIONS

In the job-optimal stable matching, at least one job must get its first-choice candidate.

A. True

B. False

REFERENCE ANSWER

B. False

JEV / CORRECT

B. False

API confidence: 0.22
Option probabilities:
{ "B": 0.61, "A": 0.39 }

Section batch: 329 ms
Not per-question latency

QUESTION + OPTIONS

A job can receive its least-preferred candidate in the job-optimal stable matching.

A. False

B. True

REFERENCE ANSWER

B. True

JEV / CORRECT

B. True

API confidence: 0.29
Option probabilities:
{ "B": 0.65, "A": 0.35 }

Section batch: 329 ms
Not per-question latency

QUESTION + OPTIONS

If a job is matched to its favorite candidate, that candidate cannot participate in a blocking pair.

A. True

B. False

REFERENCE ANSWER

B. False

JEV / INCORRECT

A. True

API confidence: 0.02
Option probabilities:
{ "B": 0.49, "A": 0.51 }

Section batch: 329 ms
Not per-question latency

QUESTION + OPTIONS

For every preference instance, modifying only candidate preferences can change the job-proposing algorithm’s output.

A. False

B. True

REFERENCE ANSWER

A. False

JEV / CORRECT

A. False

API confidence: 0.48
Option probabilities:
{ "B": 0.26, "A": 0.74 }

Section batch: 329 ms
Not per-question latency

QUESTION + OPTIONS

For every $n \geq 2$, construct preferences where job-proposing matches every job to its favorite and every candidate to its least favorite.

A. All jobs and candidates have identical ranking lists; everyone therefore receives their first choice on one side and last on the other.

B. Each J_i and C_i rank one another first; jobs get their favorite while candidates get their least favorite.

C. Each job ranks a different candidate last and proposes to that candidate first, as required by deferred acceptance.

D. Each J_i ranks C_i first, and each C_i ranks J_i last; complete all remaining rankings strictly in any order. All jobs propose to distinct first choices, so those proposals are accepted.

REFERENCE ANSWER

D. Each J_i ranks C_i first, and each C_i ranks J_i last; complete all remaining rankings strictly in any order. All jobs propose to distinct first choices, so those proposals are accepted.

JEV / CORRECT

D. Each J_i ranks C_i first, and each C_i ranks J_i last; complete all remaining rankings strictly in any order. All jobs propose to distinct first choices, so those proposals are accepted.

API confidence: 0.95
Option probabilities:
{`"B"`: 0.01, `"D"`: 0.97, `"A"`: 0.02, `"C"`: 0.0}

Section batch: 329 ms
Not per-question latency

QUESTION + OPTIONS

A six-vertex graph with four edges is connected.

- A. False
- B. Could be either
- C. True

REFERENCE ANSWER

A. False

JEV / INCORRECT

B. Could be either

API confidence: 0.24
Option probabilities:
{ "C": 0.03, "B": 0.49, "A": 0.48 }

Section batch: 367 ms
Not per-question latency

QUESTION + OPTIONS

A six-vertex graph with six edges is connected.

A. Could be either

B. True

C. False

REFERENCE ANSWER

A. Could be either

JEV / INCORRECT

C. False

API confidence: 0.26
Option probabilities:
{ "C": 0.51, "B": 0.09, "A": 0.4 }

Section batch: 367 ms
Not per-question latency

QUESTION + OPTIONS

A six-vertex graph with six edges is acyclic.

- A. Could be either
- B. True
- C. False

REFERENCE ANSWER

C. False

JEV / CORRECT

C. False

API confidence: 0.68
Option probabilities:
{ "C": 0.79, "B": 0.01, "A": 0.2 }

Section batch: 367 ms
Not per-question latency

QUESTION + OPTIONS

A six-vertex graph with thirteen edges is connected.

- A. True
- B. False
- C. Could be either

REFERENCE ANSWER

A. True

JEV / CORRECT

A. True

API confidence: 0.55
Option probabilities:
{ "C": 0.13, "B": 0.18, "A": 0.69 }

Section batch: 367 ms
Not per-question latency

QUESTION + OPTIONS

A six-vertex graph with thirteen edges is planar.

- A. False
- B. Could be either
- C. True

REFERENCE ANSWER

A. False

JEV / CORRECT

A. False

API confidence: 0.85
Option probabilities:
{ "C": 0.08, "B": 0.02, "A": 0.9 }

Section batch: 367 ms
Not per-question latency

QUESTION + OPTIONS

Maximum edges of a simple graph on six vertices?

- A. 15
- B. 12
- C. 18
- D. 30

REFERENCE ANSWER

A. 15

JEV / CORRECT

A. 15

API confidence: 1.00
Option probabilities:
{ "C": 0.0, "B": 0.0, "A": 1.0, "D": 0.0 }

Section batch: 367 ms
Not per-question latency

QUESTION + OPTIONS

Minimum edges of an undirected graph with V vertices and C connected components?

- A. $C-1$
- B. $V+C$
- C. $V-1$
- D. $V-C$

REFERENCE ANSWER

D. $V-C$

JEV / CORRECT

D. $V-C$

API confidence: 1.00
Option probabilities:
{ $"C"$: 0.0, $"B"$: 0.0, $"A"$: 0.0, $"D"$: 1.0}

Section batch: 367 ms
Not per-question latency

QUESTION + OPTIONS

K7 has an Eulerian tour.

A. True

B. False

REFERENCE ANSWER

A. True

JEV / CORRECT

A. True

API confidence: 0.62
Option probabilities:
{ "B": 0.19, "A": 0.81 }

Section batch: 367 ms
Not per-question latency

QUESTION + OPTIONS

Why does K7 have an Eulerian tour?

- A. Every complete graph has all degrees odd.
- B. It is planar and connected.
- C. It has an odd number of vertices, which alone guarantees a tour.
- D. It is connected and each vertex has even degree 6.

REFERENCE ANSWER

D. It is connected and each vertex has even degree 6.

JEV / CORRECT

D. It is connected and each vertex has even degree 6.

API confidence: 1.00
Option probabilities:
{ "C": 0.0, "B": 0.0, "A": 0.0, "D": 1.0 }

Section batch: 367 ms
Not per-question latency

QUESTION + OPTIONS

K8 has an Eulerian tour.

A. True

B. False

REFERENCE ANSWER

B. False

JEV / CORRECT

B. False

API confidence: 0.59
Option probabilities:
{ "B": 0.79, "A": 0.21 }

Section batch: 367 ms
Not per-question latency

QUESTION + OPTIONS

Why does K8 lack an Eulerian tour?

- A. It is disconnected.
- B. It has too many edges to be bipartite, which forbids Eulerian tours.
- C. It has an even number of vertices, and no even-order graph has a tour.
- D. Each vertex has odd degree 7, whereas a connected Eulerian graph requires all degrees even.

REFERENCE ANSWER

D. Each vertex has odd degree 7, whereas a connected Eulerian graph requires all degrees even.

JEV / CORRECT

D. Each vertex has odd degree 7, whereas a connected Eulerian graph requires all degrees even.

API confidence: 1.00
Option probabilities:
{ "C": 0.0, "B": 0.0, "A": 0.0, "D": 1.0 }

Section batch: 367 ms
Not per-question latency

QUESTION + OPTIONS

A connected planar embedding has 15 vertices and 4 faces including the outer face. How many edges?

- A. 13
- B. 17
- C. 19
- D. 11

REFERENCE ANSWER

B. 17

JEV / CORRECT

B. 17

API confidence: 0.42
Option probabilities:
{ "C": 0.37, "B": 0.57, "A": 0.02, "D": 0.04 }

Section batch: 367 ms
Not per-question latency

QUESTION + OPTIONS

Prove that a graph all of whose vertices have odd degree has an even number of vertices.

- A. Every vertex must have an odd number of neighbors, so all vertices can be paired along disjoint edges.
- B. Each odd degree is at least one, so the vertex count equals twice the edge count.
- C. The degree sum is twice the number of edges and therefore even. A sum of an odd number of odd integers is odd, so the number of vertices must be even.
- D. All odd-degree graphs are complete, and complete graphs have even order.

REFERENCE ANSWER

C. The degree sum is twice the number of edges and therefore even. A sum of an odd number of odd integers is odd, so the number of vertices must be even.

JEV / CORRECT

C. The degree sum is twice the number of edges and therefore even. A sum of an odd number of odd integers is odd, so the number of vertices must be even.

API confidence: 1.00
Option probabilities:
{ "B": 0.0, "A": 0.0, "C": 1.0, "D": 0.0 }

Section batch: 282 ms
Not per-question latency

QUESTION + OPTIONS

In a finite tree with at least two vertices, start walking along unused edges until stuck. Why does this reach a degree-one vertex?

- A. A tree has no edges, so the starting vertex already has degree one.
- B. Every vertex of a tree has degree at most two; hence any arbitrary walk ends at a leaf.
- C. A repeated vertex would create a cycle. The walk is finite and its terminal vertex was not previously visited; only its arrival edge has been used there, so being stuck means it has no other incident edge.
- D. Each step decreases the total degree by two, so eventually every vertex has degree one.

REFERENCE ANSWER

C. A repeated vertex would create a cycle. The walk is finite and its terminal vertex was not previously visited; only its arrival edge has been used there, so being stuck means it has no other incident edge.

JEV / CORRECT

C. A repeated vertex would create a cycle. The walk is finite and its terminal vertex was not previously visited; only its arrival edge has been used there, so being stuck means it has no other incident edge.

API confidence: 1.00
Option probabilities:
{"B": 0.0, "A": 0.0, "C": 1.0, "D": 0.0}

Section batch: 282 ms
Not per-question latency

QUESTION + OPTIONS

Compute 5^{42} modulo 41.

- A. 1
- B. 0
- C. 5
- D. 25

REFERENCE ANSWER

D. 25

JEV / CORRECT

D. 25

API confidence: 0.27
Option probabilities:
{"D": 0.46, "B": 0.01, "A": 0.29, "C": 0.24}

Section batch: 757 ms
Not per-question latency

QUESTION + OPTIONS

Last digit of 519^{487} ?

- A. 5
- B. 9
- C. 7
- D. 1

REFERENCE ANSWER

B. 9

JEV / CORRECT

B. 9

API confidence: 0.63
Option probabilities:
{"B": 0.72, "D": 0.05, "A": 0.07, "C": 0.16}

Section batch: 757 ms
Not per-question latency

QUESTION + OPTIONS

Compute 43^{21} modulo 55.

- A. 43
- B. 1
- C. 23
- D. 12

REFERENCE ANSWER

A. 43

JEV / CORRECT

A. 43

API confidence: 0.15
Option probabilities:
{ "B": 0.08, "D": 0.25, "A": 0.36, "C": 0.31 }

Section batch: 757 ms
Not per-question latency

QUESTION + OPTIONS

Choose nonzero a modulo m for which $ax=0$ modulo m has a nonzero solution.

- A. $a=4,m=9$
- B. $a=2,m=5$
- C. $a=3,m=7$
- D. $a=2,m=4$

REFERENCE ANSWER

D. $a=2,m=4$

JEV / CORRECT

D. $a=2,m=4$

API confidence: 1.00
Option probabilities:
{ $"D"$: 1.0, $"B"$: 0.0, $"A"$: 0.0, $"C"$: 0.0}

Section batch: 757 ms
Not per-question latency

QUESTION + OPTIONS

For positive integers $k < x$, $\gcd(x, x+k) = \gcd(x, k)$.

A. False

B. True

REFERENCE ANSWER

B. True

JEV / CORRECT

B. True

API confidence: 0.98
Option probabilities:
{**"B"**: 0.99, "A": 0.01}

Section batch: 757 ms
Not per-question latency

QUESTION + OPTIONS

If $\gcd(a,m)=1$, $ax=b \bmod m$ can have multiple distinct solutions in $\{0,\dots,m-1\}$.

A. False

B. True

REFERENCE ANSWER

A. False

JEV / CORRECT

A. False

API confidence: 0.99
Option probabilities:
{"B": 0.0, "A": 1.0}

Section batch: 757 ms
Not per-question latency

QUESTION + OPTIONS

If $\gcd(a,m)=2$, $ax=b \bmod m$ has either zero or two distinct solutions in $\{0,\dots,m-1\}$.

A. True

B. False

REFERENCE ANSWER

A. True

JEV / CORRECT

A. True

API confidence: 0.71
Option probabilities:
{"B": 0.15, "A": 0.85}

Section batch: 757 ms
Not per-question latency

QUESTION + OPTIONS

With $p=11, q=7$, what is the smallest valid RSA public exponent $e>1$?

- A. 3
- B. 2
- C. 7
- D. 5

REFERENCE ANSWER

C. 7

Pre-run repair:
Require $e>1$ explicitly; without it, exponent 1 is mathematically invertible.

JEV / INCORRECT

A. 3

API confidence: 0.64
Option probabilities:
{`"B": 0.2, "D": 0.06, "A": 0.73, "C": 0.01`}

Section batch: 757 ms
Not per-question latency

QUESTION + OPTIONS

RSA has $p=11, q=7, e=29$. What is the least positive decryption exponent?

- A. 31
- B. 29
- C. 59
- D. 7

REFERENCE ANSWER

B. 29

JEV / INCORRECT

C. 59

API confidence: 0.48
Option probabilities:
{`"B"`: 0.2, `"D"`: 0.09, `"A"`: 0.1, `"C"`: 0.61}

Section batch: 757 ms
Not per-question latency

QUESTION + OPTIONS

Without induction, why is $11^n - 4^n$ divisible by 7 for all nonnegative n ?

- A. $11 - 4 = 7$, so $11^n - 4^n = 7^n$ as integers.
- B. $11 = 4 \pmod{7}$, so exponentiating preserves congruence: $11^n = 4^n \pmod{7}$.
- C. All differences of powers with odd and even bases are multiples of 7.
- D. Both 11 and 4 are zero modulo 7.

REFERENCE ANSWER

B. $11 = 4 \pmod{7}$, so exponentiating preserves congruence: $11^n = 4^n \pmod{7}$.

JEV / CORRECT

B. $11 = 4 \pmod{7}$, so exponentiating preserves congruence: $11^n = 4^n \pmod{7}$.

API confidence: 1.00
Option probabilities:
{ "C": 0.0, "A": 0.0, "D": 0.0, "B": 1.0 }

Section batch: 289 ms
Not per-question latency

QUESTION + OPTIONS

If a has multiplicative order $p-1$ modulo prime p , why do $a^0, \dots, a^{p-2}$ cover all nonzero residues?

- A. They are nonzero. A repeated pair $i < j$ would imply $a^{(j-i)} = 1$ with $0 < j-i < p-1$, contradicting the order. Hence $p-1$ distinct values fill the nonzero residues.
- B. Every nonzero a automatically has order $p-1$, so no distinctness argument is needed.
- C. Since there are $p-1$ powers, they fill $p-1$ residues even if some repeat.
- D. Fermat says each power is 1, so all nonzero residues are covered.

REFERENCE ANSWER

A. They are nonzero. A repeated pair $i < j$ would imply $a^{(j-i)} = 1$ with $0 < j-i < p-1$, contradicting the order. Hence $p-1$ distinct values fill the nonzero residues.

JEV / CORRECT

A. They are nonzero. A repeated pair $i < j$ would imply $a^{(j-i)} = 1$ with $0 < j-i < p-1$, contradicting the order. Hence $p-1$ distinct values fill the nonzero residues.

API confidence: 1.00
Option probabilities:
{ "D": 0.0, "A": 1.0, "B": 0.0, "C": 0.0 }

Section batch: 289 ms
Not per-question latency

QUESTION + OPTIONS

Compute $(m-1)^2$ modulo m , $m > 1$.

- A. 2
- B. 0
- C. $m-1$
- D. 1

REFERENCE ANSWER

D. 1

JEV / CORRECT

D. 1

API confidence: 0.85
Option probabilities:
{`"D"`: 0.89, `"A"`: 0.01, `"B"`: 0.0, `"C"`: 0.1}

Section batch: 289 ms
Not per-question latency

QUESTION + OPTIONS

The residue $m-1$ is a nontrivial square root of 1 modulo m , where trivial roots mean ± 1 .

A. True

B. False

REFERENCE ANSWER

B. False

JEV / CORRECT

B. False

API confidence: 0.55
Option probabilities:
{ "A": 0.22, "B": 0.78 }

Section batch: 289 ms
Not per-question latency

QUESTION + OPTIONS

Why can a prime modulus p have no square root of 1 other than ± 1 ?

- A. $x^2-1=(x-1)(x+1)$; a prime dividing this product divides one factor, so $x=1$ or $-1 \pmod p$.
- B. A polynomial of degree two always has exactly one root.
- C. One can cancel $x-1$ from the equation even when $x=1$.
- D. Every composite modulus has no roots of 1, so primes have only the trivial ones.

REFERENCE ANSWER

A. $x^2-1=(x-1)(x+1)$; a prime dividing this product divides one factor, so $x=1$ or $-1 \pmod p$.

JEV / CORRECT

A. $x^2-1=(x-1)(x+1)$; a prime dividing this product divides one factor, so $x=1$ or $-1 \pmod p$.

API confidence: 1.00
Option probabilities:
{`"D": 0.0, "A": 1.0, "B": 0.0, "C": 0.0`}

Section batch: 289 ms
Not per-question latency

QUESTION + OPTIONS

Which is a nontrivial square root of 1 modulo 15?

- A. 4
- B. 14
- C. 0
- D. 1

REFERENCE ANSWER

A. 4

JEV / CORRECT

A. 4

API confidence: 0.73
Option probabilities:
{"D": 0.0, "A": 0.8, "B": 0.2, "C": 0.0}

Section batch: 289 ms
Not per-question latency

QUESTION + OPTIONS

P,Q are distinct formal polynomials over GF(p), with degrees $d_1, d_2 < p$.

Largest possible degree of P-Q?

- A. $\max(d_1, d_2)$
- B. $d_1 \cdot d_2$
- C. $\min(d_1, d_2)$
- D. $d_1 + d_2$

REFERENCE ANSWER

A. $\max(d_1, d_2)$

JEV / CORRECT

A. $\max(d_1, d_2)$

API confidence: 1.00
Option probabilities:
{ "B": 0.0, "D": 0.0, "A": 1.0, "C": 0.0 }

Section batch: 365 ms
Not per-question latency

QUESTION + OPTIONS

P,Q are distinct formal polynomials over GF(p), with degrees $d_1, d_2 < p$.

Assume $d_1 = d_2 \geq 2$. Smallest possible degree of P-Q?

- A. d_1
- B. Undefined because it must be zero
- C. 0
- D. $d_1 - 1$

REFERENCE ANSWER

C. 0

Pre-run repair:
Equal degrees added: with unequal degrees the printed reference 0 is false.

JEV / CORRECT

C. 0

API confidence: 0.73
Option probabilities:
{ "B": 0.0, "D": 0.15, "A": 0.05, "C": 0.8 }

Section batch: 365 ms
Not per-question latency

QUESTION + OPTIONS

P,Q are distinct formal polynomials over GF(p), with degrees $d_1, d_2 < p$.

Largest possible number of x values where $P(x)=Q(x)$?

A. $\min(d_1, d_2)-1$

B. p

C. d_1+d_2

D. $\max(d_1, d_2)$

REFERENCE ANSWER

D. $\max(d_1, d_2)$

JEV / CORRECT

D. $\max(d_1, d_2)$

API confidence: 0.96
Option probabilities:
{ "B": 0.01, "D": 0.97, "A": 0.01, "C": 0.01 }

Section batch: 365 ms
Not per-question latency

QUESTION + OPTIONS

P,Q are distinct formal polynomials over $GF(p)$, with degrees $d_1, d_2 < p$.
Assume $d_1 = d_2 \geq 2$. Smallest possible number of x values where $P(x) = Q(x)$?

- A. 1
- B. d_1
- C. 0
- D. p

REFERENCE ANSWER

C. 0

Pre-run repair:
Equal degrees added: degree-one versus
constant polynomials necessarily agree once.

JEV / CORRECT

C. 0

API confidence: 0.87
Option probabilities:
{ "B": 0.05, "D": 0.0, "A": 0.05, "C": 0.9 }

Section batch: 365 ms
Not per-question latency

QUESTION + OPTIONS

Shamir sharing over GF(7), where any two of three participants can reconstruct the secret $P(0)$.

What polynomial degree is used?

- A. 0
- B. 2
- C. 1
- D. 3

REFERENCE ANSWER

C. 1

JEV / CORRECT

C. 1

API confidence: 0.95
Option probabilities:
{**"B"**: 0.03, "D": 0.0, "A": 0.0, "C": 0.97}

Section batch: 365 ms
Not per-question latency

QUESTION + OPTIONS

Shamir sharing over GF(7), where any two of three participants can reconstruct the secret $P(0)$.

Shares are (1,6) and (2,2). What is the secret?

- A. 6
- B. 5
- C. 4
- D. 3

REFERENCE ANSWER

D. 3

JEV / CORRECT

D. 3

API confidence: 0.11
Option probabilities:
{**"B"**: 0.29, **"D"**: 0.33, **"A"**: 0.07, **"C"**: 0.31}

Section batch: 365 ms
Not per-question latency

QUESTION + OPTIONS

Shamir sharing over GF(7), where any two of three participants can reconstruct the secret $P(0)$.

Shares are (1,6) and (2,2). What should a third share at $x=3$ contain?

- A. 4
- B. 5
- C. 3
- D. 1

REFERENCE ANSWER

B. 5

JEV / INCORRECT

A. 4

API confidence: 0.18
Option probabilities:
{ "B": 0.23, "D": 0.24, "A": 0.38, "C": 0.15 }

Section batch: 365 ms
Not per-question latency

QUESTION + OPTIONS

A k -threshold scheme is reconstructed from k shares. An attacker controls coordinate x_1 and knows the other $k-1$ shares. How can it force the reconstructed secret to v ?

- A. Interpolate the original k shares first, then multiply only its own share by v .
- B. Interpolate the unique degree-at-most- $(k-1)$ polynomial through the other shares and $(0,v)$, then announce its value at x_1 .
- C. Announce the pair $(0,v)$ as its share even though its assigned coordinate is x_1 .
- D. Set its share value to v ; interpolation always copies any participant's value to the constant term.

REFERENCE ANSWER

B. Interpolate the unique degree-at-most- $(k-1)$ polynomial through the other shares and $(0,v)$, then announce its value at x_1 .

JEV / CORRECT

B. Interpolate the unique degree-at-most- $(k-1)$ polynomial through the other shares and $(0,v)$, then announce its value at x_1 .

API confidence: 0.98
Option probabilities:
{"B": 0.99, "D": 0.0, "A": 0.0, "C": 0.01}

Section batch: 365 ms
Not per-question latency

QUESTION + OPTIONS

To transmit n field symbols by Reed-Solomon and correct up to k corrupt evaluations, how many packets suffice?

- A. $n+2k-1$
- B. $n+2k$
- C. $2n+k$
- D. $n+k$

REFERENCE ANSWER

B. $n+2k$

JEV / CORRECT

B. $n+2k$

API confidence: 0.91
Option probabilities:
{ "A": 0.01, "B": 0.93, "C": 0.0, "D": 0.05 }

Section batch: 380 ms
Not per-question latency

QUESTION + OPTIONS

For n message symbols used as coefficients, what is the degree bound of the message polynomial?

- A. At most $n-1$
- B. At most $n+2k$
- C. Exactly n
- D. Exactly k

REFERENCE ANSWER

A. At most $n-1$

JEV / CORRECT

A. At most $n-1$

API confidence: 1.00
Option probabilities:
{`"A": 1.0, "B": 0.0, "C": 0.0, "D": 0.0`}

Section batch: 380 ms
Not per-question latency

QUESTION + OPTIONS

With at most k errors, what is the degree bound of the minimal error locator $E(x)$, the product over actual error locations?

- A. At most $n-1$
- B. At most k
- C. Exactly $2k$
- D. Exactly $n+k$

REFERENCE ANSWER

B. At most k

Pre-run repair:
Specify minimal locator; padded
Berlekamp-Welch locators need not have exactly the actual error count as degree.

JEV / CORRECT

B. At most k

API confidence: 0.97
Option probabilities:
{ "A": 0.01, "B": 0.98, "C": 0.01, "D": 0.0 }

Section batch: 380 ms
Not per-question latency

QUESTION + OPTIONS

There are exactly $m < k$ corruptions. How many distinct roots does the minimal error locator have at transmitted coordinates?

- A. k
- B. $n - m$
- C. $2m$
- D. m

REFERENCE ANSWER

D. m

Pre-run repair:
Specify minimal locator rather than a padded degree- k locator.

JEV / CORRECT

D. m

API confidence: 0.87
Option probabilities:
{ "A": 0.06, "B": 0.02, "C": 0.02, "D": 0.9 }

Section batch: 380 ms
Not per-question latency

QUESTION + OPTIONS

Ignoring integer rounding, what packet count N suffices to transmit n symbols while correcting an adversarial fraction $1/5$ of all transmitted packets?

- A. $5n/4$
- B. $5n/3$
- C. $3n/2$
- D. $6n/5$

REFERENCE ANSWER

B. $5n/3$

Pre-run repair:
Continuous rate bound; floor-dependent finite block rounding is not being tested.

JEV / CORRECT

B. $5n/3$

API confidence: 0.37
Option probabilities:
{ "A": 0.36, "B": 0.53, "C": 0.06, "D": 0.05 }

Section batch: 380 ms
Not per-question latency

QUESTION + OPTIONS

Paths from (0,0) to (7,7), using only unit right and up moves?

- A. 2^{14}
- B. $14!$
- C. $C(14,7)$
- D. $7! \cdot 7!$

REFERENCE ANSWER

C. $C(14,7)$

JEV / CORRECT

C. $C(14,7)$

API confidence: 1.00
Option probabilities:
{**"B"**: 0.0, **"C"**: 1.0, **"D"**: 0.0, **"A"**: 0.0}

Section batch: 729 ms
Not per-question latency

QUESTION + OPTIONS

Number of unordered 7-card hands from a standard 52-card deck?

A. $C(52,7)$

B. 52^7

C. $C(58,7)$

D. $52!/45!$

REFERENCE ANSWER

A. $C(52,7)$

JEV / CORRECT

A. $C(52,7)$

API confidence: 1.00
Option probabilities:
{`"B": 0.0, "C": 0.0, "A": 1.0, "D": 0.0`}

Section batch: 729 ms
Not per-question latency

QUESTION + OPTIONS

Number of distinct anagrams of ADDED?

- A. $5!/2!$
- B. $5!$
- C. $5!/3!$
- D. $3!$

REFERENCE ANSWER

C. $5!/3!$

JEV / INCORRECT

A. $5!/2!$

API confidence: 0.47
Option probabilities:
{ "B": 0.0, "C": 0.38, "A": 0.6, "D": 0.02 }

Section batch: 729 ms
Not per-question latency

QUESTION + OPTIONS

Number of distinct anagrams of AARDVARK?

- A. $8!/(2!2!)$
- B. $8!/3!$
- C. $8!/(3!2!)$
- D. $8!/4!$

REFERENCE ANSWER

C. $8!/(3!2!)$

JEV / CORRECT

C. $8!/(3!2!)$

API confidence: 0.34
Option probabilities:
{**"B"**: 0.07, "C": 0.5, "D": 0.01, "A": 0.42}

Section batch: 729 ms
Not per-question latency

QUESTION + OPTIONS

Ten distinguishable six-sided dice are rolled. Number of ordered outcomes?

- A. $6! \cdot 10!$
- B. 6^{10}
- C. 10^6
- D. $C(15,5)$

REFERENCE ANSWER

B. 6^{10}

JEV / CORRECT

B. 6^{10}

API confidence: 1.00
Option probabilities:
{**"B"**: 1.0, "C": 0.0, "A": 0.0, "D": 0.0}

Section batch: 729 ms
Not per-question latency

QUESTION + OPTIONS

Ten six-sided dice are rolled; record only how many of each face appear. Number of possible count vectors?

- A. $C(15,5)$
- B. $C(16,6)$
- C. $C(10,6)$
- D. 6^{10}

REFERENCE ANSWER

A. $C(15,5)$

JEV / CORRECT

A. $C(15,5)$

API confidence: 0.89
Option probabilities:
{`"B"`: 0.08, `"C"`: 0.0, `"D"`: 0.0, `"A"`: 0.92}

Section batch: 729 ms
Not per-question latency