58 questions.
6.18 seconds.

52 / 58
exact-match items

89.7%
item accuracy

393 ms
median section batch

16 sequential API requests. 62 typed judgments. Zero retries or request failures.
Six misses are included, alongside every correct result.

This is a multiple-choice adaptation, not a claim that Jev earned the same grade on the original written exam. The reference answers include documented pre-run source repairs. The source covers discrete mathematics as well as probability.

The comparison

Each item gets one page: the question and all options on the left, the reference answer in the middle, and Jev's actual answer on the right. Correctness is exact match. Select-all items require the entire chosen set; no consistency repair is applied.

The input boundary

Only the clean questions, original hints, necessary context and unmarked options were sent. Proofs became candidate proofs. Equation questions kept equation answers. The original solution PDF and private key were never sent to Jev. The adapter had seen the solutions; independent difficulty calibration has not been performed.

Timing and scoring

The measured run took 6.179 seconds including all 16 sequential requests and local checkpoint writes. Batch times include receipt of the full response body. They are not per-question times. Item accuracy is 52/58. Secondary adapted weighting: 129/154 points; Q12 uses an explicitly invented equal split of its 12 points. This is not the original partial-credit rubric.

Resource conditions

No calculator, code solver, retrieval, external reasoning model or corrective feedback. Students originally could bring two double-sided note sheets; none were supplied here. The model was pinned to jev-1.13.0. A single first run was used. Public-exam training exposure is unknown.

Probability outputs

Choice probabilities express belief over candidate answers, not the mathematical probability being asked for. The API confidence field is distinct from the selected option probability. Noul outputs use a fixed threshold of 0.5 for each original checkbox.

QUESTION + OPTIONS

Is ((P AND Q) IMPLIES R) equivalent to (P IMPLIES (Q IMPLIES R))?

A. Always True

B. Sometimes False

REFERENCE ANSWER

A. Always True

JEV / CORRECT

A. Always True

Choice: A
API confidence: 0.97
Option probabilities:
A: 0.98 B: 0.02

Q1 batch: 427 ms
2 exam item(s) in that batch

QUESTION + OPTIONS

Is [forall x, (P(x) IMPLIES Q(x))] equivalent to [(forall x, NOT P(x)) OR (forall x, Q(x))]?

A. Always True

B. Sometimes False

REFERENCE ANSWER

B. Sometimes False

JEV / CORRECT

B. Sometimes False

Choice: B
API confidence: 0.99
Option probabilities:
A: 0.0 B: 1.0

Q1 batch: 427 ms
2 exam item(s) in that batch

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.

Choice: C
API confidence: 1.0
Option probabilities:
A: 0.0 B: 0.0 C: 1.0 D: 0.0

Q2 batch: 450 ms
6 exam item(s) in that batch

QUESTION + OPTIONS

7 divides 4^186 - 1. Hint: 186 = 31 * 6.

A. True

B. False

REFERENCE ANSWER

A. True

JEV / CORRECT

A. True

Choice: A
API confidence: 0.76
Option probabilities:
A: 0.88 B: 0.12

Q2 batch: 450 ms
6 exam item(s) in that batch

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

Choice: A
API confidence: 0.66
Option probabilities:
A: 0.83 B: 0.17

Q2 batch: 450 ms
6 exam item(s) in that batch

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

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

Q2 batch: 450 ms
6 exam item(s) in that batch

QUESTION + OPTIONS

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

A. 15

B. 27

C. 18

D. 6

REFERENCE ANSWER

C. 18

JEV / INCORRECT

D. 6

Choice: D
API confidence: 0.13
Option probabilities:
A: 0.19 B: 0.19 C: 0.27 D: 0.35

Q2 batch: 450 ms
6 exam item(s) in that batch

QUESTION + OPTIONS

Find (6^7 + 7^6) mod 91. Hint: use CRT; 91=7*13.

A. 13

B. 6

C. 0

D. 78

REFERENCE ANSWER

B. 6

JEV / INCORRECT

D. 78

Choice: D
API confidence: 0.16
Option probabilities:
A: 0.28 B: 0.26 C: 0.09 D: 0.37

Q2 batch: 450 ms
6 exam item(s) in that batch

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 clarification / key repair. See methodology appendix.

JEV / CORRECT

B. 180

Choice: B
API confidence: 0.28
Option probabilities:
A: 0.07 B: 0.45 C: 0.14 D: 0.34

Q3 batch: 425 ms
3 exam item(s) in that batch

QUESTION + OPTIONS

Over GF(7), find g(x) of degree strictly less than 7, with coefficients in GF(7), giving the same output as f(x)=9x^66+7x^58+5x^55+5x^24+10x^19 for every x in 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

Choice: A
API confidence: 0.18
Option probabilities:
A: 0.38 B: 0.03 C: 0.22 D: 0.37

Q3 batch: 425 ms
3 exam item(s) in that batch

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

Choice: D
API confidence: 0.83
Option probabilities:
A: 0.06 B: 0.03 C: 0.03 D: 0.88

Q3 batch: 425 ms
3 exam item(s) in that batch

QUESTION + OPTIONS

K_4 is planar.

A. True

B. False

REFERENCE ANSWER

A. True

JEV / CORRECT

A. True

Choice: A
API confidence: 0.12
Option probabilities:
A: 0.56 B: 0.44

Q4 batch: 341 ms
4 exam item(s) in that batch

QUESTION + OPTIONS

K_5 has an Eulerian tour.

A. True

B. False

REFERENCE ANSWER

A. True

JEV / CORRECT

A. True

Choice: A
API confidence: 0.27
Option probabilities:
A: 0.64 B: 0.36

Q4 batch: 341 ms
4 exam item(s) in that batch

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

Choice: D
API confidence: 0.96
Option probabilities:
A: 0.0 B: 0.0 C: 0.03 D: 0.97

Q4 batch: 341 ms
4 exam item(s) in that batch

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.

Choice: A
API confidence: 1.0
Option probabilities:
A: 1.0 B: 0.0 C: 0.0 D: 0.0

Q4 batch: 341 ms
4 exam item(s) in that batch

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

Choice: C
API confidence: 1.0
Option probabilities:
A: 0.0 B: 0.0 C: 1.0

Q5 batch: 289 ms
7 exam item(s) in that batch

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

Choice: B
API confidence: 1.0
Option probabilities:
A: 0.0 B: 1.0 C: 0.0

Q5 batch: 289 ms
7 exam item(s) in that batch

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

Choice: C
API confidence: 1.0
Option probabilities:
A: 0.0 B: 0.0 C: 1.0

Q5 batch: 289 ms
7 exam item(s) in that batch

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

Choice: B
API confidence: 1.0
Option probabilities:
A: 0.0 B: 1.0 C: 0.0

Q5 batch: 289 ms
7 exam item(s) in that batch

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

Choice: A
API confidence: 0.97
Option probabilities:
A: 0.99 B: 0.01 C: 0.0

Q5 batch: 289 ms
7 exam item(s) in that batch

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

Choice: B
API confidence: 1.0
Option probabilities:
A: 0.0 B: 1.0 C: 0.0

Q5 batch: 289 ms
7 exam item(s) in that batch

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

Choice: C
API confidence: 0.46
Option probabilities:
A: 0.02 B: 0.34 C: 0.64

Q5 batch: 289 ms
7 exam item(s) in that batch

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)

Choice: B
API confidence: 0.91
Option probabilities:
A: 0.02 B: 0.94 C: 0.0 D: 0.04

Q6 batch: 461 ms
1 exam item(s) in that batch

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)

Choice: C
API confidence: 0.93
Option probabilities:
A: 0.0 B: 0.05 C: 0.95 D: 0.0

Q7 batch: 317 ms
6 exam item(s) in that batch

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.

Choice: D
API confidence: 0.99
Option probabilities:
A: 0.0 B: 0.0 C: 0.0 D: 1.0

Q7 batch: 317 ms
6 exam item(s) in that batch

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)

Choice: C
API confidence: 0.98
Option probabilities:
A: 0.01 B: 0.0 C: 0.99 D: 0.0

Q7 batch: 317 ms
6 exam item(s) in that batch

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)

Choice: A
API confidence: 0.37
Option probabilities:
A: 0.53 B: 0.27 C: 0.04 D: 0.16

Q7 batch: 317 ms
6 exam item(s) in that batch

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)

Choice: B
API confidence: 0.28
Option probabilities:
A: 0.24 B: 0.45 C: 0.29 D: 0.02

Q7 batch: 317 ms
6 exam item(s) in that batch

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-3*b+6*c

C. a-3*b+3*c

D. a-3*b-3*c

REFERENCE ANSWER

C. a-3*b+3*c

JEV / CORRECT

C. a-3*b+3*c

Choice: C
API confidence: 0.96
Option probabilities:
A: 0.01 B: 0.02 C: 0.97 D: 0.0

Q7 batch: 317 ms
6 exam item(s) in that batch

QUESTION + OPTIONS

In a town, 3/4 of residents have black hair and 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 9/16.

A. 1/2: a randomly selected person is a black-haired female with probability (3/4)*(2/3)=1/2; replacement makes the requested conditional probability the same.

B. 8/9: conditional on both people having black hair, the chance at least one is female is 1-(1/3)^2=8/9; this is the requested conditional probability.

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

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

REFERENCE ANSWER

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

JEV / INCORRECT

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

Choice: C
API confidence: 0.56
Option probabilities:
A: 0.03 B: 0.07 C: 0.67 D: 0.23

Q8 batch: 341 ms
1 exam item(s) in that batch

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,...).

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

A. Poisson(70*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)

Choice: D
API confidence: 1.0
Option probabilities:
A: 0.0 B: 0.0 C: 0.0 D: 1.0

Q9 batch: 448 ms
5 exam item(s) in that batch

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,...).

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. Geometric(p)

B. Uniform({1,2,...,20})

C. Binomial(20,p)

D. Uniform({0,1,...,19})

REFERENCE ANSWER

B. Uniform({1,2,...,20})

JEV / CORRECT

B. Uniform({1,2,...,20})

Choice: B
API confidence: 0.96
Option probabilities:
A: 0.0 B: 0.98 C: 0.0 D: 0.02

Q9 batch: 448 ms
5 exam item(s) in that batch

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,...).

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

A. Geometric(p)-1

B. Geometric(1-p)-1

C. Binomial(2,p)-1

D. Geometric(1-p)

REFERENCE ANSWER

B. Geometric(1-p)-1

JEV / CORRECT

B. Geometric(1-p)-1

Choice: B
API confidence: 0.62
Option probabilities:
A: 0.28 B: 0.71 C: 0.0 D: 0.01

Q9 batch: 448 ms
5 exam item(s) in that batch

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,...).

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+Geometric(1/2)

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

C. Geometric(1/2)

D. 1+Geometric(1/4)

REFERENCE ANSWER

A. 1+Geometric(1/2)

JEV / CORRECT

A. 1+Geometric(1/2)

Choice: A
API confidence: 0.73
Option probabilities:
A: 0.8 B: 0.0 C: 0.11 D: 0.09

Q9 batch: 448 ms
5 exam item(s) in that batch

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,...).

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)

Choice: D
API confidence: 0.89
Option probabilities:
A: 0.07 B: 0.0 C: 0.01 D: 0.92

Q9 batch: 448 ms
5 exam item(s) in that batch

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

Choice: B
API confidence: 0.19
Option probabilities:
A: 0.31 B: 0.32 C: 0.12 D: 0.05 E: 0.04 F: 0.16

Q10 batch: 410 ms
1 exam item(s) in that batch

QUESTION + OPTIONS

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

Independent X~Normal(1,2) and Y~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)

Choice: B
API confidence: 0.23
Option probabilities:
A: 0.41 B: 0.42 C: 0.0 D: 0.17

Q11 batch: 401 ms
3 exam item(s) in that batch

QUESTION + OPTIONS

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

Independent X,Y~Poisson(lambda). Let Z=X+Y. Select all true statements.

A. Z~Poisson(2*lambda)

B. Z has the distribution of 2P, where P~Poisson(lambda)

C. None of the above

REFERENCE ANSWER

A. Z~Poisson(2*lambda)

JEV / CORRECT

A. Z~Poisson(2*lambda)

Noul yes probabilities:
A: 0.97
B: 0.05
C: 0.12
Selection threshold: >= 0.5

Q11 batch: 401 ms
3 exam item(s) in that batch

QUESTION + OPTIONS

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

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

A. For every n, S~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~Poisson(lambda*n)
B. As n tends to infinity, (S-lambda*n)/sqrt(lambda*n) converges in distribution to Normal(0,1)

Pre-run clarification / key repair. See methodology appendix.

JEV / CORRECT

A. For every n, S~Poisson(lambda*n)
B. As n tends to infinity, (S-lambda*n)/sqrt(lambda*n) converges in distribution to Normal(0,1)

Noul yes probabilities:
A: 0.96
B: 0.97
C: 0.03
Selection threshold: >= 0.5

Q11 batch: 401 ms
3 exam item(s) in that batch

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 clarification / key repair. See methodology appendix.

JEV / CORRECT

B. 1-exp(-1/3)

Choice: B
API confidence: 0.75
Option probabilities:
A: 0.17 B: 0.81 C: 0.0 D: 0.01

Q12 batch: 321 ms
5 exam item(s) in that batch

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 clarification / key repair. See methodology appendix.

JEV / CORRECT

B. 2

Choice: B
API confidence: 0.99
Option probabilities:
A: 0.0 B: 1.0 C: 0.0 D: 0.0

Q12 batch: 321 ms
5 exam item(s) in that batch

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

Choice: B
API confidence: 0.87
Option probabilities:
A: 0.0 B: 0.91 C: 0.09 D: 0.0

Q12 batch: 321 ms
5 exam item(s) in that batch

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

Choice: A
API confidence: 0.74
Option probabilities:
A: 0.81 B: 0.01 C: 0.18 D: 0.0

Q12 batch: 321 ms
5 exam item(s) in that batch

Q12.5 | Waiting times | source page 22

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>=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

Choice: B
API confidence: 0.68
Option probabilities:
A: 0.01 B: 0.75 C: 0.01 D: 0.23

Q12 batch: 321 ms
5 exam item(s) in that batch

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*p^5

C. 12*p

D. 25*p

REFERENCE ANSWER

B. 12*p^5

JEV / CORRECT

B. 12*p^5

Choice: B
API confidence: 1.0
Option probabilities:
A: 0.0 B: 1.0 C: 0.0 D: 0.0

Q13 batch: 440 ms
6 exam item(s) in that batch

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

Choice: A
API confidence: 0.99
Option probabilities:
A: 1.0 B: 0.0 C: 0.0 D: 0.0

Q13 batch: 440 ms
6 exam item(s) in that batch

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*p^5

REFERENCE ANSWER

A. p^10

JEV / CORRECT

A. p^10

Choice: A
API confidence: 0.99
Option probabilities:
A: 0.99 B: 0.01 C: 0.0 D: 0.0

Q13 batch: 440 ms
6 exam item(s) in that batch

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 Var(X) in terms of a,b,c.

A. a+40*b+92*c-a^2

B. a+46*b+20*c-a^2

C. a+92*b+40*c

D. a+92*b+40*c-a^2

REFERENCE ANSWER

D. a+92*b+40*c-a^2

JEV / CORRECT

D. a+92*b+40*c-a^2

Choice: D
API confidence: 0.82
Option probabilities:
A: 0.1 B: 0.03 C: 0.0 D: 0.87

Q13 batch: 440 ms
6 exam item(s) in that batch

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>=1), clipped at 1?

A. 1-(1-p^5)^12

B. min(1,12*p^5)

C. min(1,12*p^10)

D. min(1,p^5)

REFERENCE ANSWER

B. min(1,12*p^5)

JEV / CORRECT

B. min(1,12*p^5)

Choice: B
API confidence: 1.0
Option probabilities:
A: 0.0 B: 1.0 C: 0.0 D: 0.0

Q13 batch: 440 ms
6 exam item(s) in that batch

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>=2), in terms of E[X] and Var(X), clipped at 1?

A. min(1,(2-E[X])^2/Var(X))

B. min(1,Var(X)/(2-E[X]))

C. min(1,Var(X)/(2-E[X])^2)

D. min(1,Var(X)/(2+E[X])^2)

REFERENCE ANSWER

C. min(1,Var(X)/(2-E[X])^2)

Pre-run clarification / key repair. See methodology appendix.

JEV / CORRECT

C. min(1,Var(X)/(2-E[X])^2)

Choice: C
API confidence: 0.97
Option probabilities:
A: 0.01 B: 0.01 C: 0.98 D: 0.0

Q13 batch: 440 ms
6 exam item(s) in that batch

QUESTION + OPTIONS

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

A. Cov(I_A,I_B)=P(A union 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. Cov(I_A,I_B)=P(A intersection 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. Cov(I_A,I_B)=P(A intersection 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. Cov(I_A,I_B)=P(A)P(B)-P(A intersection B)=P(B)[P(A|B)-P(A)]. Because P(B)>0, positive covariance forces the bracket to be positive.

REFERENCE ANSWER

C. Cov(I_A,I_B)=P(A intersection 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. Cov(I_A,I_B)=P(A intersection B)-P(A)P(B)=P(B)[P(A|B)-P(A)]. Because P(B)>0, positive covariance forces the bracket to be positive.

Choice: C
API confidence: 0.97
Option probabilities:
A: 0.02 B: 0.0 C: 0.98 D: 0.0

Q14 batch: 385 ms
1 exam item(s) in that batch

QUESTION + OPTIONS

Gaussian(mu,v) denotes a Gaussian distribution with mean mu and variance v.

Let X~Gaussian(3,6) and Y~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 clarification / key repair. See methodology appendix.

JEV / CORRECT

A. 0

Choice: A
API confidence: 0.99
Option probabilities:
A: 1.0 B: 0.0 C: 0.0 D: 0.0

Q15 batch: 378 ms
5 exam item(s) in that batch

QUESTION + OPTIONS

Gaussian(mu,v) denotes a Gaussian distribution with mean mu and variance v.

For X~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

Choice: C
API confidence: 0.38
Option probabilities:
A: 0.42 B: 0.02 C: 0.54 D: 0.02

Q15 batch: 378 ms
5 exam item(s) in that batch

QUESTION + OPTIONS

Gaussian(mu,v) denotes a Gaussian distribution with mean mu and variance v.

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 | A,B), in terms of A and B?

A. 1-abs(A-B)/12

B. abs(A-B)/12

C. (A-B)/12

D. abs(A-B)/144

REFERENCE ANSWER

B. abs(A-B)/12

JEV / CORRECT

B. abs(A-B)/12

Choice: B
API confidence: 0.96
Option probabilities:
A: 0.03 B: 0.97 C: 0.0 D: 0.0

Q15 batch: 378 ms
5 exam item(s) in that batch

QUESTION + OPTIONS

Gaussian(mu,v) denotes a Gaussian distribution with mean mu and variance v.

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

Choice: D
API confidence: 0.96
Option probabilities:
A: 0.02 B: 0.01 C: 0.01 D: 0.96

Q15 batch: 378 ms
5 exam item(s) in that batch

QUESTION + OPTIONS

Gaussian(mu,v) denotes a Gaussian distribution with mean mu and variance v.

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 | 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

Choice: C
API confidence: 0.35
Option probabilities:
A: 0.0 B: 0.45 C: 0.52 D: 0.03

Q15 batch: 378 ms
5 exam item(s) in that batch

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(CHI).

A. h(MIA)=1; h(NYC)=0; h(SFO)=h(CHI); h(DC)=(h(SFO)+h(NYC)+h(MIA))/3; h(CHI)=(h(SFO)+h(DC))/2.

B. h(MIA)=1; h(NYC)=0; h(SFO)=h(CHI); h(DC)=(h(NYC)+h(MIA))/2; h(CHI)=(h(SFO)+h(DC)+h(NYC))/3.

C. h(MIA)=0; h(NYC)=1; h(SFO)=h(CHI); h(DC)=(h(SFO)+h(NYC)+h(MIA))/3; h(CHI)=(h(SFO)+h(DC)+h(NYC))/3.

D. h(MIA)=1; h(NYC)=0; h(SFO)=h(CHI); h(DC)=(h(SFO)+h(NYC)+h(MIA))/3; h(CHI)=(h(SFO)+h(DC)+h(NYC))/3.

REFERENCE ANSWER

D. h(MIA)=1; h(NYC)=0; h(SFO)=h(CHI); h(DC)=(h(SFO)+h(NYC)+h(MIA))/3; h(CHI)=(h(SFO)+h(DC)+h(NYC))/3.

JEV / CORRECT

D. h(MIA)=1; h(NYC)=0; h(SFO)=h(CHI); h(DC)=(h(SFO)+h(NYC)+h(MIA))/3; h(CHI)=(h(SFO)+h(DC)+h(NYC))/3.

Choice: D
API confidence: 0.98
Option probabilities:
A: 0.01 B: 0.0 C: 0.0 D: 0.99

Q16 batch: 336 ms
2 exam item(s) in that batch

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(MIA)=0; t(SFO)=1+t(CHI); t(CHI)=1+(t(SFO)+t(DC)+t(NYC))/3; t(DC)=1+(t(NYC)+t(MIA))/3; t(NYC)=3+(t(CHI)+t(DC))/2.

B. t(MIA)=0; t(SFO)=1+t(CHI); t(CHI)=1+(t(SFO)+t(DC)+t(NYC))/3; t(DC)=1+(t(SFO)+t(NYC)+t(MIA))/3; t(NYC)=3+(t(CHI)+t(DC))/2.

C. t(MIA)=0; t(SFO)=1+t(CHI); t(CHI)=1+(t(SFO)+t(DC)+t(NYC))/3; t(DC)=1+(t(SFO)+t(NYC)+t(MIA))/3; t(NYC)=1+(t(CHI)+t(DC))/2.

D. t(MIA)=1; t(SFO)=1+t(CHI); t(CHI)=1+(t(SFO)+t(DC)+t(NYC))/3; t(DC)=1+(t(SFO)+t(NYC)+t(MIA))/3; t(NYC)=3+(t(CHI)+t(DC))/2.

REFERENCE ANSWER

B. t(MIA)=0; t(SFO)=1+t(CHI); t(CHI)=1+(t(SFO)+t(DC)+t(NYC))/3; t(DC)=1+(t(SFO)+t(NYC)+t(MIA))/3; t(NYC)=3+(t(CHI)+t(DC))/2.

Pre-run clarification / key repair. See methodology appendix.

JEV / CORRECT

B. t(MIA)=0; t(SFO)=1+t(CHI); t(CHI)=1+(t(SFO)+t(DC)+t(NYC))/3; t(DC)=1+(t(SFO)+t(NYC)+t(MIA))/3; t(NYC)=3+(t(CHI)+t(DC))/2.

Choice: B
API confidence: 0.97
Option probabilities:
A: 0.01 B: 0.97 C: 0.0 D: 0.02

Q16 batch: 336 ms
2 exam item(s) in that batch

The source/key issues were addressed before the run, with no edits based on Jev's answers:

Q3.1: “Distinct polynomials” clarified as formal polynomials rather than polynomial functions.
Q11.3: Positive Poisson rate specified so the CLT standardization is defined.
Q12.1-Q12.2: Arrival model made explicit as a homogeneous Poisson process.
Q13.6: Added $E[X]<2$, needed for the stated upper-tail use of Chebyshev.
Q15.1: Added independence; the two marginal distributions alone do not imply $P(X=Y)=0$.
Q16.2: Corrected the reference recurrence to include the DC -> SFO route shown in both diagrams.

Diagnostic slices: original-choice formats 16/17; adapted written responses 36/41; counting/probability items 32/35; repaired items 7/7; remaining items 45/51. These slices do not replace the all-item denominator.

Misses: Q2.5 (RSA), Q2.6 (modular powers), Q3.2 (finite-field polynomial), Q8 (conditional probability), Q10 (recursive expectation), Q15.5 (expected distance).

“Clipped at 1” is explicit for the standard union and Chebyshev bound choices. Normal's second parameter is variance; Geometric counts trials including success. These notation clarifications were fixed before testing.

Source: user-supplied final_fa25_sol.pdf, CS 70 Fall 2025 final (December 19, 2025), solutions updated December 20, 2025. Text and diagram transcription were inspected locally. Candidate answer recognition is easier than producing unrestricted written solutions; this is not a psychometrically equivalent exam.

Reproducibility: the accompanying evidence.json includes exact requests, raw responses, timings and scoring. requests.json was frozen with SHA-256 before the first inference call. TypeSafe API documentation: https://docs.typesafe.ai/api and https://docs.typesafe.ai/models.