

# Institute of Actuaries of India

## ACET January 2026

### Mathematics

**Q. 1.** If  $f(x) = \ln(\sqrt{x^2 + 9})$ , then the minimum value of  $f(x)$  is:

- A. 0
- B.  $\ln 3$
- C.  $\ln 9$
- D. None of the above

1 mark

**Q. 2.** If  $f(x) = |x^2 - 4x|$  and  $g(x) = x^2 - 4|x|$ , then which of the following is true for all real  $x$ ?

- A.  $f(x) > g(x)$
- B.  $f(x) = g(x)$
- C.  $f(x) < g(x)$
- D. None of the above

2 marks

**Q. 3.** The equation  $3x^3 - 2x + 7 = 0$  has:

- A. At least 2 real roots
- B. Exactly 1 real root
- C. Exactly 2 real roots
- D. 3 real roots

2 marks

**Q. 4.** Let  $[x]$  denote the greatest integer  $\leq x$  and  $\{x\} = x - [x]$ . Evaluate

$$I = \int_0^{2025} [x]\{x\} dx.$$

- A. An odd integer
- B. An even integer not divisible by 4
- C. A multiple of 4
- D. Not an integer

3 marks

**Q. 5.** If  $a$  and  $b$  are the roots of  $x^2 - 12x + 20 = 0$ , then the roots of

$$x^2 - (a + b)x + ab = 0$$

are:

- A.  $a, b$
- B.  $a^2, b^2$
- C.  $1/a, 1/b$
- D. None of the above

1 mark

**Q. 6.** Evaluate

$$\lim_{x \rightarrow 0} \frac{\tan(7x) - \tan(3x)}{x}$$

- A. 4
- B. 10
- C. 7
- D. None of the above

1 mark

**Q. 7.** A geometric progression  $(a_n)$  satisfies  $a_5 = 48$  and  $a_{10} = 3$ .

Let  $k$  be the smallest integer  $> 10$  such that  $a_k$  is an integer. Then  $k + a_k$  equals:

- A. 18
- B. 19
- C. 20
- D. None of the above

3 marks

**Q. 8.** If  $\vec{v} = 6\mathbf{i} - 8\mathbf{j}$ , then a unit vector in the direction of  $\vec{v}$  is:

- A.  $\frac{3}{5}\mathbf{i} - \frac{4}{5}\mathbf{j}$
- B.  $\frac{4}{5}\mathbf{i} - \frac{3}{5}\mathbf{j}$
- C.  $\frac{7}{10}\mathbf{i} - \frac{3}{10}\mathbf{j}$
- D. None of the above

1 mark

**Q. 9.** Which of the following statements is/are true?

X:  $\vec{a} \cdot \vec{b} = \vec{b} \cdot \vec{a}$       Y:  $\vec{a} \times \vec{b} = \vec{b} \times \vec{a}$

- A. Both X and Y
- B. Neither X nor Y
- C. X but not Y
- D. Y but not X

1 mark

**Q. 10.** If  $A$  is a  $3 \times 3$  matrix with  $|A| = 5$ , then  $|A^{-1}|$  equals:

- A.  $1/5$
- B.  $5$
- C.  $25$
- D. None of the above

1 mark

**Q. 11.** For a  $2 \times 2$  matrix  $M$ ,  $\text{adj}(\text{adj}(M))$  equals:

- A.  $M$
- B.  $|M| M$
- C.  $I$
- D. None of the above

1 mark

**Q. 12.** Evaluate

$$\int_0^1 e^{2x} (1+x) dx.$$

- A.  $e^2 - 1$
- B.  $\frac{e^2+1}{2}$
- C.  $2e^2 - 1$
- D. None of the above

3 marks

**Q. 13.** If  $e^x = \tan y$ , then  $\frac{dy}{dx}$  at  $x = 0$  equals:

- A.  $1$
- B.  $\frac{1}{2}$
- C.  $\sec^2(0)$

D. None of the above

1 mark

**Q. 14.** The function  $f(x) = x^3 - 3x^2 + 2$  is strictly increasing in:

- A.  $(-\infty, 1)$
- B.  $(2, \infty)$
- C.  $(-\infty, 0) \cup (2, \infty)$
- D.  $(0, 2)$

1 mark

**Q. 15.** The coefficient of  $x^{12}$  in  $(x^3 - 2)^8$  is:

- A.  $\binom{8}{4}(-2)^4$
- B.  $\binom{8}{3}(-2)^5$
- C.  $\binom{8}{2}(-2)^6$
- D. None of the above

1 mark

**Q. 16.** The value of

$$\sum_{n=1}^{2024} \frac{1}{n(n+1)}$$

is:

- A. Less than 1
- B. Between 1 and 2
- C. Between 2 and 3
- D. More than 3

1 mark

**Q. 17.** Using the Trapezoidal rule with  $h = 0.25$ , the nearest value to

$$\int_0^1 (x^2 + 1) dx$$

is:

- A. 1.25
- B. 1.33
- C. 1.50

D. None of the above

2 marks

**Q. 18.** Using Newton–Raphson method to solve  $e^x = 5x$  with initial guess  $x_0 = 1$ , the value of  $x_1$  is:

A. 0.5

B. 1.2

C. 0.8

D. None of the above

2 marks

**Q. 19.** If  $\omega$  is a complex cube root of unity (other than 1), then

$$\omega^{2025} + \omega^{2027}$$

equals:

A. 0

B. 1

C.  $\omega$

D. None of the above

1 mark

**Q. 20.** If  $z = \frac{3-4i}{1+2i}$ , then  $|z|$  equals:

A. 1

B. 2

C.  $\sqrt{5}$

D. None of the above

1 mark

## Statistics

**Q. 21.** A biased 3-sided spinner has outcomes  $\{0, 1, 2\}$ . The probability of outcome  $j$  is proportional to  $j + 1$ . Let  $N$  be the outcome. The median of  $N$  is:

A. 0

B. 1

C. 2

D. Cannot be determined

1 mark

**Q. 22.** Five students have heights  $h_1 \leq h_2 \leq h_3 \leq h_4 \leq h_5$ . Their average height is 170 cm. All  $\binom{5}{3}$  possible 3-student groups are formed and their mean heights calculated. The smallest and largest of these 3-student means are 162 cm and 176 cm respectively. The median height  $h_3$  is:

- A. 164 cm
- B. 168 cm
- C. 172 cm
- D. 170 cm

1 mark

**Q. 23.** A club has 8 engineers and 5 economists. A 6-member committee must be formed with at least 2 economists and more engineers than economists. The number of possible committees is:

- A. 350
- B. 420
- C. 490
- D. 700

1 mark

**Q. 24.** Two batches of students appear for the same exam. Batch A has 40 students with mean 65 and variance 16. Batch B has  $n$  students with mean 75. The combined mean of A + B is 70. If all Batch B students have the same mark, then the size  $n$  of Batch B is:

- A. 10
- B. 20
- C. 30
- D. 40

1 mark

**Q. 25.** For two events A and B with  $P(A) = 0.3$ ,  $P(B) = 0.5$  and  $P(A | B) = 0.4$ .

Then  $P(B | A)$  equals:

- A. 0.4
- B. 0.6
- C.  $\frac{2}{3}$

D. None of the above

1 mark

**Q. 26.** A fair 6-sided die is rolled once. If it shows  $n$ , a fair coin is tossed  $n$  times and  $X$  is the number of heads. The probability that  $X = 0$  equals:

A.  $\frac{21}{128}$

B.  $\frac{7}{64}$

C.  $\frac{7}{96}$

D.  $\frac{1}{12}$

2 marks

**Q. 27.** Let  $X \sim \text{Uniform}(0,2)$ . Define  $Y = 5X - 3$ . The interquartile range (IQR) of  $Y$  is:

A. 2.5

B. 5

C. 7.5

D. 10

1 mark

**Q. 28.** A lifetime  $T$  (in years) has an exponential distribution with mean 4. Given that the item has already survived 3 years, the probability that it survives at least 5 more years is:

A.  $e^{-5/4}$

B.  $e^{-5/2}$

C.  $e^{-2}$

D. None of the above

1 mark

**Q. 29.** If  $X \sim N(10,9)$  and  $Y = 2X - 5$ , then the variance of  $Y$  equals:

A. 9

B. 18

C. 36

D. 81

1 mark

**Q. 30.** A Binomial( $n, p$ ) distribution is symmetric about its mean when:

A.  $n = 2$

B.  $p = \frac{1}{2}$

C.  $np = 1$

D.  $n$  is even

1 mark

**Q. 31.** For a Poisson( $\lambda$ ) random variable  $X$ , it is known that  $P(X = 3) = 2 \cdot P(X = 4)$ .

Then  $\lambda$  equals:

A. 2

B. 2.5

C. 3

D. 4

1 mark

**Q. 32.** Let  $X$  have an exponential distribution with mean  $\theta$ . It is known that

$$\frac{P(X > 2)}{P(X > 5)} = e.$$

Then the variance of  $X$  is:

A. 1

B. 3

C. 4

D. 9

2 marks

**Q. 33.** A discrete random variable  $X$  takes values 0, 1, 2, 3, 4 and has CDF:

- $F(x) = 0$  for  $x < 0$
- $F(x) = 0.2$  for  $0 \leq x < 1$
- $F(x) = 0.5$  for  $1 \leq x < 2$
- $F(x) = 0.8$  for  $2 \leq x < 3$
- $F(x) = 0.95$  for  $3 \leq x < 4$
- $F(x) = 1$  for  $x \geq 4$

The probability that  $X$  is odd is:

A. 0.30

B. 0.45

C. 0.50

D. 0.55

1 mark

**Q. 34.** A discrete random variable  $X$  takes values 0, 1, 2, 3, 4 and has CDF:

- $F(x) = 0$  for  $x < 0$
- $F(x) = 0.2$  for  $0 \leq x < 1$

- $F(x) = 0.5$  for  $1 \leq x < 2$
- $F(x) = 0.8$  for  $2 \leq x < 3$
- $F(x) = 0.95$  for  $3 \leq x < 4$
- $F(x) = 1$  for  $x \geq 4$

For  $X$ , let  $m$  be the mean and  $M$  be the median of  $X$ . Then  $|m - M|$  is:

- A. Less than 0.25
- B. Between 0.25 and 0.5
- C. Between 0.5 and 1
- D. 1 or more

1 mark

**Q. 35.** The stem-and-leaf plot below shows scores (out of 50) in a test:

Stem | Leaves

2 | 1 4

3 | 0 3 3 8

4 | 0 2 5 5 7

5 | 0 1 3 4 4

Which of the following statements is true?

- A. The dataset has a unique mode, which is 33.
- B. The dataset has a unique mode, which is 45.
- C. The dataset has more than one mode.
- D. The dataset has no mode.

2 marks

**Q. 36.** For variables  $X$  and  $Y$ , the regression line of  $X$  on  $Y$  is  $4X - 3Y + 10 = 0$ . The sample standard deviations are  $s_X = 2$ ,  $s_Y = 4$ . Assuming these are valid regression and standard deviation values, which of the following is true about the correlation coefficient  $\rho$  between  $X$  and  $Y$ ?

A.  $\rho = \frac{3}{2}$

B.  $\rho = \frac{3}{4}$

C.  $|\rho| > 1$ , so the given information cannot all be correct.

D.  $\rho = 0$

3 marks

**Q. 37.** For two variables  $X$  and  $Y$ , the regression of  $X$  on  $Y$  is  $X - 2Y + 1 = 0$ , and the regression of  $Y$  on  $X$  is  $3X - Y - 2 = 0$ . Which of the following is true?

- A. The correlation coefficient is  $\frac{1}{2}$ .
- B. The correlation coefficient is  $\frac{\sqrt{6}}{2}$ .
- C. The correlation coefficient is negative.
- D.  $\rho^2 > 1$ , hence these two lines cannot both be valid regression lines for the same pair  $(X, Y)$ .

2 marks

**Q. 38.** Let  $X$  be the outcome of a fair 4-sided die taking values  $\{1, 2, 3, 4\}$ . Define  $Y = X^2$ . The covariance  $\text{Cov}(X, Y)$  is:

- A. 0
- B. 3.5
- C. 5
- D. 6.25

2 marks

**Q. 39.** A fair coin is tossed once. If it shows heads, a fair 6-sided die is rolled once and the outcome is recorded as  $Z$ . If it shows tails, the same die is rolled twice and the two outcomes are added to give  $Z$ . The expected value  $E[Z]$  is:

- A. 4.5
- B. 5.25
- C. 7
- D. 8.75

3 marks

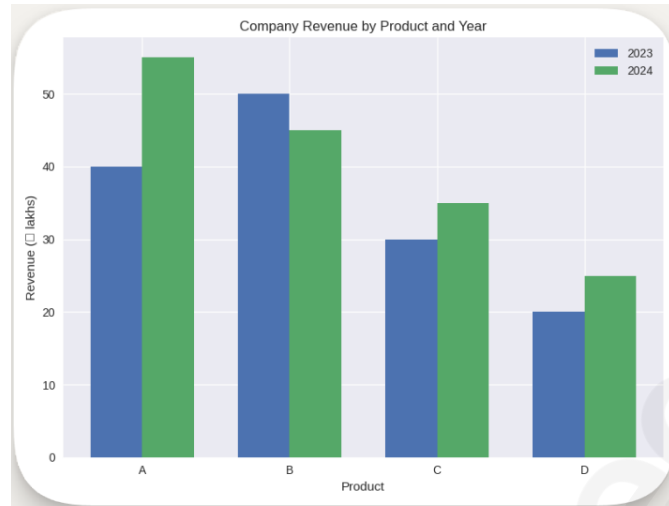
**Q. 40.** Events  $A$  and  $B$  satisfy  $P(A) = 0.4$ ,  $P(B) = 0.7$ ,  $P(A \cap B) = 0.28$ . Which of the following statements is true?

X:  $A$  and  $B$  are independent. Y:  $A$  and  $B^c$  are independent.

- A. Both X and Y
- B. Only X
- C. Only Y
- D. Neither X nor Y

2 marks

## Data Interpretation



Product	Profit Margin 2024 (%)
A	20
B	15
C	25
D	10

**Q. 41.** What is the total revenue of the company in 2023 from all four products together?

- A. ₹120 lakhs
- B. ₹130 lakhs
- C. ₹140 lakhs
- D. ₹150 lakhs

1 mark

**Q. 42.** Which product shows the largest absolute increase in revenue from 2023 to 2024?

- A. Product A
- B. Product B
- C. Product C
- D. Product D

2 marks

**Q. 43.** Using the 2024 revenues and profit margins, what is the total profit in 2024 (in ₹ lakhs) from all four products combined?

- A. 28.75
- B. 29
- C. 30.25
- D. 31

2 marks

**Q. 44.** In 2024, which product contributes the highest share of total profit for the company?

- A. Product A
- B. Product B
- C. Product C
- D. Product D

1 mark



**Q. 45.** In which year is the gap between Product R and Product S the smallest?

- A. 2016
- B. 2019
- C. 2021
- D. 2022

1 mark

**Q. 46.** In which year does Product S first exceed Product R in output?

- A. 2016
- B. 2017
- C. 2018
- D. 2019

1 mark

**Q. 47.** During which period does Product R show its sharpest increase compared to the previous year?

- A. 2014–2015
- B. 2018–2019
- C. 2019–2020
- D. 2021–2022

1 mark

**Q. 48.** In which year is the combined output of Product R and Product S visually the highest?

- A. 2017
- B. 2020
- C. 2021
- D. 2022

1 mark

Department	January	February	March	April
Physics	92%	88%	90%	91%
Chemistry	85%	87%	89%	86%
Biology	78%	82%	80%	83%
Mathematics	95%	93%	94%	96%

**Q. 49.** Which department had the highest average attendance over the four months?

- A. Physics
- B. Chemistry
- C. Biology
- D. Mathematics

2 marks

**Q. 50.** In which month was the difference between the highest and lowest attendance the biggest?

- A. January
- B. February
- C. March
- D. April

1 mark

**Q. 51.** Which department showed the most consistent attendance (i.e., the smallest range between highest and lowest monthly percentages)?

- A. Physics
- B. Chemistry
- C. Biology
- D. Mathematics

2 marks

## English

**Q. 52.** Choose the word that best completes the sentence:

The research team was appreciated for its \_\_\_\_\_ preparation before starting the experiment.

- A. careless
- B. meticulous
- C. reckless
- D. haphazard

1 mark

**Q. 53.** Choose the word closest in meaning to “prudent”.

- A. foolish
- B. cautious
- C. lazy
- D. indifferent

2 marks

**Q. 54.** Choose the word that is the opposite of “seldom”.

- A. rarely
- B. occasionally
- C. frequently
- D. hardly

1 mark

**Q. 55.** “She did not knew that the meeting had been postponed.” Identify the error in the sentence.

- A. She did not
- B. knew
- C. that the meeting
- D. had been postponed

1 mark

**Q. 56.** “The principal refused to \_\_\_\_\_ the rude behaviour of the students.”

- A. except
- B. accept
- C. expect
- D. access

1 mark

**Q. 57.** A person who loves and collects books is called a \_\_\_\_\_.

- A. biologist
- B. bibliophile
- C. philatelist
- D. dramatist

2 marks

**Q. 58.** A student who is very nervous before an exam can be said to have “butterflies in their \_\_\_\_\_”.

- A. head
- B. stomach
- C. throat
- D. mind

1 mark

**Q. 59.** Artist : Painting :: Architect : ?

- A. Machines
- B. Buildings
- C. Medicines
- D. Poems

1 mark

**Q. 60.** Read the passage below and answer the question:

Many cities are encouraging people to use bicycles for short trips. Dedicated cycling lanes have been built on busy roads, and several offices now provide parking spaces for cycles. Although some residents still prefer cars for convenience, an increasing number of commuters say that cycling saves time during traffic jams and helps them stay fit.

Which of these is NOT a valid inference from the passage above?

- A. Some people choose bicycles to avoid getting stuck in traffic.
- B. At least a few offices support employees who cycle to work.
- C. Everyone in the city has completely stopped using cars for short trips.
- D. Cycling is promoted as both a transport and health-friendly option.

2 marks

**Q. 61.** The following sentences are jumbled up. Choose the correct sequence.

- I. Over months and years, these choices gradually shape a person’s life.
- II. At first, a single decision may seem small and unimportant.
- III. Yet each decision adds to a pattern of behaviour.
- IV. That pattern becomes easier to repeat every time we follow it.

- A. II, III, IV, I
- B. II, IV, III, I

- C. III, II, IV, I
- D. IV, II, III, I

2 marks

**Q. 62.** Consider the following set of sentences:

- I. She is senior than me by three years.
  - II. Please explain me this concept again.
  - III. He enjoys to play football in the evening.
- Of these, the sentences that are erroneous are:

- A. I and II
- B. I and III
- C. II and III
- D. I, II and III

1 mark

### Logical Reasoning

**Q. 63.** Today is 10th March 2026 and it falls on a Tuesday. In which of the following years will 10th March again fall on a Tuesday?

- A. 2037
- B. 2031
- C. 2032
- D. 2030

2 marks

**Q. 64.** Between 3:00 p.m. and 4:00 p.m., the minute hand and hour hand of a clock form a right angle ( $90^\circ$ ). How many times does this happen in that one-hour interval?

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

1 mark

**Q. 65.** A solid cube is painted on the outside and then broken into many identical small cubes.

Which of the following statements is always correct?

- A. The cubes at the corners all have paint on three faces
- B. The cubes along the edges have paint on only one face
- C. The cubes in the middle have paint on one or more faces
- D. The number of painted cubes depends on how many pieces the cube is cut into

2 marks

**Q. 66.** If A is B's father's sister's son, then B is A's:

- A. Father / mother
- B. Cousin brother / sister
- C. Nephew / niece
- D. Son / daughter

1 mark

**Q. 67.** Five friends — A, B, C, D, and E — are seated in a row, all facing north.

- C is sitting immediately to the left of D.
- E is sitting at the right end of the row.
- B is sitting somewhere to the left of C.

Which of the following must be true?

- A. A is sitting immediately next to C
- B. C is sitting at the left end
- C. A is sitting to the right of D
- D. B is not sitting next to D

1 mark

**Q. 68.** Statements:

1. All doctors are graduates.
2. Some graduates are artists.
3. No artist is a pilot.

Which of the following is definitely true?

- A. Some doctors are pilots.
- B. Some graduates are not pilots.
- C. All graduates are doctors.
- D. No graduate is a pilot.

1 mark

**Q. 69.** Arrange in a logical sequence:

I = Interview, A = Application, S = Selection, J = Job Offer

- A. A, I, S, J
- B. I, A, S, J
- C. A, S, I, J
- D. S, A, I, J

1 mark

**Q. 70.** Find the wrong number in the series:

3, 8, 18, 40, 78, 158, ...

- A. 18
- B. 40
- C. 78
- D. 158

1 mark

\*\*\*\*\*

