AIMO 2026

Annual International Mathematics Olympiad

Mathematics Association, BITS Pilani

Classes 11 and 12: Question Paper

Held online on 24 October 2026 · Duration: 1 hour

Instructions

- This paper consists of 20 MCQs (Part A, Q1–Q20) and 5 numerical-type questions (Part B, Q21–Q25).
- Each MCQ has exactly one correct option. The answer to each numerical-type question is a non-negative integer.
- Each correct answer carries 4 marks. For every wrong answer, 1 mark will be deducted. This applies to both Part A and Part B.
- No marks will be awarded or deducted for unanswered questions.
- The symbol $[x]$ denotes the **Greatest Integer Function (G.I.F.)**, i.e., the greatest integer less than or equal to x, unless stated otherwise.
- The symbol $\{x\}$ denotes the fractional part of x, defined by $\{x\} = x - [x]$.
- e denotes the base of natural logarithms. $\arg z$ denotes the principal argument, $-\pi < \arg z \leq \pi$, and $\cot^{-1}$ takes values in $(0, \pi)$.
- Use of calculators or any electronic gadgets is strictly prohibited.

Part A

Q1. A data set consists of 100 real values $x_1, \ldots, x_{100}$ with mean 20. The variance of n values with mean $\bar{x}$ is defined as $\frac{1}{n}\sum_{i=1}^{n}(x_i - \bar{x})^2$. One of the values, equal to 20, is replaced by -20, and the other 99 values are unchanged. By how much does the variance increase?

(1) 15.84 (2) 16.00 (3) 15.68 (4) 16.16

Q2. Three vectors $\vec{a}$, $\vec{b}$, and $\vec{c}$ are such that the angle between each pair of them is $60°$. If $\vec{a} = \hat{\imath}$ and $\vec{b} = \hat{\imath} + \sqrt{3}\,\hat{\jmath}$, and the unit vector along $\vec{c}$ is given by $\hat{c} = p\hat{\imath} + q\hat{\jmath} + r\hat{k}$, then the value of $2p + 36q^2 + 3r^2$ is equal to:

(1) 6 (2) 4 (3) 2 (4) 5

Q3. The two (distinct) roots of $z^2 + (1+i)z + k = 0$, where $k \in \mathbb{C}$, together with the origin, are the vertices of an equilateral triangle in the Argand plane. Then k equals:

(1) $\frac{3i}{2}$ (2) $\frac{2i}{3}$ (3) $2i$ (4) $-\frac{2i}{3}$

Q4. Four-digit positive integers are formed using only the digits 2, 3 and 4, in such a way that the digit 2 appears at most three times, the digit 3 at most twice, and the digit 4 at most once. How many distinct such integers are divisible by 2 or by 3 (or both)?

(1) 29 (2) 32 (3) 35 (4) 38

Q5. The number of points of intersection of the loci

$$\arg(z-1-3i)=\cot^{-1}(1) \qquad \text{and} \qquad \arg\left(\frac{z-6i}{z+2}\right)=\pm\frac{\pi}{2}$$

is:

(1) 0 (2) 1 (3) 2 (4) 3

Q6. A candy factory uses 5 fruit flavours $\{A, B, C, D, E\}$. Each candy is made using one or more of these flavours, and its taste depends only on the *set* of flavours included. Thus a "combination" is a non-empty subset of $\{A, B, C, D, E\}$.

A kid may prefer some combinations to others; for example, a kid may prefer $\{A, B, C\}$ over $\{B, C\}$. The *preference order* of a kid is a strict ranking of all the combinations (no two combinations are ranked equal), the ones occurring earlier being preferred more. Every ranking of all the combinations is possible for some kid.

A party is to be organised so that no two kids attending have the same preference order. What is the maximum number of kids that can attend such a party?

(1) $2^{5!}-1$ (2) $(2^5-1)!$ (3) $\binom{5}{2}-1$ (4) 5^2

Q7. Let a be the positive real number for which $\lim\limits_{x\to 0}\dfrac{x\tan x - x^2\left(2\cos^2 x-1\right)}{x^a}$ exists and is finite and non-zero. If this limit equals $\dfrac{b}{c}$, where b, c are coprime positive integers, then what is $c-b+a$?

(1) 2 (2) 4 (3) 6 (4) 0

Q8. Three distinct vertices of a regular octagon are selected at random, all $\binom{8}{3}$ choices being equally likely. What is the probability that they form an acute-angled triangle?

(1) $\dfrac{3}{14}$ (2) $\dfrac{2}{7}$ (3) $\dfrac{1}{7}$ (4) $\dfrac{1}{4}$

Q9. Let z_1 be a point lying on the curve $|z-3+8i|=4$. Let z_2 and z_3 be the points on the curve $|z+3|=6$ for which $|z_1-z_2|$ is minimum and $|z_1-z_3|$ is maximum, respectively. What is the value of z_2+z_3?

(1) -3 (2) 3 (3) 6 (4) -6

Q10. How many ordered sequences $(a_1, a_2, \ldots, a_8)$ of integers satisfy $0 \le a_i \le 3$ for every i and $a_1+a_2+\cdots+a_8=12$?

(1) 8092 (2) 8192 (3) 8008 (4) 8064

Q11. Given $\cos(\alpha-\beta)=1$ and $\sin(\alpha+\beta)=\dfrac{1}{e}$, where $\alpha, \beta \in [-\pi, 2\pi]$, how many ordered pairs (α, β) satisfy both equations?

(1) 0 (2) 6 (3) 12 (4) 10

Q12. If $a, b, c, p, q, r \in \mathbb{R} \setminus \{0\}$ such that

$$ap + bq + cr + \sqrt{(a^2 + b^2 + c^2)(p^2 + q^2 + r^2)} = 0,$$

find the value of

$$\frac{aq}{bp} + \frac{br}{cq} + \frac{cp}{ar}.$$

(1) 2 (2) 3 (3) 4 (4) 6

Q13. How many positive integers $n \leq 100$ can be written in the form $[x] + [2x] + [3x]$ for some real number x?

(1) 63 (2) 66 (3) 67 (4) 68

Q14. Let the line $2x + 3y = 13$ meet the circle $x^2 + y^2 = 20$ at A and B. Find the equation of the circle with diameter AB.

(1) $(x-2)^2 + (y-3)^2 = 7$
(2) $(x-3)^2 + (y-2)^2 = 6$
(3) $(x-1)^2 + (y-2)^2 = 7$
(4) $(x-1)^2 + (y-2)^2 = 6$

Q15. Two real numbers x and y are chosen independently and uniformly at random from the interval $(0, 1)$. Let N be the integer nearest to $\dfrac{x}{y}$ (the probability that $\frac{x}{y}$ is exactly half-way between two integers is 0). What is the probability that N is even? (Zero is an even integer.)

(1) $\dfrac{5-\pi}{4}$ (2) $\dfrac{\pi-1}{4}$ (3) $\dfrac{4-\pi}{2}$ (4) $\dfrac{1}{2}$

Q16. Two knights of different colours are placed uniformly at random on two distinct squares of an otherwise empty standard 8×8 chessboard. If P denotes the probability that the two knights attack each other (that is, one can capture the other in a single move), then $15P$ is equal to:

Note: A knight moves two squares horizontally and one square vertically, or two squares vertically and one square horizontally, in any direction, provided the destination lies on the board.

(1) $\dfrac{5}{4}$ (2) $\dfrac{5}{6}$ (3) $\dfrac{10}{7}$ (4) $\dfrac{5}{3}$

Q17. Let S_1 and S_2 be the foci of an ellipse with eccentricity $\frac{2}{3}$ and semi-major axis of length 2 units. Let A be the foot of the perpendicular from S_1 to a tangent to the ellipse, with $S_1A = 1$ unit. Find the perimeter of triangle S_1S_2A.

(1) $\dfrac{11+\sqrt{89}}{3}$ (2) $\dfrac{11+\sqrt{101}}{3}$ (3) $\dfrac{11+\sqrt{113}}{3}$ (4) $\dfrac{11+\sqrt{95}}{3}$

Q18. For the purposes of this problem, the following definitions are to be used (they differ from the usual ones).

A **relation** from a set A to a set B is any subset of the Cartesian product $A \times B$. Such a relation is a **function** from A to B if and only if every element of A has exactly one image in B. The set A may be any set, including the empty set.

Differentiability: A function is said to be differentiable throughout its domain if and only if, for every value x in its domain, there exists another, distinct, value y in its domain such that x and y have the same output.

Continuity: A function is said to be continuous throughout its domain if and only if there exist at least two distinct values in its domain that have the same output.

Consider the statements:

I. If a function is differentiable throughout its domain, then it is continuous throughout its domain.

II. If a function is continuous throughout its domain, then it is differentiable throughout its domain.

Which of these statements is/are **FALSE**?

(1) Statement I only
(2) Statement II only
(3) Both Statement I and Statement II
(4) Neither Statement I nor Statement II

Q19. Let two conic sections have the following equations:

$$C_1 : \; x^2 + y^2 - 3\sqrt{2}\,x + 3\sqrt{2}\,y = 0,$$
$$C_2 : \; x^2 + 2xy + y^2 - 4\sqrt{2}\,x + 4\sqrt{2}\,y = 0.$$

How many (real) straight lines are tangent to both C_1 and C_2?

(1) 1 (2) 2 (3) 3 (4) 4

Q20. Let $f : \mathbb{R} \to \mathbb{R}$ be defined as (recall $\{x\} = x - [x]$)

$$f(x) = \begin{cases} \max\big(\{x\}, \{x^2\}, \{x^3\}\big), & \text{for } x \geq 0, \\ \min\big(\{x\}, \{x^2\}, \{x^3\}\big), & \text{for } x < 0. \end{cases}$$

Let $k = \displaystyle\int_{-1}^{1} f(x)\,dx$. Find the value of $\left[\dfrac{4k-1}{2}\right]$.

(1) -1 (2) 1 (3) 0 (4) 2

Part B

Q21. Consider all bijective functions $f : \{1,2,3,4\} \to \{1,2,3,4\}$ satisfying the following condition: for each $k \in \{1,2,3\}$, if $f(k)$ is odd, then $f(k+1)$ is even. The number of such functions is _____.

Q22. Eight beads, two each of four colours (R, G, B, Y), are strung on a circular necklace. Beads of the same colour are identical. Two arrangements are considered the same if one can be obtained from the other by rotating the necklace, but an arrangement and its mirror image are considered different (unless they are related by a rotation). The number of distinct arrangements in which no two beads of the same colour are adjacent (the last bead being adjacent to the first) is _____.

Q23. If

$$I = \lim_{R\to\infty} \int_0^R \frac{1}{\left(1 + x^{\sqrt{2}+1}\right)^{\sqrt{2}+1}}\, dx,$$

then the value of I^{-2} is _____.

Q24. The number of ordered triples (a, b, c) of positive integers satisfying

$$\operatorname{lcm}(a, b) = 1000, \qquad \operatorname{lcm}(b, c) = 2000, \qquad \operatorname{lcm}(c, a) = 2000$$

is _____.

Q25. Let r be the remainder when $7^{7^{7^7}}$ is divided by 1000 (the exponents are evaluated from the top: the number is 7 raised to the power $7^{(7^7)}$). Then r equals _____.