IMO 2025

Second Level

International Maths Olympiad

by **Maths Olympiad Foundation**

Time : 45 Mins | **Class-X** | **Maximum Marks : 50**

General Instructions:

1. **All questions are mandatory.** Read the questions carefully before selecting an answer.
2. The question paper contains **25 MCQ**, each carrying 2 **marks**.
3. No negative marking for unattempt questions; one mark will be deducted for each incorrect /overwriting or multiple answers. Illegible answers may not be evaluated.
4. Answers must be marked by writing the correct option **(A/B/C/D)** in the **Answer Sheet**.
5. **Use of calculators, smart watches, or any electronic devices is strictly prohibited.**
6. Rough work must be done **only in the A4 sheet provided by the invigilator**.
7. Ensure that your **Name, Roll Number, School Code, and other required details** are correctly filled in the Answer Sheet before submission.
8. The **final Answer Sheet along with the question paper must be submitted to the invigilator** before leaving the examination hall.
9. Any form of **unfair practice will lead to immediate disqualification**.

Q.1. Raha has invited a few friends to celebrate her birthday party. The first time the doorbell rings, one friend arrives. On every next door bell ring, a group of friends, enter, that has two more person that the group that entered on the previous ring. How many friends are present in the party if Raha answered the doorbell 8 times in total.

(a) 16 (b) 32 (c) 60 (d) 64

Q.2. Seema is x years old and her elder sister is y years old. Which of the following options given below will not be true?

(a) $x^3 = y^3$ (b) $y - x \neq 0$

(c) $y > x$ (d) $x - y < 0$

Q.3. A boy can run at the speed of p km/h to cover a distance of 1 km but due to slippery ground, his speed gets reduced by q km/h. (where $p > q$, $q \neq 0$). If he takes r hour to cover 1 km, then:

(a) $\frac{1}{r} = (p - q)$ (b) $\frac{1}{r} = (p + q)$

(c) $r = (p - q)$ (d) $r = p + q$

Q.4. **The value of tan 63° – tan 9° + tan 27° – tan 81° is:**

(a) –4 (b) 2

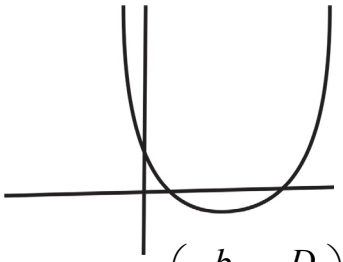
(c) –1 (d) None of these

Q.5. **If n is a natural number, then $9^{2n} = 4^{2n}$ is always divisible by:**

(a) 5 (b) 13

(c) Both 5 and 13 (d) None of these

Q.6. **If the diagram shows the graph of function $f(x) = ax^2 + bx + c$, then:**



$\left(\frac{-b}{2a}, \frac{-D}{2a}\right)$

(a) $a > 0$, $b < 0$ and $c > 0$ (b) $a < 0$, $b < 0$ and $c < 0$

(c) $a < 0$, $b > 0$ and $c > 0$ (d) $a < 0$, $b > 0$ and $c < 0$

Q.7. **If one of the zeros of quadratic polynomial $x^2 + ax + b$ is negative of the other, then it:**

(a) has no linear term and constant term is negative

(b) has no linear term and the constant term is positive

(c) can have a linear term but the constant term is negtative

(d) can have a linear term but the constant term is positive

Q.8. **If the equation $\left(a^2 + b^2\right)x^2 - 2b\left(a + c\right)x + \left(b^2 + c^2\right) = 0$ has equal roots, then:**

(a) $2b = a + c$ (b) $b^2 = ac$ (c) $b = \frac{2ac}{a + c}$ (d) $b = ac$

Q.9. **If $\frac{5 + 9 + 13 + \ldots \text{ upto } n \text{ terms}}{7 + 9 + 11 + \ldots \text{ to } (n+1) \text{ terms}} = \frac{17}{16}$, then $n =$ _____**

(a) 8 (b) 7 (c) 10 (d) 11

Q.10. **If the centroid of triangle formed by the points, (a, b), (b, c) and (c, a) is at the origin, then $a^3 + b^3 + c^3$ is:**

(a) abc (b) 0 (c) $a + b + c$ (d) $3\,abc$

Q.11. In a ΔABC, perpendicular AD from A on BC meets BC at D. If BD = 8 cm, DC = 2 cm and AD = 4cm, then:

(a) ΔABC is isoscles

(b) ΔABC is equilateral

(c) AC = 2AB

(d) ΔABC is right angled at A

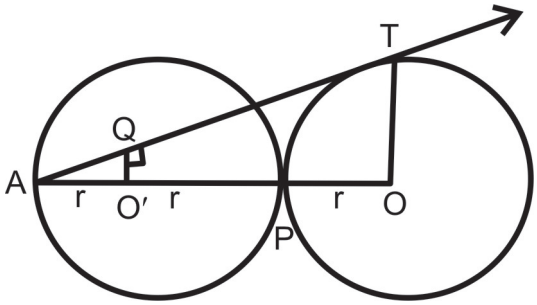
Q.12. Two circles of same radii *r* and centres O and O[1] touch each other at point *P* as shown in the figure. If OO′ is produced to meet the circle *c* (O′, *r*) at A and AT is a tangent to circle (O, *r*) such that $O'O \perp AT$. Then $AO : AO'$ is:

(a) $\frac{3}{2}$

(b) 2

(c) 3

(d) $\frac{1}{4}$



Q.13. If *a* Cos θ – *b* Sin θ = *c* then *a* Sin θ + *b* Cos θ = _____

(a) $\pm\sqrt{a^2+b^2+c^2}$

(b) $\pm\sqrt{a^2+b^2-c^2}$

(c) $\pm\sqrt{c^2-a^2-b^2}$

(d) None of these

Q.14. The angle of elevation of the top of a tower standing on a horizontal plane from a point A is α. After walking a distance '*d*' towards the foot of the tower the angle of elevation is found to be β. The height of the tower is:

(a) $\frac{d}{\cot\alpha+\cot\beta}$

(b) $\frac{d}{\cot\alpha-\cot\beta}$

(c) $\frac{d}{\tan\beta-\tan\alpha}$

(d) $\frac{d}{\tan\beta+\tan\alpha}$

Q.15. If the sum of the areas of two circles with radii 'r_1' and 'r_2' is equal to the area of a circle of radius *r* then:

(a) $r = r_1 + r_2$

(b) $r_1^2 + r_2^2 = r^2$

(c) $r_1 + r_2 < r$

(d) $r_1^2 + r_2^2 < r^2$

Q.16. If the circumference of a circle and the perimeter of a square are equal, then:

(a) Area of circle = Area of the square

(b) Area of the circle < Area of the the square

(c) Area of circle > Area of the the square

(d) Nothing definite can be said

Q.17. The maximum volume of a cone that can be carved out of a solid hemisphere of radius *r* is:

(a) $3\pi r^2$ (b) $\frac{\pi r^3}{3}$ (c) $\frac{\pi r^2}{3}$ (d) $3\pi r^3$

Q.18. If $\bar{X} = a + h\left(\frac{1}{N}\Sigma\, fi\, ui\right)$ then for finding the mean of a grouped frequency distribution *ui* = _____

(a) $\frac{x_i + a}{h}$ (b) $h\,(x_i - a)$

(c) $\frac{x_i - a}{h}$ (d) $\frac{a - x_i}{h}$

Q.19. A number *x* is chosen at random from the numbers –3, –2, –1, 0, 1, 2, 3; the probabililty that $|x| < 2$ is:

(a) $\frac{5}{7}$ (b) $\frac{2}{7}$ (c) $\frac{3}{7}$ (d) $\frac{1}{7}$

Q.20. Study the following statements and choose the correct option:

Statement I: It is possible to construct a triangle whose sides measure 7cm, 5 cm and 12 cm.

Statement II: It is possible to construct an angle of 22.5° using a ruler and compass.

(a) Statement I is true but Statement II is false

(b) Statement I is false but Statement II is true

(c) Both Statements I and II are false

(d) Both Statements I and II are true

Q.21. From an external point, two tangents are drawn to a circle. Which of the following statements is correct?

(I) Lengths of tangent are equal

(II) Angle between tangents is always 90°

(III) Tangents are perpendicular to the radius at the point of contact

(IV) Tangents intersect at centre

(a) I, II and III (b) II and III only

(c) I, III and V (d) I and III only

Q.22. Identify the incorrecty statements:

(I) Mean is affected by extreme values **(II) Median is affected by extreme values**

(III) Mode may not exist **(IV) Mean = Median = Mode always**

(a) II and IV only (b) I and II only

(c) I and III only (d) III and IV only

Q.23. **If $a + b = 7$ and $ab = 0$, which of the following are correct?**

(I) $a^2 + b^2 = 29$ **(II)** $a^3 + b^3 = 133$

(III) $(a - b)^2 = 9$ **(IV)** $a^2b + ab^2 = 70$

(a) I, II and III (b) II, III and IV

(c) I, III and IV (d) All the statements are incorrect

Q.24. **If 3 is the least prime factor of a and 7 is the least prime factor of b then the least prime factor of $(a + b)$ is:**

(a) 2 (b) 3 (c) 5 (d) 10

Q.25. **If ABC is an isosceles triangle and D is a point on BC such that AD $\perp$ BC, then:**

(a) $AB^2 - AD^2 = BD \cdot DC$ (b) $AB^2 - AD^2 = BD^2 - DC^2$

(c) $AB^2 + AD^2 = BD \cdot DC$ (d) $AB^2 + AD^2 = BD^2 - DC^2$