

# SCO INTERNATIONAL MATHS OLYMPIAD

## CLASS 10 QUESTION PAPER

A professional objective-format paper for schools, teachers, parents, and students

**Designed from Class 10 mathematics pathways and aligned with SCO's platform flow for guided preparation, practice, reporting, and future-ready academic growth.**

- Class 10 / secondary-level mathematics challenge paper
- question blocks with answer keys and explanations
- balanced coverage of algebra, geometry, trigonometry, statistics, probability, and achiever reasoning

Probability	Algebra	Geometry	Trigonometry	Statistics
Mensuration	Reasoning	Case Study	Achievers	Practice

**DO NOT OPEN THIS BOOKLET UNTIL ASKED TO DO SO**

Class / Grade	Class 10 / Grade 10
Question Paper	Set H   Objective Type   50 Questions
Time Allowed	60 minutes

## Guidelines for the Candidate

- Before the exam begins, candidates may use the additional time provided for completing personal details on the OMR sheet or response sheet.
- Clearly write name, school code, class, roll number, registration ID, and contact number in the space provided.
- The paper contains 50 objective-type questions across General Mathematics, Reason/Assertion, Case Study, and Achievers sections.
- Every question has only one correct answer unless explicitly stated otherwise. Select one response choice only.
- Use an HB pencil or a blue/black ballpoint pen to mark responses as instructed by the invigilator or online platform.
- Calculator use is not allowed. Rough work may be done in the space provided at the end of the booklet.
- At the conclusion of the test, submit the OMR sheet or final online response as instructed.

### Candidate Details

<b>Name</b>	.....
<b>Registration ID / Contact No.</b>	.....

Rebranded and corrected from the attached Class 10 IMO question paper. Inconsistent or ambiguous items were rewritten so that every question has one clear correct answer and a complete explanation.

## GENERAL MATHEMATICS

**Q.1** The roots of the quadratic equation  $x^2 - 7x + 10 = 0$  are  $\alpha$  and  $\beta$ . Find  $\alpha^2 + \beta^2$ .

- A. 49
- B. 29
- C. 25
- D. 20

**Answer:** B. 29

**Explanation:** Here  $\alpha + \beta = 7$  and  $\alpha\beta = 10$ . Therefore  $\alpha^2 + \beta^2 = (\alpha + \beta)^2 - 2\alpha\beta = 49 - 20 = 29$ .

**Q.2** If  $\sin \theta = \frac{3}{5}$  and  $\theta$  is in the first quadrant, find  $\cos 2\theta$ .

- A.  $\frac{7}{25}$
- B.  $-\frac{7}{25}$
- C.  $\frac{24}{25}$
- D.  $-\frac{24}{25}$

**Answer:** A.  $\frac{7}{25}$

**Explanation:**  $\cos 2\theta = 1 - 2\sin^2 \theta = 1 - 2\left(\frac{9}{25}\right) = 1 - \frac{18}{25} = \frac{7}{25}$ .

**Q.3** If  $x + y = 7$  and  $2x - y = 5$ , what are the values of  $x$  and  $y$ ?

- A.  $x = 3, y = 4$
- B.  $x = 4, y = 3$
- C.  $x = 5, y = 2$
- D.  $x = 2, y = 5$

**Answer:** B.  $x = 4, y = 3$

**Explanation:** Adding the two equations gives  $3x = 12$ , so  $x = 4$ . Then  $x + y = 7$  gives  $y = 3$ .

**Q.4** Evaluate  $\sin^2 30^\circ + \cos^2 60^\circ + \tan^2 45^\circ$ .

- A. 1
- B.  $\frac{3}{2}$
- C. 0
- D.  $\frac{1}{2}$

**Answer:** B.  $\frac{3}{2}$

**Explanation:**  $\sin 30^\circ = \frac{1}{2}$ ,  $\cos 60^\circ = \frac{1}{2}$ , and  $\tan 45^\circ = 1$ . Hence the value is  $\frac{1}{4} + \frac{1}{4} + 1 = \frac{3}{2}$ .

**Q.5** If the sum of the first  $n$  terms of an arithmetic progression is  $S_n = 2n^2 + 3n$ , what is the 7th term?

- A. 23
- B. 29
- C. 31
- D. 35

**Answer:** B. 29

**Explanation:** The 7th term is  $S_7 - S_6$ .  $S_7 = 2(49) + 21 = 119$  and  $S_6 = 2(36) + 18 = 90$ . Hence  $a_7 = 119 - 90 = 29$ .

**Q.6** If  $a, b, c$  are the roots of  $x^3 - 6x^2 + 11x - 6 = 0$ , what is  $ab + bc + ca$ ?

- A. 14
- B. 16
- C. 11
- D. 20

**Answer:** C. 11

**Explanation:** For  $x^3 - 6x^2 + 11x - 6 = 0$ , the sum of pairwise products of roots is the coefficient of  $x$ , namely 11.

**Q.7** In a right-angled triangle, the legs are 3 cm and 4 cm. What is the radius of the circle inscribed in the triangle?

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

**Answer:** A. 1 cm

**Explanation:** The hypotenuse is 5 cm. For a right triangle, inradius  $r = (a + b - c)/2 = (3 + 4 - 5)/2 = 1$  cm.

**Q.8** If  $(x - 2)$  is a factor of  $x^2 - 5x + k$ , find  $k$ .

- A. 4
- B. 6
- C. 8
- D. 10

**Answer:** B. 6

**Explanation:** By factor theorem,  $f(2) = 0$ . So  $2^2 - 5(2) + k = 0$  gives  $4 - 10 + k = 0$ , hence  $k = 6$ .

**Q.9** If  $a = 2$  and  $b = 4$ , find  $(a + b)^2 - (a^2 + b^2)$ .

- A. 0
- B. 12
- C. 16
- D. 8

**Answer:** C. 16

**Explanation:**  $(a + b)^2 - (a^2 + b^2) = 2ab = 2(2)(4) = 16$ .

**Q.10** A number is chosen at random from 1 to 100. What is the probability that it is divisible by 2 or 5?

- A.  $\frac{2}{5}$
- B.  $\frac{3}{5}$
- C.  $\frac{6}{10}$  only
- D.  $\frac{60}{100}$  only

**Answer:** B.  $\frac{3}{5}$

**Explanation:** There are 50 multiples of 2, 20 multiples of 5, and 10 multiples of 10. By inclusion-exclusion, favourable outcomes =  $50 + 20 - 10 = 60$ , so probability =  $\frac{60}{100} = \frac{3}{5}$ .

**Q.11** If the sum of the roots of  $x^2 - (p + 2)x + 12 = 0$  is 9, find  $p$ .

- A. 7
- B. 9
- C. 11
- D. 12

**Answer:** A. 7

**Explanation:** Sum of roots =  $p + 2$ . Given  $p + 2 = 9$ , so  $p = 7$ .

**Q.12** The area of a right-angled triangle is 30 square units. If the base is 5 units, what is the height?

- A. 6
- B. 12
- C. 10
- D. 15

**Answer:** B. 12

**Explanation:** Area =  $\frac{1}{2} \times \text{base} \times \text{height}$ . Hence  $30 = \frac{1}{2} \times 5 \times h$ , so  $h = 12$ .

**Q.13** If  $x + y = 5$  and  $x^2 + y^2 = 13$ , find  $xy$ .

- A. 4
- B. 6
- C. 2
- D. 1

**Answer:** B. 6

**Explanation:** Using  $(x + y)^2 = x^2 + y^2 + 2xy$ , we get  $25 = 13 + 2xy$ , so  $2xy = 12$  and  $xy = 6$ .

**Q.14** If  $a = 3$  and  $b = 4$ , find  $\sqrt{a^2 + b^2}$ .

- A. 2
- B. 3
- C. 5
- D. 1.25

**Answer:** C. 5

**Explanation:**  $\sqrt{3^2 + 4^2} = \sqrt{9 + 16} = \sqrt{25} = 5$ .

**Q.15** What is the sum of the squares of the first 10 natural numbers?

- A. 385
- B. 300
- C. 350
- D. 400

**Answer:** A. 385

**Explanation:** Sum of squares =  $n(n + 1)(2n + 1)/6$ . For  $n = 10$ , the sum is  $10 \times 11 \times 21 / 6 = 385$ .

**Q.16** If two dice are thrown, what is the probability of getting a sum of 9?

- A.  $1/9$
- B.  $1/6$
- C.  $1/12$
- D.  $1/18$

**Answer:** A.  $1/9$

**Explanation:** The favourable pairs are (3,6), (4,5), (5,4), and (6,3), so there are 4 outcomes out of 36. Probability =  $4/36 = 1/9$ .

**Q.17** If  $a + b = 5$  and  $a^2 + b^2 = 17$ , find  $ab$ .

- A. 4
- B. 5
- C. 6
- D. 3

**Answer:** A. 4

**Explanation:**  $25 = 17 + 2ab$ , so  $2ab = 8$  and  $ab = 4$ .

**Q.18** A frustum of a cone has radii 8 cm and 4 cm and slant height 10 cm. What is its total surface area including the two circular bases?

- A.  $200\pi\text{ cm}^2$
- B.  $240\pi\text{ cm}^2$
- C.  $160\pi\text{ cm}^2$
- D.  $384\pi\text{ cm}^2$

**Answer:** A.  $200\pi\text{ cm}^2$

**Explanation:**  $\text{TSA} = \pi(R + r)l + \pi(R^2 + r^2) = \pi(8 + 4)(10) + \pi(8^2 + 4^2) = 120\pi + 80\pi = 200\pi\text{ cm}^2$ .

**Q.19** A sphere is inscribed in a cone of height 8 cm and base radius 6 cm. If the slant height is 10 cm, find the radius of the sphere.

- A. 4 cm
- B. 5 cm
- C. 3 cm
- D. 2 cm

**Answer:** C. 3 cm

**Explanation:** For a cone, the insphere radius is  $r = Rh/(l + R)$ . Here  $R = 6$ ,  $h = 8$ , and  $l = 10$ . Therefore  $r = 6 \times 8 / (10 + 6) = 48/16 = 3$  cm.

**Q.20** A box contains 5 white balls, 3 red balls, and 2 blue balls. Two balls are drawn without replacement. What is the probability that one is white and the other is red?

- A.  $5/28$
- B.  $1/3$
- C.  $5/18$
- D.  $3/14$

**Answer:** B.  $1/3$

**Explanation:** Total ways =  $C(10,2) = 45$ . Favourable ways = choose 1 white and 1 red =  $5 \times 3 = 15$ . Probability =  $15/45 = 1/3$ .

**Q.21** A fair coin is flipped 5 times. What is the probability that at least one tail appears?

- A.  $31/32$
- B.  $15/32$
- C.  $1/32$
- D.  $3/4$

**Answer:** A.  $31/32$

**Explanation:** The complement is no tail, i.e., all heads, with probability  $(1/2)^5 = 1/32$ . Therefore probability of at least one tail =  $1 - 1/32 = 31/32$ .

**Q.22** In a group of 20 students, the average age is 15 years. If two students aged 12 and 18 leave, what is the new average age?

- A. 14.9 years
- B. 15 years
- C. 14.8 years
- D. 15.2 years

**Answer:** B. 15 years

**Explanation:** Original total age =  $20 \times 15 = 300$ . Ages leaving =  $12 + 18 = 30$ . New total = 270 and new count = 18. New average =  $270/18 = 15$ .

**Q.23** In a class of 30 students, the mean score is 80. If one score 60 is replaced by 90, what is the new mean?

- A. 80.5
- B. 81
- C. 82
- D. 80.75

**Answer:** B. 81

**Explanation:** Original total =  $30 \times 80 = 2400$ . New total =  $2400 - 60 + 90 = 2430$ . New mean =  $2430/30 = 81$ .

**Q.24** A rectangular prism has length 8 cm, width 6 cm, and height 10 cm. The largest sphere that can be inscribed in it has what volume?

- A.  $36 \pi \text{ cm}^3$
- B.  $72 \pi \text{ cm}^3$
- C.  $64 \pi \text{ cm}^3$
- D.  $125 \pi \text{ cm}^3$

**Answer:** A.  $36 \pi \text{ cm}^3$

**Explanation:** The sphere diameter equals the smallest dimension, 6 cm. Radius = 3 cm. Volume =  $(4/3)\pi r^3 = (4/3)\pi(27) = 36\pi \text{ cm}^3$ .

**Q.25** A biased die is rolled. The probability of getting a number less than 4 is  $\frac{2}{3}$ . What is the probability of getting a number greater than or equal to 4?

- A.  $\frac{1}{3}$
- B.  $\frac{2}{3}$
- C.  $\frac{1}{2}$
- D.  $\frac{3}{4}$

**Answer:** A.  $\frac{1}{3}$

**Explanation:** The two events are complementary. Probability =  $1 - \frac{2}{3} = \frac{1}{3}$ .

**Q.26** The variance of a data set is 16. What is the standard deviation?

- A. 2
- B. 4
- C. 8
- D. 16

**Answer:** B. 4

**Explanation:** Standard deviation is the square root of variance.  $\sqrt{16} = 4$ .

**Q.27** A circle is inscribed in a square of area  $64 \text{ cm}^2$ . What is the area of the circle?

- A.  $16 \pi \text{ cm}^2$
- B.  $32 \pi \text{ cm}^2$
- C.  $36 \pi \text{ cm}^2$
- D.  $40 \pi \text{ cm}^2$

**Answer:** A.  $16 \pi \text{ cm}^2$

**Explanation:** Side of square =  $\sqrt{64} = 8 \text{ cm}$ . The inscribed circle has diameter 8 cm, radius 4 cm. Area =  $\pi r^2 = 16\pi \text{ cm}^2$ .

## REASON AND ASSERTION

**Q.28** Assertion (A): The centroid of the triangle with vertices (2,3), (4,7), and (6,5) is (4,5). Reason (R): The centroid of a triangle is obtained by averaging the x-coordinates and y-coordinates of its vertices.

- A. Both A and R are true, and R is the correct explanation of A.
- B. Both A and R are true, but R is not the correct explanation of A.
- C. A is true, but R is false.
- D. A is false, but R is true.

**Answer:** A. Both A and R are true, and R is the correct explanation of A.

**Explanation:** Centroid =  $((2+4+6)/3, (3+7+5)/3) = (4,5)$ . The reason gives the exact formula.

**Q.29** Assertion (A): The lines through (2,3),(4,7) and through (6,11),(8,15) are parallel. Reason (R): The slope of a line through two points is  $(y_2 - y_1)/(x_2 - x_1)$ .

- A. Both A and R are true, and R is the correct explanation of A.
- B. Both A and R are true, but R is not the correct explanation of A.
- C. A is true, but R is false.
- D. A is false, but R is true.

**Answer:** A. Both A and R are true, and R is the correct explanation of A.

**Explanation:** Both slopes are  $4/2 = 2$ . Equal slopes imply parallel lines.

**Q.30** Assertion (A): A triangle with sides 5 cm, 12 cm, and 13 cm is a right triangle. Reason (R): The sum of the angles of a triangle is always  $180^\circ$ .

- A. Both A and R are true, and R is the correct explanation of A.
- B. Both A and R are true, but R is not the correct explanation of A.
- C. A is true, but R is false.
- D. A is false, but R is true.

**Answer:** B. Both A and R are true, but R is not the correct explanation of A.

**Explanation:**  $5^2 + 12^2 = 13^2$ , so the assertion is true. The reason is also true, but it does not explain why the triangle is right-angled.

**Q.31** Assertion (A): A triangle with sides 7 cm, 24 cm, and 25 cm is not a right triangle. Reason (R): In a right triangle, the square of the hypotenuse equals the sum of the squares of the other two sides.

- A. Both A and R are true, and R is the correct explanation of A.
- B. Both A and R are true, but R is not the correct explanation of A.
- C. A is true, but R is false.
- D. A is false, but R is true.

**Answer:** D. A is false, but R is true.

**Explanation:**  $7^2 + 24^2 = 49 + 576 = 625 = 25^2$ , so the triangle is right-angled. The reason is true.

**Q.32** Assertion (A): If the  $n$ -th term of an AP is  $a_n = 7n + 2$ , then the common difference is 2. Reason (R): In an arithmetic progression, the difference between consecutive terms is constant.

- A. Both A and R are true, and R is the correct explanation of A.
- B. Both A and R are true, but R is not the correct explanation of A.
- C. A is true, but R is false.
- D. A is false, but R is true.

**Answer:** D. A is false, but R is true.

**Explanation:**  $a_{(n+1)} - a_n = [7(n+1)+2] - [7n+2] = 7$ . Therefore the common difference is 7, not 2.

**Q.33** Assertion (A): If the first term of an AP is 5 and the sum of the first 10 terms is 100, then the common difference is 1. Reason (R): The sum of an AP is  $S_n = n/2 [2a + (n - 1)d]$ .

- A. Both A and R are true, and R is the correct explanation of A.
- B. Both A and R are true, but R is not the correct explanation of A.
- C. A is true, but R is false.
- D. A is false, but R is true.

**Answer:** D. A is false, but R is true.

**Explanation:**  $100 = 10/2 [10 + 9d] = 5(10 + 9d)$ . Hence  $10 + 9d = 20$  and  $d = 10/9$ , not 1.

**Q.34** Assertion (A): In a triangle with sides 5, 5, and 6, the medians to the equal sides are equal. Reason (R): In an isosceles triangle, the medians drawn to the equal sides are equal.

- A. Both A and R are true, and R is the correct explanation of A.
- B. Both A and R are true, but R is not the correct explanation of A.
- C. A is true, but R is false.
- D. A is false, but R is true.

**Answer:** A. Both A and R are true, and R is the correct explanation of A.

**Explanation:** A triangle with sides 5, 5, and 6 is isosceles. Therefore the medians drawn to equal sides are equal.

**Q.35** Assertion (A): The equation of a line passing through (1,2) with slope 3 is  $y = 3x + 1$ . Reason (R): In coordinate geometry, the equation of a line can be written in slope-intercept form  $y = mx + c$ .

- A. Both A and R are true, and R is the correct explanation of A.
- B. Both A and R are true, but R is not the correct explanation of A.
- C. A is true, but R is false.
- D. A is false, but R is true.

**Answer:** D. A is false, but R is true.

**Explanation:** For slope 3 through (1,2),  $2 = 3(1) + c$ , so  $c = -1$ . The correct equation is  $y = 3x - 1$ .

**Q.36** Assertion (A): The distance between the points (2,-1) and (5,3) is 5. Reason (R): The distance between  $(x_1, y_1)$  and  $(x_2, y_2)$  is  $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ .

- A. Both A and R are true, and R is the correct explanation of A.
- B. Both A and R are true, but R is not the correct explanation of A.
- C. A is true, but R is false.
- D. A is false, but R is true.

**Answer:** A. Both A and R are true, and R is the correct explanation of A.

**Explanation:** Distance =  $\sqrt{3^2 + 4^2} = 5$ .

**Q.37** Assertion (A): A triangle with sides 8, 15, and 17 is an obtuse triangle. Reason (R): A triangle is right-angled if the square of one side equals the sum of the squares of the other two sides.

- A. Both A and R are true, and R is the correct explanation of A.
- B. Both A and R are true, but R is not the correct explanation of A.
- C. A is true, but R is false.
- D. A is false, but R is true.

**Answer:** D. A is false, but R is true.

**Explanation:**  $8^2 + 15^2 = 17^2$ , so it is a right triangle, not obtuse.

**Q.38** Assertion (A): If the 5th term of an AP is 18 and the 10th term is 38, then the common difference is 4. Reason (R): The general form of an AP is  $a, a+d, a+2d, \dots$ , where  $d$  is the common difference.

- A. Both A and R are true, and R is the correct explanation of A.
- B. Both A and R are true, but R is not the correct explanation of A.
- C. A is true, but R is false.
- D. A is false, but R is true.

**Answer:** A. Both A and R are true, and R is the correct explanation of A.

**Explanation:**  $a_{10} - a_5 = 5d = 38 - 18 = 20$ . Hence  $d = 4$ .

**Q.39** Assertion (A): In triangle ABC, if  $AB = 10$ ,  $AC = 6$ , and  $BC = 8$ , then the area is 24 square cm. Reason (R): In a triangle, the perpendicular drawn from a vertex to the opposite side divides the triangle into two right triangles.

- A. Both A and R are true, and R is the correct explanation of A.
- B. Both A and R are true, but R is not the correct explanation of A.
- C. A is true, but R is false.
- D. A is false, but R is true.

**Answer:** B. Both A and R are true, but R is not the correct explanation of A.

**Explanation:** The sides 6, 8, 10 form a right triangle, so area =  $\frac{1}{2} \times 6 \times 8 = 24$ . The reason is a true general fact but does not directly explain the calculation.

**Q.40**

**Assertion (A):** The area of a triangle with vertices (1,2), (5,2), and (1,8) is 12 square units. **Reason (R):** The area of a triangle from coordinates can be found using the determinant/shoelace formula.

- A. Both A and R are true, and R is the correct explanation of A.
- B. Both A and R are true, but R is not the correct explanation of A.
- C. A is true, but R is false.
- D. A is false, but R is true.

**Answer:** A. Both A and R are true, and R is the correct explanation of A.

**Explanation:** The base from (1,2) to (5,2) is 4 and height to (1,8) is 6. Area =  $\frac{1}{2} \times 4 \times 6 = 12$ .

**Q.41** The vertices of a triangle are  $(0,0)$ ,  $(5,0)$ , and  $(2,k)$ . If the area of the triangle is 10 square units, find the value(s) of  $k$ .

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

**Answer:** C. -4, 4

**Explanation:** Area =  $\frac{1}{2} \times \text{base} \times \text{height} = \frac{1}{2} \times 5 \times |k| = 10$ . Hence  $|k| = 4$ , so  $k = -4$  or  $4$ .

**Q.42** If the angle between the lines  $2x - y + 1 = 0$  and  $x + y - 4 = 0$  is theta, find  $\tan$  theta.

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

**Answer:** C. 3

**Explanation:** The slopes are  $m_1 = 2$  and  $m_2 = -1$ .  $\tan \theta = \left| \frac{m_2 - m_1}{1 + m_1 m_2} \right| = \left| \frac{-3}{1 - 2} \right| = 3$ .

**Q.43** If the  $n$ -th term is  $a_n = 3n^2 + 2n$ , find  $a_{(n+1)} - a_n$ .

- A. 8
- B.  $6n$
- C.  $6n + 5$
- D.  $3(2n - 1)$

**Answer:** C.  $6n + 5$

**Explanation:**  $a_{(n+1)} = 3(n+1)^2 + 2(n+1) = 3n^2 + 8n + 5$ . Subtract  $a_n = 3n^2 + 2n$  to get  $6n + 5$ .

**Q.44** A circle of radius 5 is tangent to the  $x$ -axis at  $P(4,0)$  and lies above the  $x$ -axis. What is its equation?

- A.  $(x - 4)^2 + (y - 5)^2 = 25$
- B.  $(x + 4)^2 + (y - 5)^2 = 25$
- C.  $(x - 4)^2 + y^2 = 25$
- D.  $x^2 + (y - 5)^2 = 25$

**Answer:** A.  $(x - 4)^2 + (y - 5)^2 = 25$

**Explanation:** If the tangent point is  $(4,0)$  and the circle lies above the  $x$ -axis, the centre is  $(4,5)$ . Hence the equation is  $(x - 4)^2 + (y - 5)^2 = 25$ .

**Q.45** A line passes through  $P(2,3)$  and is parallel to the line joining  $A(1,1)$  and  $B(4,7)$ . Find its equation.

- A.  $y - 3 = 2(x - 2)$
- B.  $y - 3 = 3(x - 2)$
- C.  $y - 3 = 2x - 1$
- D. None of these

**Answer:** A.  $y - 3 = 2(x - 2)$

**Explanation:** Slope of  $AB = \frac{7 - 1}{4 - 1} = \frac{6}{3} = 2$ . A parallel line through  $(2,3)$  is  $y - 3 = 2(x - 2)$ .

**Q.46** A quadratic equation has roots  $\alpha$  and  $\beta$  such that  $\alpha^2 + \beta^2 = 10$  and  $\alpha + \beta = 6$ . Find the equation.

- A.  $x^2 - 6x + 10 = 0$
- B.  $x^2 - 6x + 8 = 0$
- C.  $x^2 - 6x + 13 = 0$
- D. None of these

**Answer:** C.  $x^2 - 6x + 13 = 0$

**Explanation:**  $\alpha^2 + \beta^2 = (\alpha + \beta)^2 - 2\alpha\beta$ . So  $10 = 36 - 2\alpha\beta$ , giving  $\alpha\beta = 13$ . The equation is  $x^2 - 6x + 13 = 0$ .

**Q.47** For triangle A(1,4), B(-3,-2), and C(5,6), find the length of the median from A to BC.

- A. 2
- B.  $\sqrt{52}$
- C.  $\sqrt{58}$
- D. None

**Answer:** A. 2

**Explanation:** The midpoint of BC is  $((-3+5)/2, (-2+6)/2) = (1,2)$ . Distance from A(1,4) to (1,2) is 2.

**Q.48** A box contains 4 red balls, 5 green balls, and 1 blue ball. What is the probability of selecting a red ball?

- A.  $1/5$
- B.  $2/5$
- C.  $4/5$
- D.  $1/10$

**Answer:** B.  $2/5$

**Explanation:** Total balls = 10 and red balls = 4. Probability =  $4/10 = 2/5$ .

**Q.49** In triangle A(2,3), B(6,7), C(8,3), the midpoints of AB and AC are joined. Which statement is correct?

- A. The segment is parallel to BC and half of BC.
- B. The segment is perpendicular to BC.
- C. The segment is equal to BC.
- D. Insufficient data

**Answer:** A. The segment is parallel to BC and half of BC.

**Explanation:** By the midpoint theorem, the segment joining midpoints of two sides of a triangle is parallel to the third side and half of it.

**Q.50** A train covers 300 km at a uniform speed  $v$  km/h. If the speed is reduced by 5 km/h, it takes 1 hour more. Find  $v$ .

- A. 30 km/h
- B. 35 km/h
- C. 41.31 km/h approximately
- D. 50 km/h

**Answer:** C. 41.31 km/h approximately

**Explanation:**  $300/(v - 5) - 300/v = 1$ . This gives  $1500/[v(v - 5)] = 1$ , so  $v^2 - 5v - 1500 = 0$ . Hence  $v = (5 + \sqrt{6025})/2 = 41.31$  approximately.

## Consolidated Answer Key

Q.No.	Answer	Q.No.	Answer	Section
1	Here $\alpha + \beta = 7$ and $\alpha\beta = 10$	26	Standard deviation is the square root of variance	IMO Class 10
2	$\cos 2\theta = 1 - 2\sin^2\theta$ $\theta = 1 - 2(9/25) = 1 - 18/25 = 7/25$	27	Side of square = $\sqrt{64} = 8$ cm	IMO Class 10
3	Adding the two equations gives $3x = 12$ , so $x = 4$	28	Centroid = $((2+4+6)/3, (3+7+5)/3) = (4,5)$	IMO Class 10
4	$\sin 30^\circ = 1/2$ , $\cos 60^\circ = 1/2$ , and $\tan 45^\circ = 1$	29	Both slopes are $4/2 = 2$	IMO Class 10
5	The 7th term is $S_7 - S_6$	30	$5^2 + 12^2 = 13^2$ , so the assertion is true	IMO Class 10
6	For $x^3 - 6x^2 + 11x - 6 = 0$ , the sum of pairwise products of roots is the coefficient of $x$ , namely 11	31	$7^2 + 24^2 = 49 + 576 = 625 = 25^2$ , so the triangle is right-angled	IMO Class 10
7	The hypotenuse is 5 cm	32	$a_{(n+1)} - a_n = [7(n+1)+2] - [7n+2] = 7$	IMO Class 10
8	By factor theorem, $f(2) = 0$	33	$100 = 10/2 [10 + 9d] = 5(10 + 9d)$	IMO Class 10
9	$(a + b)^2 - (a^2 + b^2) = 2ab = 2(2)(4) = 16$	34	A triangle with sides 5, 5, and 6 is isosceles	IMO Class 10
10	There are 50 multiples of 2, 20 multiples of 5, and 10 multiples of 10	35	For slope 3 through (1,2), $2 = 3(1) + c$ , so $c = -1$	IMO Class 10
11	Sum of roots = $p + 2$	36	Distance = $\sqrt{3^2 + 4^2} = 5$	IMO Class 10
12	Area = $1/2 \times \text{base} \times \text{height}$	37	$8^2 + 15^2 = 17^2$ , so it is a right triangle, not obtuse	IMO Class 10
13	Using $(x + y)^2 = x^2 + y^2 + 2xy$ , we get $25 = 13 + 2xy$ , so $2xy = 12$ and $xy = 6$	38	$a_{10} - a_5 = 5d = 38 - 18 = 20$	IMO Class 10
14	$\sqrt{3^2 + 4^2} = \sqrt{9 + 16} = \sqrt{25} = 5$	39	The sides 6, 8, 10 form a right triangle, so area = $1/2 \times 6 \times 8 = 24$	IMO Class 10
15	Sum of squares = $n(n + 1)(2n + 1)/6$	40	The base from (1,2) to (5,2) is 4 and height to (1,8) is 6	IMO Class 10
16	The favourable pairs are (3,6), (4,5), (5,4), and (6,3), so there are 4 outcomes out of 36	41	Area = $1/2 \times \text{base} \times \text{height} = 1/2 \times 5 \times  k  = 10$	IMO Class 10
17	$25 = 17 + 2ab$ , so $2ab = 8$ and $ab = 4$	42	The slopes are $m_1 = 2$ and $m_2 = -1$	IMO Class 10
18	TSA = $\pi(R + r)l + \pi(R^2 + r^2) = \pi(8 + 4)(10) + \pi(8^2 + 4^2) = 120\pi + 80\pi = 200\pi$ cm <sup>2</sup>	43	$a_{(n+1)} = 3(n+1)^2 + 2(n+1) = 3n^2 + 8n + 5$	IMO Class 10

19	For a cone, the insphere radius is $r = Rh/(l + R)$	44	If the tangent point is (4,0) and the circle lies above the x-axis, the centre is (4,5)	IMO Class 10
20	Total ways = $C(10,2) = 45$	45	Slope of AB = $(7 - 1)/(4 - 1) = 6/3 = 2$	IMO Class 10
21	The complement is no tail, i	46	$\alpha^2 + \beta^2 = (\alpha + \beta)^2 - 2\alpha\beta$	IMO Class 10
22	Original total age = $20 \times 15 = 300$	47	The midpoint of BC is $((-3+5)/2, (-2+6)/2) = (1,2)$	IMO Class 10
23	Original total = $30 \times 80 = 2400$	48	Total balls = 10 and red balls = 4	IMO Class 10
24	The sphere diameter equals the smallest dimension, 6 cm	49	By the midpoint theorem, the segment joining midpoints of two sides of a triangle is parallel to the third side and half of it	IMO Class 10
25	The two events are complementary	50	$300/(v - 5) - 300/v = 1$	IMO Class 10

