



# CREST Mathematics Olympiad (CMO)

Previous Year Paper (2023-24)

## Class 9 (Set - A)

**Time Allowed: 1 hour**

**Maximum Marks: 60**

- Additional **10 minutes** will be allotted to fill up information on the OMR Sheet, before the start of the exam.
- Fill in all the mandatory fields clearly on the OMR Sheet.
- There are a total of **50 questions** in this booklet comprising **2 sections** namely
- the **Practical Mathematics & Achievers' Section** consisting of **40 questions (1 marks each) & 10 questions (2 marks each)** respectively.
- There is no negative marking. The use of a calculator is not permitted.
- There is **only ONE correct option** to a given question.
- Use **HB Pencil / Ballpoint pen (Blue / Black) only** for marking the correct choice of answers on the OMR Sheet.
- Rough work is to be done in the space provided in the test booklet. Extra plain sheet may be provided by the school for the rough work.
- The OMR Sheet is to be handed over to the invigilator at the end of the exam.
- No candidate is allowed to carry any textual material, printed or written, bits of paper, any electronic device, digital watches, etc. inside the examination hall.
- The use of unfair means may result in the cancellation of the exam. Any such instances must be reported at **+91-98182-94134** or **info@crestolympiads.com**

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

**FILL IN THE DETAILS**

Candidate Name: \_\_\_\_\_

Class: \_\_\_\_\_ Section: \_\_\_\_\_

CREST ID: \_\_\_\_\_

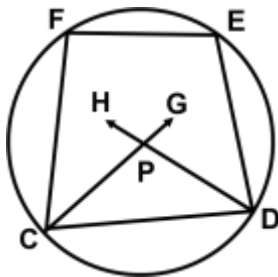
## Practical Mathematics (Each Question is 1 Mark)

- From a group of 3 men and 2 women, two people are selected at random. Find the probability that at least one woman is selected:
  - $\frac{1}{5}$
  - $\frac{7}{10}$
  - $\frac{2}{5}$
  - $\frac{5}{6}$
- Which of the following statements is not true?
  - Between two integers, there exists an infinite number of rational numbers
  - Between two rational numbers, there exists an infinite number of integers
  - Between two rational numbers, there exists an infinite number of rational numbers
  - Between two real numbers, there exists an infinite number of real numbers
- Axioms are assumed:
  - Universal truth in all branches of mathematics
  - Theorems
  - Definitions
  - Universal truths specific to geometry
- A, B and C are three sets of values of x:  
A: 2, 3, 7, 1, 3, 2, 3  
B: 7, 5, 9, 12, 5, 3, 8  
C: 4, 4, 11, 7, 2, 3, 4  
Which one of the following statements is correct?
  - Mean of A = Mode of C
  - Mean of C = Median of B
  - Median of B = Mode of A
  - Mean, Median and Mode of A are equal
- The sum of n terms of an AP is a n (n - 1). The sum of the squares of these terms is equal to:
  - $a^2n^2 (n - 1)^2$
  - $[a^2 n (n - 1) (2n - 1)]/6$
  - $[2a^2 n (n - 1) (2n - 1)]/3$
  - $[2a^2 n (n + 1) (2n + 1)]/3$
- If  $p = 3x^3 - 5x + 9$ ,  $Q = 4x^3 + 5x^2 - 11$  and  $R = 5x^3 + 4x^2 - 3x + 7$ , then find the value of  $(p - 2Q + R)$ :
  - $2(3x^2 + 4x - 19)$
  - $-6x^2 - 5x + 38$
  - $-2(3x^2 + 4x + 19)$
  - $-2(3x^2 + 4x - 19)$
- If the roots of the quadratic equation  $x^2 - 3x - 304 = 0$  are  $\alpha$  and  $\beta$ , then the quadratic equation with roots  $3\alpha$  and  $3\beta$  is:
  - $x^2 - 9x - 2736 = 0$
  - $x^2 + 9x - 2736 = 0$
  - $x^2 - 9x + 2736 = 0$
  - $x^2 + 9x + 2736 = 0$
- The dimensions of a cuboidal container are 12 cm x 10 cm x 8 cm. How many bottles of syrup can be poured into the container if each bottle contains 20  $\text{cm}^3$  of syrup?
  - 46
  - 54
  - 48
  - 58
- Seolina can complete a piece of work in 30 days. She worked for 6 days and left. Speggy completed the remaining work in 16 days. In how many days can the entire work be completed if they work together?
  - 8
  - 12
  - 16
  - 20

10. A, B and C can complete a piece of work in 25, 30 and 50 days, respectively. They started the work together but A and C left 2 days before the completion of the work. In how many days will the work be completed?

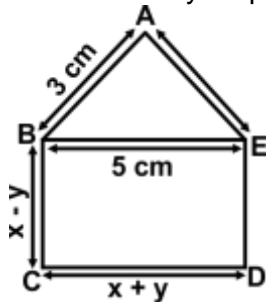
- a. 14                      b. 12  
c. 18                      d. 10

11. In the following, CDEF is a cyclic quadrilateral. CG and DH are the angle bisectors of  $\angle C$  and  $\angle D$  respectively. If  $\angle E = 100^\circ$  and  $\angle F = 110^\circ$ , then find  $\angle CPD$ :



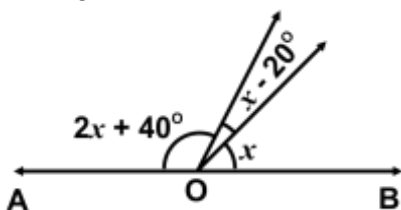
- a.  $105^\circ$                       b.  $80^\circ$   
c.  $150^\circ$                       d.  $90^\circ$

12. In the figure below ABCDE is a pentagon with  $BE \parallel CD$  and  $BC \parallel DE$ . BC is perpendicular to CD. If the perimeter of ABCDE is 21 cm, then find the values of x and y respectively:



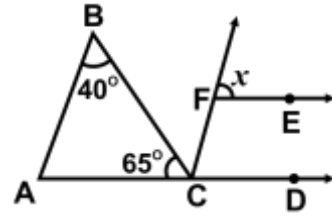
- a. 0, 5                      b. 5, 0  
c. 3, 2                      d. 2, 5

13. Look at the image given below. If AOB is a straight line, then the value of x is:



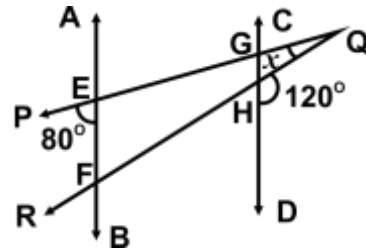
- a.  $60^\circ$                       b.  $30^\circ$   
c.  $90^\circ$                       d.  $40^\circ$

14. Look at the image given below. If  $AB \parallel CF$  and  $CD \parallel FE$ , then find the value of x:



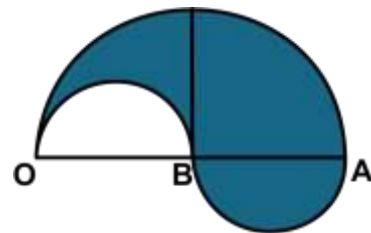
- a.  $105^\circ$                       b.  $60^\circ$   
c.  $40^\circ$                       d.  $75^\circ$

15. In the given figure,  $AB \parallel CD$ . PQ and QR intersect AB and CD both at E, F, and G, H respectively. Find the value of x:



- a.  $40^\circ$                       b.  $20^\circ$   
c.  $100^\circ$                       d.  $60^\circ$

16. In the given figure,  $OB = BA = 14$  cm and semicircles are drawn on OB, BA and OA as diameters. Then, the perimeter of the shaded area is:

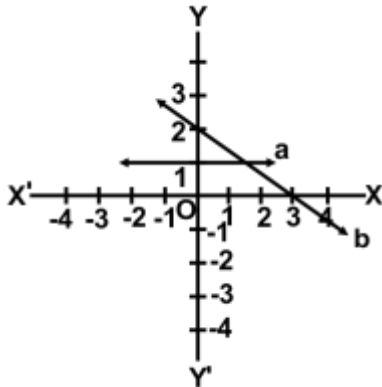


- a. 80 cm                      b. 176 cm  
c. 264 cm                      d. 352 cm

17. Which of the following options represents the ordinate of all points on the x-axis?

- a. 0                              b. 1  
c. 2                              d. -1

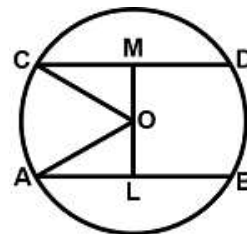
18. A student wrote the equations of the lines a and b drawn in the following graph as  $y = 1$  and  $2x + 3y = 6$  respectively. Write the coordinates of the point of intersection of lines a and b. Also, find the area enclosed between these lines and the Y-axis:



- a.  $(3, 1) \frac{3}{4}$  sq. unit  
 b.  $(\frac{3}{2}, 1), \frac{3}{4}$  sq. unit  
 c.  $(1, 3), \frac{3}{2}$  sq. units  
 d.  $(1, \frac{1}{3}), \frac{3}{2}$  sq. units
19. The line joining the centre of a circle to the midpoint of a chord (except diameters) is always:
- a. Parallel to the chord  
 b. Perpendicular to the chord  
 c. Equal to the chord  
 d. Tangent to the chord
20. A card is drawn from a well-shuffled pack of 52 cards. The probability that the card drawn is a red ace is:
- a.  $\frac{1}{13}$                       b.  $\frac{1}{26}$   
 c.  $\frac{3}{52}$                         d.  $\frac{1}{2}$
21. What least number must be subtracted from 1294 so that the remainder when divided by 9, 11, 13 will leave in each case the same remainder 6?
- a. 0                              b. 1  
 c. 2                              d. 3
22. If the areas of the three adjacent faces of a cuboidal box are  $120 \text{ cm}^2$ ,  $72$

$\text{cm}^2$  and  $60 \text{ cm}^2$  respectively, then the volume of the box is:

- a.  $720 \text{ cm}^3$                       b.  $864 \text{ cm}^3$   
 c.  $7200 \text{ cm}^3$                     d.  $5184 \text{ cm}^3$
23. The common quantity that must be added to each term of  $a^2 : b^2$  to make it equal to  $a : b$  is:
- a.  $ab$                               b.  $a + b$   
 c.  $a - b$                             d.  $a/b$
24. Duke is learning about the famous mathematician Euclid. According to Euclid's definition, the ends of a line are:
- a. Breathless                    b. Points  
 c. Lengthless                    d. Segments
25. A student walks from his house at  $2 \frac{1}{2} \text{ km/hr}$  and reaches his school late by 6 minutes. The next day, he increases his speed by  $1 \text{ km/hr}$  and reaches 6 minutes before school time. How far is the school from his house?
- a.  $\frac{5}{4} \text{ km}$                           b.  $\frac{7}{4} \text{ km}$   
 c.  $\frac{9}{4} \text{ km}$                           d.  $\frac{11}{4} \text{ km}$
26. AB and CD are two parallel chords on the opposite sides of the centre of the circle. If  $AB = 10 \text{ cm}$ ,  $CD = 24 \text{ cm}$  and the radius of the circle is  $13 \text{ cm}$ , the distance between the chords is:



- a.  $17 \text{ cm}$                           b.  $15 \text{ cm}$   
 c.  $16 \text{ cm}$                           d.  $18 \text{ cm}$
27. Dora, Samuel, and Nike were standing at the three ends. The points  $A(-3, 0)$ ,  $B(1, -3)$  and  $C(4, 1)$  are the vertices of:

- a. An equilateral triangle
- b. An isosceles right-angled triangle
- c. A scalene triangle
- d. Right-angled triangle

**28.** A boy has some candies. If he divides it between himself and his two siblings, there are two candies that would remain. But if he also included his parents, there would be no candies left. Given that the number of candies is a two-digit number, how many values can it assume?

- a. 5
- b. 6
- c. 7
- d. 9

**29.** Angelina wants to solve the following: If  $a^2 + b^2 + c^2 = 20$  and  $a + b + c = 0$ , find  $ab + bc + ca$ . Help her by choosing the correct option.

- a. -10
- b. 14
- c. 10
- d. -14

**30.** Dora drew a figure and concealed it in one hand. She challenged her friend Luke to figure out what she drew by providing the following clue: The figure obtained by joining the midpoints of adjacent sides of a rectangle 8 cm and 6 cm is:

- a. a rhombus of area  $24 \text{ cm}^2$
- b. a rectangle of area  $24 \text{ cm}^2$
- c. a trapezium of area  $24 \text{ cm}^2$
- d. a square of area  $25 \text{ cm}^2$

**31.** Goel and his friends are speaking about properties of triangles. Goel: Two equilateral triangles are congruent when their areas are proportional.

Albert: Two equilateral triangles are congruent when their sides are proportional.

Luke: Two equilateral triangles are congruent when their angles are proportional.

Mike: Two equilateral triangles are congruent when their sides are equal.

- a. Luke
- b. Mike
- c. Albert
- d. Goel

**32.** Max began constructing a triangle using the measurements provided. Two sides of a triangle are 5 cm and 1.5 cm long. The length of the triangle's third side cannot be:

- a. 3.6 cm
- b. 3.4 cm
- c. 4.2 cm
- d. 4.5 cm

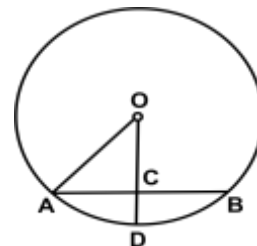
**33.** The area of triangle ABC is  $15 \text{ cm}^2$ . If  $\triangle ABC$  and a parallelogram ABPD are on the same base and between the same parallel lines then what is the area of parallelogram ABPD?

- a.  $20 \text{ cm}^2$
- b.  $27 \text{ cm}^2$
- c.  $30 \text{ cm}^2$
- d.  $15 \text{ cm}^2$

**34.** For Albertson, collecting coins is a hobby. He has amassed a collection of \$25 worth of nickels and dimes. There are three times as many nickels as dimes. How many nickel coins are there?

- a. 200
- b. 250
- c. 300
- d. 350

**35.** In the given figure, if  $OA = 5 \text{ cm}$ ,  $AB = 8 \text{ cm}$ , and OD is perpendicular to AB, then CD is equal to:



- a. 4 cm
- b. 3 cm
- c. 2 cm
- d. 1 cm

**36.** A ground is shaped as a trapezium that has parallel sides, 25 m and 10 m. The

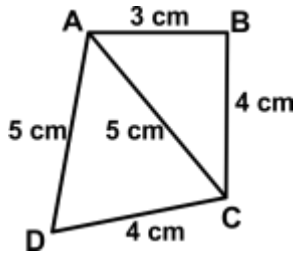
non-parallel sides are 14 m and 13 m. Determine the area of the field.

- a.  $169 \text{ m}^2$                       b.  $189 \text{ m}^2$   
c.  $196 \text{ m}^2$                       d.  $198 \text{ m}^2$

37. In his spare time, Tom created a triangular ludo board for his children to enjoy. A triangular board has 6 cm, 8 cm and 10 cm edges. The cost of painting it at a rate of 9 cents per  $\text{cm}^2$  is:

- a. \$2.00                              b. \$2.16  
c. \$2.22                              d. \$2.45

38. Mehek drew a quadrilateral with the sides being 3 cm, 4 cm, 4 cm, and 5 cm, with one of the diagonals being 5 cm, as seen in the image below. The resulting quadrilateral's area is:



39. A hemispherical balloon's radius rises from 6 cm to 12 cm as air is pumped into it. The ratio of the balloon's surface areas in the two cases is:

- a. 1:2                                  b. 1:3  
c. 1:4                                  d. 1:5

40. There were 1640 members who attended a famous magic show. A study of 640 people, it was found that 512 people liked the magic show very much. If a person is selected at random, the probability that the person liked the magic show is:

- a. 0.5                                  b. 0.6  
c. 0.7                                  d. 0.8

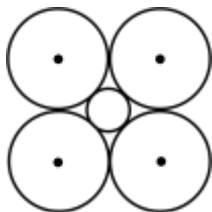
- a.  $15.17 \text{ cm}^2$                       b.  $19.17 \text{ cm}^2$   
c.  $20.17 \text{ cm}^2$                       d.  $22.17 \text{ cm}^2$

## Achievers' Section (Each Question is 2 Marks)

41. If the distance from the vertex to the centroid of an equilateral triangle is 6 cm, then what is the area of the triangle?

- a.  $24 \text{ cm}^2$                               b.  $27\sqrt{3} \text{ cm}^2$   
c.  $12 \text{ cm}^2$                               d.  $12\sqrt{3} \text{ cm}^2$

42. In the adjoining figure, if the radius of each of the four outer circles is  $r$ , then what is the radius of the inner circle?



- a.  $2r/(\sqrt{2} + 1)$                       b.  $r/\sqrt{2}$   
c.  $(\sqrt{2} - 1)r$                           d.  $\sqrt{2}r$

43. Sia and Ria measure the two angles of a quadrilateral to be  $36^\circ$  and  $72^\circ$ , respectively, and the other two angles are in the ratio 3:4, so find the measure of the other two angles.

- a.  $108^\circ, 144^\circ$                       b.  $118^\circ, 124^\circ$   
c.  $98^\circ, 84^\circ$                           d.  $88^\circ, 44^\circ$

44. If the radius of a cylinder is decreased by 50% and the height is increased by 50% to form a new cylinder, then the volume will be decreased by:

- a. 0%                                      b. 25%  
c. 62.5%                                  d. 75%

45. In a town, 35.4% of the people are not literate, 27% have education up to primary school, and 18.6% have education up to middle school. The people with education up to high school are twice the number of people with education up to pre-university. Of the remaining, 660 are graduates. If the population of the town is 15,000, then what is the number of people with education up to high school?
- a. 3120                      b. 1560  
c. 1460                      d. None of these
46. Nike has marked four points on his plot where a fence will be built, and he wants to know the shape of the plot. The points A(1, 2), B(5, 4), C(3, 8) and D(-1, 6) taken in order are the vertices of:
- a. A rectangle              b. A rhombus  
c. A square                      d. A kite
47. A man had certain number of cookies with him. At first, he wanted to divide it amongst his three children. When the division was done, one cookie remained. Just then, one of the cousins came. Now it was possible to divide the same number of cookies equally between the four children. What is the minimum number of cookies with the man?
- a. 13                              b. 17  
c. 16                              d. 15
48. Mr. Anderson left  $\frac{1}{3}$  of his property to his wife and  $\frac{3}{5}$  of the remainder to his daughter. He gave the rest to his son who received \$6,400. How much was his original property worth?
- a. \$16,000                      b. \$32,000  
c. \$24,000                      d. \$1,600
49. Andrea drew a  $\triangle ABC$  on the blackboard and asked her students, If the bisector of the angle A of a  $\triangle ABC$  is perpendicular to the base BC of the triangle, then the triangle ABC is :
- a. Acute angled              b. Scalene  
c. Isosceles                      d. Obtuse an
50. Louis is a farmer. A pile of wheat is in the shape of a cone with a 48-metre diameter and a 7-metre height. Find the area of the canvas needed if the heap needs to be covered to keep it dry in the rain.
- a. 1775.2 m<sup>2</sup>                      b. 1885.7 m<sup>2</sup>  
c. 1895.3 m<sup>2</sup>                      d. 1990.2 m<sup>2</sup>

## Answer Key

- |     |   |     |   |     |   |     |   |     |   |     |   |     |   |
|-----|---|-----|---|-----|---|-----|---|-----|---|-----|---|-----|---|
| 1.  | b | 2.  | b | 3.  | a | 4.  | d | 5.  | c | 6.  | d | 7.  | a |
| 8.  | c | 9.  | b | 10. | b | 11. | a | 12. | b | 13. | d | 14. | d |
| 15. | b | 16. | a | 17. | a | 18. | b | 19. | b | 20. | b | 21. | b |
| 22. | a | 23. | a | 24. | b | 25. | b | 26. | a | 27. | b | 28. | b |
| 29. | a | 30. | a | 31. | b | 32. | b | 33. | c | 34. | c | 35. | c |
| 36. | c | 37. | b | 38. | a | 39. | c | 40. | d | 41. | b | 42. | c |
| 43. | a | 44. | c | 45. | c | 46. | c | 47. | c | 48. | c | 49. | c |
| 50. | b |     |   |     |   |     |   |     |   |     |   |     |   |