



CREST Mathematics Olympiad (CMO)
Previous Year Paper (2021-22)

Class 9

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 **2 sections** in the question paper namely the **Practical Mathematics & Achievers' Section** consisting of **40 questions (1 mark 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 or Blue / Black ball point pen 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, etc. inside the examination hall.
- The use of unfair means may result in the cancellation of the exam. Any such instances may be reported at **+91-98182-94134** or **info@crestolympiads.com**

DO NOT OPEN THIS BOOKLET UNTIL ASKED TO DO SO

FILL IN THE DETAILS

Student Name: _____

Class: _____ Section: _____

Enrollment No: _____

Practical Mathematics (Each Question is 1 Mark)

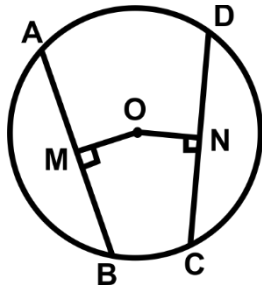
1. If the roots of the equation $(c^2 - ab)x^2 - 2(a^2 - bc)x + (b^2 - ac) = 0$ for $a \neq 0$ are real and equal, then the value of $a^3 + b^3 + c^3$ is:
- a. abc b. $3abc$
c. 0 d. 1
2. If the equation $(a^2 + b^2)x^2 - 2(ac + bd)x + (c^2 + d^2) = 0$ has equal roots, then which one of the following is correct?
- a. $ab = cd$ b. $ad = bc$
c. $a^2 + c^2 = b^2 + d^2$ d. $ac = bd$
3. If $a = 2 + \sqrt{3}$ and $b = 2 - \sqrt{3}$, then find the value of $(\frac{1}{a^2} - \frac{1}{b^2})$:
- a. 14 b. -14
c. $8\sqrt{3}$ d. $-8\sqrt{3}$
4. If angles with measure x and y form a complementary pair, then angles with which of the following measures will form a supplementary pair?
- a. $(x + 47^\circ), (y + 43^\circ)$
b. $(x - 23^\circ), (y + 23^\circ)$
c. $(x - 43^\circ), (y - 47^\circ)$
d. $(x + 43^\circ), (y + 47^\circ)$
5. If the length of a rectangular field is increased by 20% and the breadth is reduced by 20% the area of the rectangle will be 192 m^2 . What is the area of the original rectangle?
- a. 184 m^2 b. 196 m^2
c. 204 m^2 d. 200 m^2
6. Three cubes with sides in the ratio $3 : 4 : 5$ are melted to form a single cube whose diagonal is $12\sqrt{3}$ cm. The sides of the cubes are:
- a. $3 \text{ cm}, 4 \text{ cm}, 5 \text{ cm}$
b. $6 \text{ cm}, 8 \text{ cm}, 10 \text{ cm}$
c. $9 \text{ cm}, 12 \text{ cm}, 15 \text{ cm}$
d. $12 \text{ cm}, 16 \text{ cm}, 20 \text{ cm}$
7. A company planned an outdoor location trip in which arrangements for food were made for 60 people for 20 days. After 5 days, 15 more men joined. For how many more days will the food last?
- a. 15 days b. 12 days
c. 17 days d. 20 days
8. A towel, when bleached, was found to have lost 20% of its length and 10% of its breadth. The percentage of decrease in its area is:
- a. 10% b. 20%
c. 10.08% d. 28%
9. The polynomial $x^3 - 4x^2 + x - 4$ on factorisation gives:
- a. $(x - 4)(x - 1)(x + 1)$
b. $(x - 4)(x^2 + 4)$
c. $(x + 4)(x + 1)(x - 1)$
d. $(x - 4)(x^2 + 1)$
10. If the endpoints of the diameter of a circle are $(-2, 3)$ and $(6, -3)$, then the area of the circle (in square units) is:
- a. $\frac{550}{3}$ b. $\frac{540}{7}$
c. $\frac{560}{7}$ d. $\frac{550}{7}$
11. In all the three sections of Woodland High School, there are 50, 70 and 80 students. Those who secured F grade are 10%, 20%, and 30%, respectively. What percentage of the total students in the school secured F grade?

- a. 12.5% b. 15.6%
c. 21.5% d. 23.4%

12. A and B can complete a piece of work in 4 days and 8 days, respectively. They work on alternate days and A starts the work. In how many days will the work be completed?

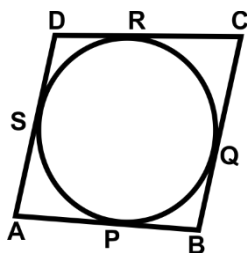
- a. 3 b. 4
c. 5 d. 6

13. In the given figure, O is the centre of the circle. AB and CD are its two chords. If $OM \perp AB$, $ON \perp CD$ and $OM = ON$, then which of the following is correct?



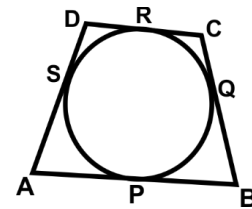
- a. $AB \neq CD$ b. $AB < CD$
c. $AB > CD$ d. $AB = CD$

14. In the given figure, a circle touches all the four sides of quadrilateral ABCD with $AB = 6$ cm, $BC = 7$ cm and $CD = 4$ cm. The length AD is:



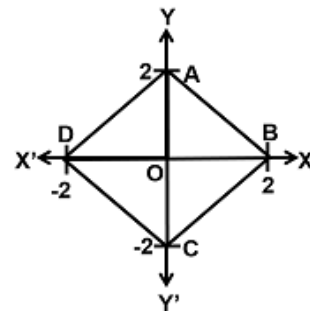
- a. 3 cm b. 4 cm
c. 5 cm d. 6 cm

15. In the given figure quadrilateral ABCD is circumscribed touching the circle at P, Q, R and S. If $AP = 6$ cm, $BP = 5$ cm, $CQ = 3$ cm and $DR = 4$ cm, then perimeter of quadrilateral ABCD is:



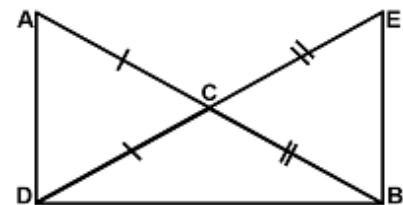
- a. 18 cm b. 27 cm
c. 36 cm d. 22 cm

16. Which of the following triangles is formed by straight lines $x + y = 2$, $x - y = 2$ and y -axis?



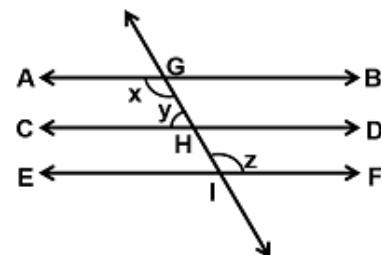
- a. $\triangle AOB$ b. $\triangle ABC$
c. $\triangle ADC$ d. $\triangle ADO$

17. In the given figure, $AC = DC$ and $CB = CE$. Using Euclid's axiom, which of the following options is correct?



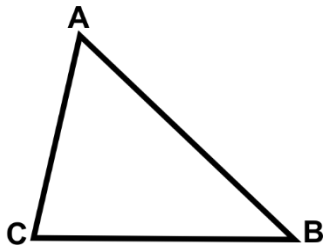
- a. $AB = 2DE$ b. $AB = DE$
c. $AD = BE$ d. $AB = AC$

18. In the figure given below, if $AB \parallel CD$, $CD \parallel EF$ and $y : z = 4 : 5$, then find the value of $\angle x$:



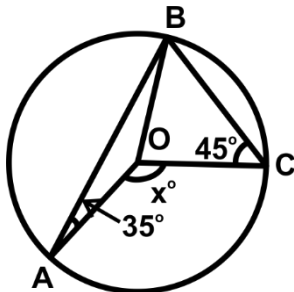
- a. 100° b. 76°
c. 82° d. 122°

19. Look at the image given below. In $\triangle ABC$, AB is the greatest side. Which of the following is correct?



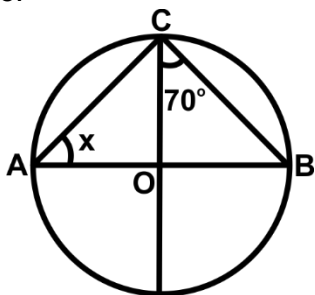
- a. $\angle C > 60^\circ$ b. $\angle B > 60^\circ$
 c. $\angle A > 60^\circ$ d. $\angle C < 60^\circ$

20. In the given figure, O is the centre of the circle. If $\angle BAO = 35^\circ$ and $\angle BCO = 45^\circ$, then the value of x will be:



- a. 160° b. 170°
 c. 80° d. 140°

21. If in the figure given below 'O' is the centre of the circle, then the value of x will be:



- a. 90° b. 50°
 c. 20° d. 40°

22. The smallest rational number by which $\frac{1}{3}$ should be multiplied so that its decimal expansion terminates after one place of decimal, is:

- a. $\frac{3}{100}$ b. $\frac{3}{10}$
 c. 3 d. 30

23. If $a = \frac{\sqrt{2} + 1}{\sqrt{2} - 1}$ and $b = \frac{\sqrt{2} - 1}{\sqrt{2} + 1}$, then value of $a^2 + ab + b^2$ is:

- a. 70 b. 35
 c. 40 d. 34

24. The difference between the two numbers is 1365. On dividing the larger number by smaller, we get 6 as quotient and 15 as the remainder. The smaller number is:

- a. 240 b. 270
 c. 295 d. 360

25. Which of the following statements is true?

- a. The point P (6, 0) lie in the quadrant I.
 b. The perpendicular distance of the point A (5, 4) from x-axis is 5 units.
 c. The mirror image of the points A (4, 5) in the x-axis is A' (-4, 5).
 d. The mirror image of point A (4, 5) in the y-axis is A' (-4, 5).

26. Which of the following options is correct?

Euclid's axiom 5 is:

- a. Things which coincide with one another are equal
 b. If equals are subtracted from equals, the remainders are equals
 c. The whole is greater than the part
 d. Things which are equal to the same thing are also equal to one another

27. Three chords AB, CD and EF of a circle are respectively 3 cm, 3.5 cm and 3.8 cm away from the centre. Then which of the following is correct?

- a. $AB > CD > EF$
 b. $AB < CD < EF$

- c. $AB = CD = EF$
 d. $AB = CD < EF$

28. Cards marked with the numbers 2 to 101 are placed in a box and mixed thoroughly. One card is drawn from this box. Find the probability that the number on the card is a perfect square:

- a. $\frac{1}{50}$ b. $\frac{8}{100}$
 c. $\frac{9}{100}$ d. $\frac{1}{10}$

29. There are four prime numbers written in ascending order. The product of the first three is 385 and that of the last three is 1001. The first number is:

- a. 5 b. 7
 c. 11 d. 17

30. Reck was asked to find $\frac{7}{9}$ of a fraction. But, he made a mistake of dividing the given fraction by $\frac{7}{9}$ and got an answer which exceeded the correct answer by $\frac{8}{21}$. The correct answer is:

- a. $\frac{3}{7}$ b. $\frac{7}{12}$
 c. $\frac{2}{21}$ d. $\frac{1}{3}$

31. 1250 oranges were distributed among a group of girls of a class. Each girl got twice as many oranges as the number of girls in that group. The number of girls in the group was:

- a. 25 b. 45
 c. 50 d. 100

32. Reblet's father was 38 years old when she was born while her mother was 36 years old when her brother 4 years younger to her was born. What is the difference between the ages of her parents?

- a. 2 years b. 4 years
 c. 6 years d. 8 years

33. By melting a solid lead sphere of diameter 12 cm, three small spheres are made, whose diameters are in the ratio 3 : 4 : 5. The radius of the smallest sphere is:

- a. 1.5 cm b. 3 cm
 c. 4 cm d. 6 cm

34. The simple interest on a sum of money is $\frac{1}{144}$ of the principal and the number of years is equal to the rate percent per annum. What will be the rate percent per annum?

- a. $\frac{3}{5}\%$ b. $\frac{5}{6}\%$
 c. $\frac{7}{6}\%$ d. $\frac{1}{6}\%$

35. If $\frac{[\sqrt{x+1} + \sqrt{x-1}]}{[\sqrt{x+1} - \sqrt{x-1}]} = 3$, then the value of x is:

- a. $\frac{3}{5}$ b. $\frac{4}{5}$
 c. $\frac{5}{3}$ d. 3

36. If $\frac{5 + 2\sqrt{3}}{7 + 4\sqrt{3}} = a + b\sqrt{3}$, then which of the following options is correct?

- a. $a = -11, b = -6$ b. $a = -11, b = 6$
 c. $a = 11, b = -6$ d. $a = 6, b = 11$

37. The ratio of the measure of an interior angle of a regular octagon to the measure of each of its exterior angles is:

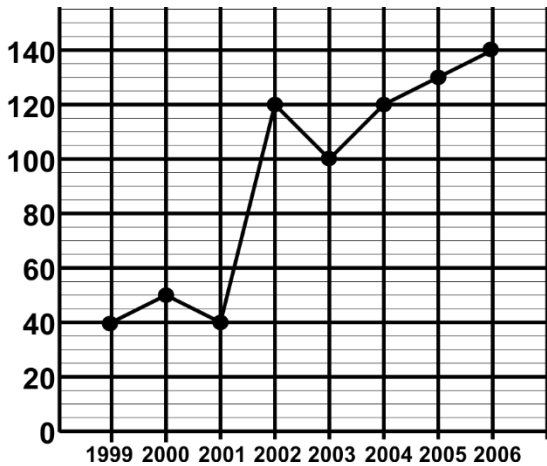
- a. 1: 2 b. 1: 3
 c. 2: 3 d. 3: 1

38. If the distance of the point P (x, y) from A (a, 0) is a + x, then find the value of y^2 :

- a. $2ax$ b. $4ax$
c. $6ax$ d. $8ax$

39. For how many years is the percent rise more than 100%?

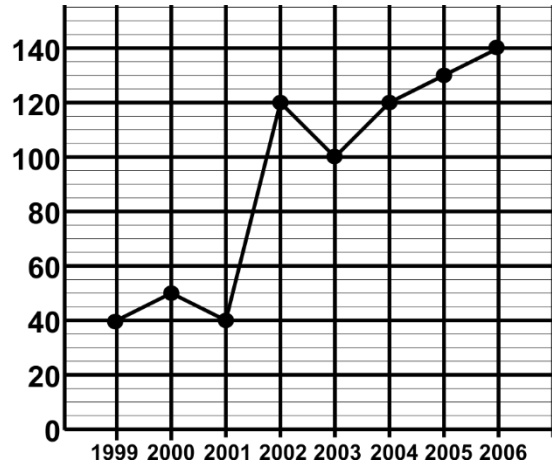
Percent rise in production over the years



- a. One b. Two
c. Three d. Four

40. What is the average of percent rise over the given years?

Percent rise in production over the years



- a. 110% b. 105%
c. 100.5% d. 92.5%

Achiever's Section (Each Question is 2 Marks)

41. A natural number is chosen at random from amongst the first 300. What is the probability that the number chosen is a multiple of 2 or 3 or 5?

- a. $\frac{1}{10}$ b. $\frac{11}{15}$
c. $\frac{4}{50}$ d. $\frac{17}{30}$

42. From 101 to 500, if a number is chosen at random, what is the probability that the number ends with 0?

- a. $\frac{11}{100}$ b. $\frac{40}{399}$
c. $\frac{1}{10}$ d. $\frac{41}{400}$

43. Two equal sums are lent at simple interest. The first sum is recovered in 3 years and the second sum in 6 years. The rate of interest per annum on the first sum is 2% more than that of the

second sum. Find the total sum lent if the amount in each case is \$560:

- a. \$530 b. \$500
c. \$1,480 d. \$1,000

44. Rocky takes some flowers in a basket and visits three stores one by one. At each store, she offers one-half of the flowers from the basket. If she is left with 3 flowers at the end, then find the number of flowers she had in the beginning:

- a. 25 b. 26
c. 27 d. 24

45. Number of students left in the school auditorium from the total strength of 1000 students when they leave the auditorium in batches of 25 form an A.P. Find the common difference:

- a. 25
c. 50

- b. -25
d. -50

- a. 25
c. 33

- b. 27
d. 81

46. If the chord of a circle of radius r subtends a right angle at the centre of the circle, then the area of the corresponding segment of the circle is:

- a. $\left(\frac{\pi}{2} - 1\right)r^2$ b. $\frac{r^2}{2}$
c. $\frac{\pi r^2}{4}$ d. $\left(\frac{\pi}{4} - \frac{1}{2}\right)r^2$

47. If x and y are natural numbers such that $(3x + 7y)$ is a multiple of 11, then which of the following expressions is always divisible by 11?

- a. $(4x + 6y)$ b. $(x + y + 4)$
c. $(9x + 4y)$ d. $(4x - 9y)$

48. The difference between two positive numbers is 3. If the sum of the squares of these numbers is 369, then the sum of numbers is:

49. If the side of a rhombus is 20 cm and its shorter diagonal is three-fourths of its longer diagonal, then the area of the rhombus is:

- a. 375 cm^2 b. 380 cm^2
c. 384 cm^2 d. 395 cm^2

50. A, B and C each working alone, can finish a piece of work in 27, 33, and 45 days, respectively. If A starts by working alone for 12 days, then B takes over from A and works for 11 days. At this stage, C takes over from B and completes the remaining work. In how many days the whole work was completed?

- a. 33 days b. 31 days
c. 39 days d. 35 days

Answer Key

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