CBSE Class 10 Mathematics Standard

Sample Paper - 02 (2020-21)

Maximum Marks: 80

Time Allowed: 3 hours

General Instructions:

i. This question paper contains two parts A and B.
ii. Both Part A and Part B have internal choices.

Part – A consists 20 questions

i. Questions 1-16 carry 1 mark each. Internal choice is provided in 5 questions.
ii. Questions 17-20 are based on the case study. Each case study has 5 case-based sub-parts. An examinee is to attempt any 4 out of 5 sub-parts.

Part – B consists 16 questions

i. Question No 21 to 26 are Very short answer type questions of 2 mark each,
ii. Question No 27 to 33 are Short Answer Type questions of 3 marks each
iii. Question No 34 to 36 are Long Answer Type questions of 5 marks each.
iv. Internal choice is provided in 2 questions of 2 marks, 2 questions of 3 marks and 1 question of 5 marks.

Part-A

1. The HCF of 45 and 105 is 15. Write their LCM.

OR

$\sqrt{7}$ is an irrational number.

2. Without factorization, find the nature of the roots of the quadratic equation.

$4x^2 - 12x + 9 = 0$.

3. Find the value of k so that the following system of equations has no solution:

$3x - y - 5 = 0, 6x - 2y + k = 0$

4. How many common tangents can be drawn to two circles touching externally?
5. Write the first four terms of the AP, when the first term a = -1 and the common difference $d = \frac{1}{2}$

OR

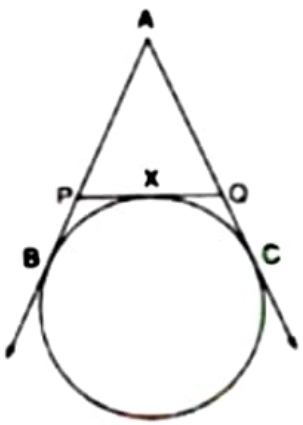
Find the 6^{th} term from the end of the A.P. 17,14,11,...., - 40

6. For the AP 0.6, 1.7, 2.8, 3.9 ....., write the first term and the common difference.
7. Solve: $4x^2 + 5x = 0$.

OR

If p, q and r are rational numbers and $p \neq q \neq r$, then find the roots of the equation $(p^2 - q^2)x^2 - (q^2 - r^2)x + r^2 - p^2 = 0$.

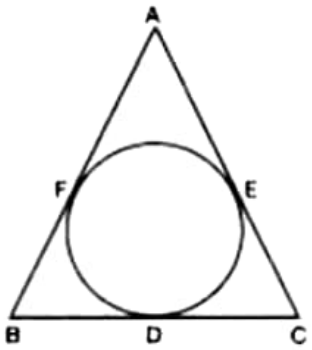
8. In the given figure,AB, AC and PQ are tangents. If AB = 5 cm, then find the perimeter of $\triangle APQ$.



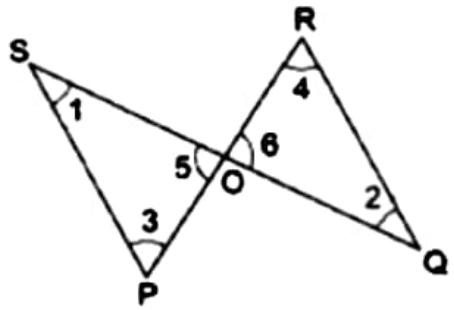
9. What is the maximum number of parallel tangents a circle can have on a diameter?

OR

A triangle ABC is drawn to circumscribe a circle. If AB = 13 cm, BC = 14 cm and AE = 7 cm, then find AC.



10. In Fig. if $\Delta POS \sim \Delta ROQ$, prove that $PS \| QR$.



11. Which term of the sequence 4,9,14,19, ... is 124?
12. Prove that: $\frac{\sin^3\theta+\cos^3\theta}{\sin\theta+\cos\theta} + \sin\theta\cos\theta = 1$
13. If cot A + $\frac{1}{\cot A}$ = 1, then find the value of $\cot^2 A + \frac{1}{\cot^2 A}$.
14. A metallic cone of radius 12 cm and height 24 cm is melted and made into spheres of radius 2 cm each. How many spheres are formed?
15. What is the sum of first n terms of the AP a, 3a, 5a,.....
16. A card is drawn at random from a well-shuffled pack of 52 cards. Find the probability that the card was drawn is neither a red card nor a queen.
17. **2-DIMENSINAL PLANE/ CARTESIAN PLANE**

    Using Cartesian Coordinates we mark a point on a graph by **how far along** and **how far up** it is.

    The left-right (**horizontal**) direction is commonly called X-axis.

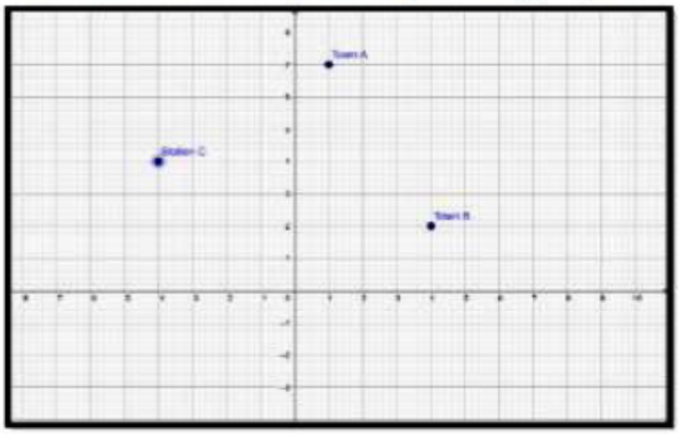
    The up-down (**vertical**) direction is commonly called Y-axis.

    When we include negative values, the x and y axes divide the space up into 4 pieces.

    Read the information given above and below and answer the questions that follow:

    Two friends Seema and Aditya work in the same office in Delhi. In the Christmas vacations, both decided to go their hometowns represented by Town A and Town B respectively in the figure given below. Town A and Town B are connected by trains from

the same station C (in the given figure) in Delhi.



i. Who will travel more distance to reach to their hometown?
   a. Seema
   b. Aditya
   c. Both travel the same distance
   d. None of these

ii. Seema and Aditya planned to meet at a location D situated at a point D represented by the mid-point of the line joining the point represented by Town A and Town B. Then the coordinates of the point represented by the point D are:
   a. $\left(\frac{2}{5}, \frac{9}{2}\right)$
   b. $\left(\frac{5}{2}, \frac{2}{9}\right)$
   c. $\left(\frac{9}{2}, \frac{5}{2}\right)$
   d. $\left(\frac{5}{2}, \frac{9}{2}\right)$

iii. The area of the triangle formed by joining the points represented by A, B and C is:
   a. 17 sq. units
   b. 27 sq. units
   c. 7 sq. units
   d. 15 sq. units

iv. The location of the station is given by:
   a. (4, -4)
   b. (-4, 4)
   c. (-2, 4)
   d. (4, 2)

v. The location of the Town B is given by:

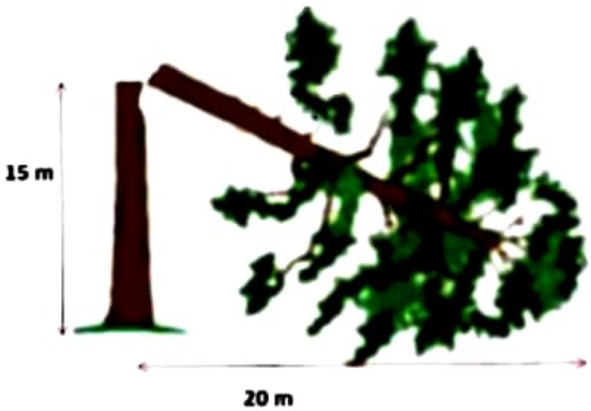
a. (4, -4)

b. (1, 7)

c. (2, 4)

d. (4, 2)

18. Suresh is having a garden near Delhi. In the garden, there are different types of trees and flower plants. One day due to heavy rain and storm one of the trees got broken as shown in the figure.



The height of the unbroken part is 15 m and the broken part of the tree has fallen at 20 m away from the base of the tree.

Using the Pythagoras answer the following questions:

a. What is the length of the broken part?

a. 15 m

b. 20 m

c. 25 m

d. 30 m

b. What was the height of the full tree?

a. 40 m

b. 50 m

c. 35 m

d. 30 m

c. In the formed right-angle triangle what is the length of the hypotenuse?

a. 15 m

b. 20 m

c. 25 m

d. 30m

d. What is the area of the formed right angle triangle?

a. 100 m^2

b. 200 m^2

c. 60 m^2

d. 150 m^2

e. What is the perimeter of the formed triangle?

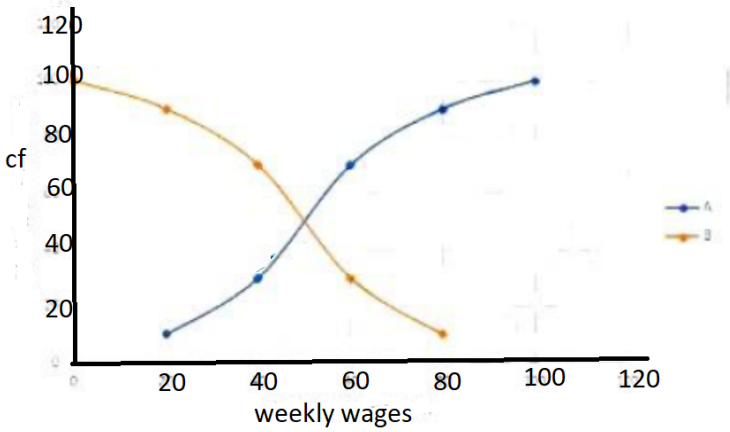
a. 60 m

b. 50 m

c. 45 m

d. 100 m

19. A Mall is constructing in the city, Jaipur. 100 workers are working in the Mall. The data of the distribution of weekly wages of 100 workers are recorded and the following graph is made:



Based on the above graph, answer the following questions:

i. Identify less than type ogive from the given graph.

a. A

b. point of intersection of A and B

c. B

d. none of these

ii. Find the Median Wages.

a. Rs.60

b. Rs.150

c. Rs.50

d. Rs.55

iii. Find Mode of the data if Mean Wages is Rs. 50

a. Rs.52

b. Rs.60

c. Rs.55

d. Rs.50

iv. The construction of the cumulative frequency table is useful in determining the:

a. Median

b. Mean

c. Mode

d. All of the above

v. The intersection of the Ogive graph(abscissa) represents which of the following:

a. Mean

b. Median

c. Mode

d. All of these

20. To make the teaching, learning process easier, creative, and innovative, A teacher brings clay in the classroom to teach the topic mensuration. She thought this method of teaching is more interesting, leave a long-lasting impact She forms a cylinder of radius 6 cm and height 8 cm with the clay, then she moulds the cylinder into a sphere and asks some question to students [use $\pi = 3.14$]

i. The radius of the sphere so form:

a. 6 cm
b. 7 cm
c. 4 cm
d. 8 cm

ii. The volume of the sphere so formed:

a. 902.32 cm^3
b. 899.34 cm^3
c. 904.32 cm^3
d. 999.33 cm^3

iii. What is the ratio of the volume of a sphere to the volume of a cylinder?

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

iv. The total surface area of the cylinder is:

a. 525.57 cm^2
b. 557.55 cm^2
c. 534.32 cm^2
d. 527.52 cm^2

v. During the conversion of a solid from one shape to another the volume of the new shape will:

a. increase
b. decrease
c. remain unaltered
d. be double

Part-B

21. Express the following in the form p/q, where p and q are integers and q ≠0.

$0.\overline{2341}$

22. The mid-points of the sides of a triangle are (3, 4), (4,1) and (2, 0). Find the coordinates of the vertices of the triangle.

OR

Find the values of k so that the area of the triangle with vertices (1, -1), (- 4, 2k) and (- k, - 5) is 24 sq. units.

23. Find a cubic polynomial whose zeros are $\frac{1}{2}$, 1 and -3.
24. Draw a circle of radius 4cm from a point P, 7cm from the centre of the circle, draw a pair of tangents to the circle measure the length of each tangent segment.
25. Prove the following identity, where the angles involved are acute angles for which the expressions are defined. $\frac{\tan A}{1-\cot A} + \frac{\cot A}{1-\tan A} = 1 + \sec A \operatorname{cosec} A$
[Hint : Write the expression in terms of sin θ and cos θ]

OR

If $\cot \theta = \frac{7}{8}$, evaluate $\frac{(1+\sin\theta)(1-\sin\theta)}{(1+\cos\theta)(1-\cos\theta)}$.

26. From a point P, the length of the tangent to a circle is 15 cm and distance of P from the centre of the circle is 17 cm. Then what is the radius of the circle?
27. Show that $3 + 5\sqrt{2}$ is an irrational number.
28. The hypotenuse of a right triangle is 25 cm. The difference between the lengths of the other two sides of the triangle is 5 cm. Find the lengths of these sides.

OR

Solve the quadratic equation by factorization:
$\frac{1}{2a+b+2x} = \frac{1}{2a} + \frac{1}{b} + \frac{1}{2x}$

29. Find the zeros of the polynomial $f(x) = x^3 - 12x^2 + 39x - 28$, if it is given that the zeros are in A.P.
30. D is the mid-point of side BC of $\triangle$ABC and E is the mid-point of AD. BE produced meets AC at the point M. Prove that BE = 3EM.

OR

In a $\triangle ABC$, AB = AC and D is a point on AC such that $BC^2 = AC \times DC$. Prove that BD = BC.

31. A number is selected at random from first 50 natural numbers. Find the probability that it is a multiple of 3 and 4.
32. If a 1.5-m-tall girl stands at a distance of 3m from a lamp-post and casts a shadow of length 4.5m on the ground then find the height of the lamp-post.
33. Compute the mode of the following data:

Class Interval	1 - 5	6 - 10	11 - 15	16 - 20	21 - 25	26 - 31	31 - 35	36 - 40	41 - 45	46 - 50
Frequency	3	8	13	18	28	20	13	8	6	4

34. A semicircular region and a square region have equal perimeters. The area of the square region exceeds that of the semicircular region by 4 cm^2. Find the perimeters and areas of the two regions.
35. Half the perimeter of a rectangular garden, whose length is 4 m more than its width, is 36 m. find the dimensions of the garden.
36. From the top of a 7 m high building, the angle of elevation of the top of a tower is 60^o and the angle of depression of its foot is 45^o. Find the height of the tower.