CLASS 10 MATH TEST PAPER 23 (FULL SYLLABUS, 80 MARKS)
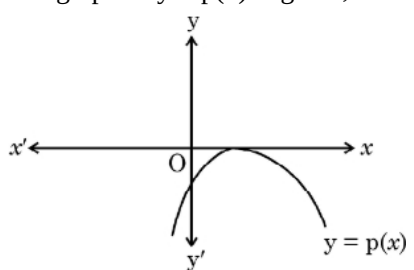
Class 10 - Mathematics

Time Allowed: 3 hours   **Maximum Marks: 80**

General Instructions:

Read the following instructions carefully and follow them:

1. This question paper contains 38 questions.

2. This Question Paper is divided into 5 Sections A, B, C, D and E.

3. In Section A, Questions no. 1-18 are multiple choice questions (MCQs) and questions no. 19 and 20 are Assertion-Reason based questions of 1 mark each.

4. In Section B, Questions no. 21-25 are very short answer (VSA) type questions, carrying 02 marks each.

5. In Section C, Questions no. 26-31 are short answer (SA) type questions, carrying 03 marks each.

6. In Section D, Questions no. 32-35 are long answer (LA) type questions, carrying 05 marks each.

7. In Section E, Questions no. 36-38 are case study-based questions carrying 4 marks each with sub-parts of the values of 1,1 and 2 marks each respectively.

8. All Questions are compulsory. However, an internal choice in 2 Questions of Section B, 2 Questions of Section C and 2 Questions of Section D has been provided. An internal choice has been provided in all the 2 marks questions of Section E.

9. Draw neat and clean figures wherever required.

10. Take $\pi = 22/7$ wherever required if not stated.

11. Use of calculators is not allowed.

Section A

1. The total number of factors of a prime number is: **[1]**

   a) 2   b) 1

   c) 3   d) 0

2. The graph of y = p(x) is given, for a polynomial p(x). The number of zeroes of p(x) from the graph is **[1]**

   a) 0   b) 3

   c) 2   d) 1

3. The pair of equations 2x + y = 5, 3x + 2y = 8 has **[1]**
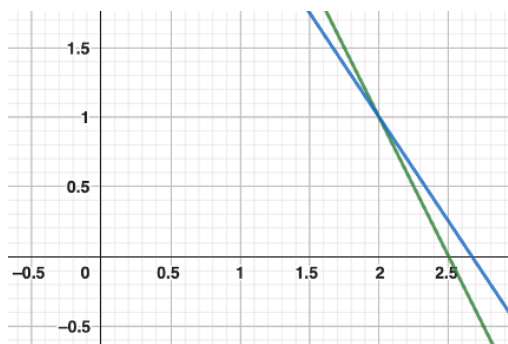
a) a unique solution   b) two solutions

c) infinitely many solutions   d) no solution

4. $9x^2 - 6x - 4 = 0$ have **[1]**

    a) No Real roots   b) Real and Distinct roots

    c) Real roots   d) Real and Equal roots

5. The 4th term from the end of an AP - 11, - 8, - 5, …., 49 is **[1]**

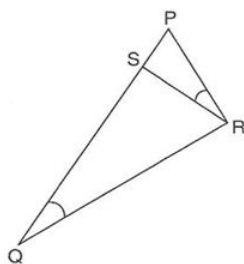   a) 40   b) 37

    c) 43   d) 58

6. If x is a positive integer such that the distance between points P (x, 2) and Q (3, - 6) is 10 units, then x = **[1]**

    a) 3   b) 9

    c) -9   d) -3

7. The coordinates of the vertex A of a rectangle ABCD whose three vertices are given as B(0, 0), C(3, 0) and D(0, 4) are: **[1]**
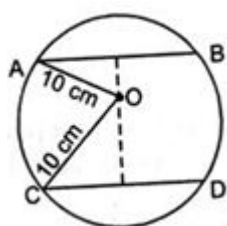
    a) (4, 0)   b) (0, 3)

    c) (3, 4)   d) (4, 3)

8. In the adjoining figure $\angle PQR = \angle PRS$. If PR = 8cm, PS = 4 cm, then PQ is equal to **[1]**

    a) 16 cm.   b) 12 cm.

    c) 24 cm.   d) 32 cm.

9. In the given figure, O is the centre of the circle with radius 10 cm. If AB ∥ CD, AB = 16 cm and CD = 12 cm, the distance between the two chords AB and CD is : **[1]**

    a) 12 cm   b) 20 cm

c) 16 cm   d) 14 cm

10. In a right triangle ABC, right angled at B, BC = 12 cm and AB = 5 cm. The radius of the circle inscribed in the triangle (in cm) is **[1]**

    a) 4   b) 1

    c) 2   d) 3

11. $\cot^2\theta - \frac{1}{\sin^2\theta}$ is equal to: **[1]**

    a) 2   b) -2

    c) -1   d) 1

12. The value of $5 \sin^2 90^\circ - 2 \cos^2 0^\circ$ is: **[1]**

    a) 3   b) -3

    c) 5   d) -2

13. From the top of a hill, the angles of depression of two consecutive km stones due east are found to be 30° and 45°. The height of the hill is **[1]**

    a) $(\sqrt{3} - 1)$ Km   b) $\frac{1}{2}(\sqrt{3} - 1)$ Km

    c) $(\sqrt{3} + 1)$ Km   d) $\frac{1}{2}(\sqrt{3} + 1)$ Km

14. Find the area of the segment if the area of the sector is 44 m and the part of a triangle in the sector is 12 m. **[1]**

    a) 39 m^2 b) 31 m^2

    c) 32 m^2 d) 22 m^2

15. The area of a sector of a circle of radius 5 cm is $5\pi \text{ cm}^2$. The angle contained by the sector will be **[1]**

    a) 72° b) 45°

    c) 60° d) 90°

16. A bag contains cards numbered from 1 to 25. A card is drawn at random from the bag. The probability that the number on this card is divisible by both 2 and 3 is **[1]**

    a) $\frac{2}{25}$ b) $\frac{1}{5}$

    c) $\frac{3}{25}$ d) $\frac{4}{25}$

17. A lot consists of 40 mobile phones of which 32 are good, 3 have only minor defects and 5 have major defects. Ram will buy a phone if it is good or have minor defects. One phone is selected at random. The probability that it is acceptable to Ram is: **[1]**

    a) $\frac{3}{40}$ b) $\frac{4}{5}$

    c) $\frac{3}{5}$ d) $\frac{7}{8}$

18. If x_i is changed to $x_i + a$, then $\overline{x}$ is changed to **[1]**

    a) $\overline{x} + a$ b) $a\overline{x}$

    c) $\overline{x} - a$ d) $\frac{\overline{x}}{a}$

19. **Assertion (A):** A piece of cloth is required to completely cover a solid object. The solid object is composed of a **[1]**

hemisphere and a cone surmounted on it. If the common radius is 7 m and height of the cone is 1 m, 463.39 cm^2 is the area of cloth required.

Reason (R): Surface area of hemisphere = $2\pi r^2$.

    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.

20. **Assertion (A):** The sum of series with the nth term $t_n = (9 - 5n)$ is 220 when no. of terms n = 6. **[1]**

    Reason (R): Sum of first n terms in an A.P. is given by the formula: $Sn = 2n \times [2a + (n - 1)d]$

    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.

Section B

21. Explain why $3 \times 5 \times 7 + 7$ is a composite number. **[2]**

22. State which pairs of triangles in the given figure are similar? Also, state the similarity criterion used. **[2]**
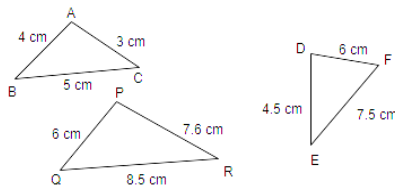
23. In the given figure, TP and TQ are tangents from T to the circle with centre O and R is any point on the circle. If AB is a tangent to the circle at R, prove that TA + AR = TB + BR. **[2]**
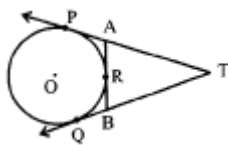
24. If $\cot \theta = \frac{15}{8}$, then evaluate: $\frac{(2+2\sin\theta)(1-\sin\theta)}{(1+\cos\theta)(2-2\cos\theta)}$ **[2]**

OR

Prove that : $\frac{\tan A}{\sec A - 1} + \frac{\tan A}{\sec A + 1} = 2 \operatorname{cosec} A$.

25. What is the length (in terms of π) of the arc that subtends an angle of 36° at the centre of a circle of radius 5 cm? **[2]**

OR

An arc subtends an angle of 90° at the centre of the circle of radius 14 cm. Write the area of minor sector thus formed in terms of π.

Section C

26. A shopkeeper has 120 litres of petrol, 180 litres of diesel and 240 litres of kerosene. He wants to sell oil by filling the three kinds of oils in tins of equal capacity. What should be the greatest capacity of such a tin? **[3]**

27. If α, β are the zeros of the polynomial $2x^2 – 4x + 5$. find the value of (i) $\alpha^2 + \beta^2$ (ii) $(\alpha - \beta)^2$. **[3]**

28. A man invested an amount at 12% per annum simple interest and another amount at 10% per annum simple interest. He received an annual interest of ₹2600. But, if he had interchanged the amounts invested, he would have received ₹140 less. What amounts did he invest at the different rates? **[3]**

OR

The angles of a cyclic quadrilateral ABCD are $\angle A = (6x + 10)°$, $\angle B = (5x)°$, $\angle C = (x + y)°$, $\angle D = (3y – 10)°$ Find x and y, and hence the values of the four angles.
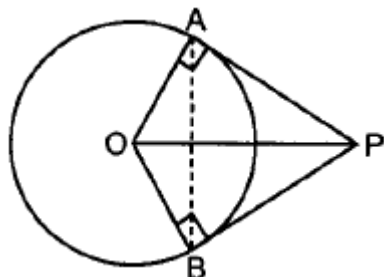
29. In the given figure, tangents PQ and PR are drawn to a circle such that $\angle RPQ = 30^\circ$. A chord RS is drawn parallel to tangent PQ. Find the $\angle RQS$. **[3]**

Hint: Draw a line through Q and perpendicular to QP.]
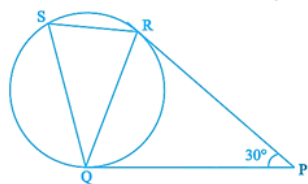
OR

In figure, OP is equal to diameter of the circle. Prove that $\triangle APB$ is an equilateral triangle.

30. Prove that: $2\left(\sin^6\theta + \cos^6\theta\right) - 3\left(\sin^4\theta + \cos^4\theta\right) + 1 = 0$ **[3]**

31. If the median of the following frequency distribution is 46, find the missing frequencies. **[3]**

| Variable	10-20	20-30	30-40	40-50	50-60	60-70	70-80	Total
Frequency	12	30	?	65	?	25	18	229

Section D

32. A truck covers a distance of 150 km at a certain average speed and then covers another 200 km at an average speed which is 20 km per hour more than the first speed. If the truck covers the total distance in 5 hours, then find the first speed of the truck. **[5]**

OR

If the equation $\left(1 + m^2\right)x^2 + 2mcx + \left(c^2 - a^2\right) = 0$ has equal roots, prove that $c^2 = a^2\left(1 + m^2\right)$

33. In the figure, $\angle BED = \angle BDE$ and In the figure, E is the midpoint of BC. Prove that $\frac{AF}{CF} = \frac{AD}{BE}$ **[5]**
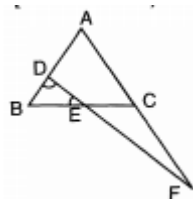
34. A solid toy is in the form of a hemisphere surmounted by a right circular cone of same radius. The height of the cone is 10 cm and the radius of the base is 7 cm. Determine the volume of the toy. Also find the area of the coloured sheet required to cover the toy. (Use $\pi = \frac{22}{7}$ and $\sqrt{149} = 12.2$) **[5]**

OR

A tent is in the shape of a right circular cylinder up to a height of 3 m and then a right circular cone, with a maximum height of 13.5 m above the ground. Calculate the cost of painting the inner side of the tent at the rate of ₹ 2 per square metre, if the radius of the base is 14 m.

35. The mode of the following frequency distribution is 36. Find the missing frequency (f). **[5]**

Class	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50	50 - 60	60 - 70
Frequency	8	10	f	16	12	6	7

Section E

36. **Read the following text carefully and answer the questions that follow:** **[4]**

In a school garden, Dinesh was given two types of plants viz. sunflower and rose flower as shown in the following figure.

The distance between two plants is to be 5m, a basket filled with plants is kept at point A which is 10 m from the first plant. Dinesh has to take one plant from the basket and then he will have to plant it in a row as shown in the figure and then he has to return to the basket to collect another plant. He continues in the same way until all the flower plants in the basket. Dinesh has to plant ten numbers of flower plants.

  i. Write the above information in the progression and find first term and common difference. (1)
 ii. Find the distance covered by Dinesh to plant the first 5 plants and return to basket. (1)
iii. Find the distance covered by Dinesh to plant all 10 plants and return to basket. (2)

   OR

   If the speed of Dinesh is 10 m/min and he takes 15 minutes to plant a flower plant then find the total time taken by Dinesh to plant 10 plants. (2)

37. **Read the following text carefully and answer the questions that follow:** **[4]**

Karan went to the Lab near to his home for COVID 19 test along with his family members.

The seats in the waiting area were as per the norms of distancing during this pandemic (as shown in the figure).

His family member took their seats surrounded by red circular area.
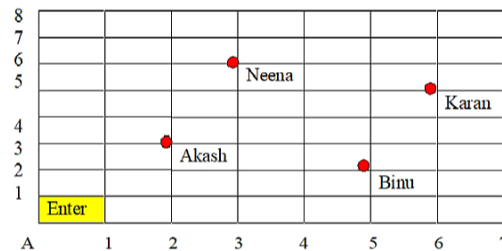
  i. What is the distance between Neena and Karan? (1)
 ii. What are the coordinates of seat of Akash? (1)
iii. What will be the coordinates of a point exactly between Akash and Binu where a person can be? (2)

   OR

   Find distance between Binu and Karan. (2)

38. Tower Bridge is a Grade I listed combined bascule and suspension bridge in London, built between 1886 and **[4]**
1894, designed by Horace Jones and engineered by John Wolfe Barry. The bridge is 800 feet (240 m) in length and consists of two bridge towers connected at the upper level by two horizontal walkways, and a central pair of bascules that can open to allow shipping.

In this bridge, two towers of equal heights are standing opposite each other on either side of the road, which is 80 m wide. During summer holidays, Neeta visited the tower bridge. She stood at some point on the road between these towers. From that point between the towers on the road, the angles of elevation of the top of the towers was 60° and 30° respectively.
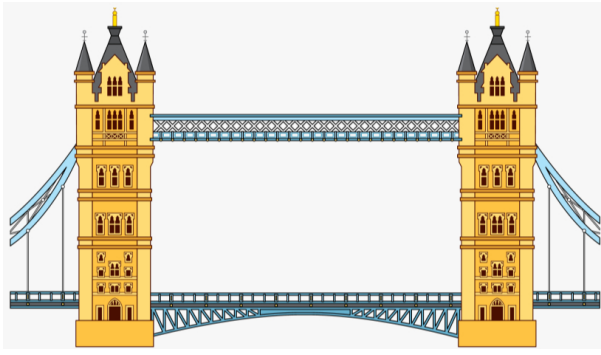
i. Neeta used some applications of trigronomatry she learned in her class to find the height of the towers without actually measuring them. What would be the height of the towers she would have calculated?

ii. Also find the distances of the point from the base of the towers where Neeta was standing while measuring the height.