# SELF ASSESSSMENT PAPER 3

## Class 10 - Mathematics

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

**General Instructions:**

1. This Question Paper has 5 Sections A, B, C, D and E.

2. Section A has 20 MCQs carrying 1 mark each

3. Section B has 5 questions carrying 02 marks each.

4. Section C has 6 questions carrying 03 marks each.

5. Section D has 4 questions carrying 05 marks each.

6. Section E has 3 case based integrated units of assessment (04 marks each) with sub- parts of the values of 1, 1 and 2 marks each respectively.

7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided. An internal choice has been provided in the 2marks questions of Section E

8. Draw neat figures wherever required. Take $\pi = \frac{22}{7}$ wherever required if not stated.

**Section A**

1.   2.35 is                                                                                                                                       **[1]**

   a) an integer                                                          b) a rational number

   c) an irrational number                                        d) a natural number

2.   If the diagram in Fig. shows the graph of the polynomial $f(x) = ax^2 + bx + c$, then                      **[1]**
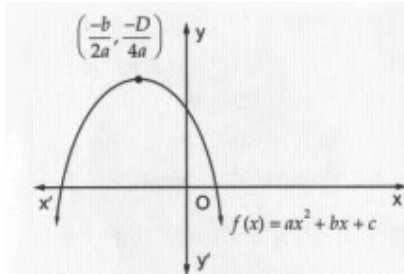


   a) a < 0, b < 0 and c < 0                                    b) a < 0, b > 0 and c > 0

   c) a < 0, b < 0 and c > 0                                    d) a < 0, b > 0 and c < 0

3.   The pair of equations x + 2y + 5 = 0 and −3x − 6y + 1 = 0 have                                                    **[1]**

    a) a unique solution                         b) infinitely many solutions

    c) no solution                                 d) exactly two solutions

4. If one root of the equation $x^2 + ax + 3 = 0$ is 1, then its other root is         **[1]**

    a) 3                                         b) -3

    c) 2                                          d) -2

5. If the common difference of an A.P. is 5, then the value of $a_{20} - a_{13}$ is         **[1]**

    a) 35                                       b) 25

    c) 40                                       d) 30

6. If A(5, 3), B(11, -5) and P(12, y) are the vertices of a right triangle right angled at P, then y =         **[1]**

    a) -1, 4                                  b) 2, 4

    c) -2, 4                                 d) 2, -4

7. The midpoint of segment AB is P(0,4). If the coordinates of B are (-2,3),then the coordinates of A are         **[1]**

    a) (-2 -5)                               b) (2, 9)

    c) (-2, 11)                              d) (2, 5)

8. In $\triangle$ PQR, if $\frac{pQ}{PR} = \frac{QM}{MR}$, $\angle Q = 75^0$ and $\angle R = 45^0$, Then the measure of $\angle QPM$ is         **[1]**



    a) $22.5^0$.                                b) $30^0$.

    c) $60^0$.                                d) $45^0$.

9. In Figure, PQ and PR are two tangents to a circle with centre O. If $\angle QPR = 46°$, then $\angle QOR$ equals         **[1]**



    a) $67^0$                                    b) $46^0$

c) $134^o$            d) $44^o$

10. The chord of a circle of radius 10 cm subtends a right angle at its centre. The length of the chord (in cm) is **[1]**

     a) $\frac{5}{\sqrt{2}}$            b) $10\sqrt{3}$

     c) $5\sqrt{2}$            d) $10\sqrt{2}$

11. If x = r sin $\theta$ cos $\phi$, y = r sin $\theta$ sin $\phi$ and z = r cos $\theta$, then **[1]**

     a) $x^2 + y^2 + z^2 = r^2$            b) $x^2 - y^2 + z^2 = r^2$

     c) $z^2 + y^2 - x^2 = r^2$            d) $x^2 + y^2 - z^2 = r^2$

12. If tan A = n tan B and sin A = m sin B, then $\cos^2 A$ = **[1]**

     a) $\frac{m^2-1}{n^2-1}$            b) $\frac{m^2+1}{n^2-1}$

     c) $\frac{m^2+1}{n^2+1}$            d) $\frac{m^2-1}{n^2+1}$

13. A ladder 12 m long rests against a wall. If it reaches the wall at a height of $6\sqrt{3}$ m, then the angle of elevation is **[1]**

     a) $60°$            b) $30°$

     c) $75°$            d) $45°$

14. A chord of a circle of radius 10 cm subtends a right angle at the centre. The area of the minor segments (given, $\pi$ = 3.14) is **[1]**

     a) $32.5$ cm$^2$            b) $34.5$ cm$^2$

     c) $30.5$ cm$^2$            d) $28.5$ cm$^2$

15. In a circle of radius 21 cm, an arc subtends an angle of $60^0$ at the centre. The length of the arc is **[1]**

     a) 18.16 cm            b) 23.5 cm

     c) 22 cm            d) 21 cm

16. A ticket is drawn from a bag containing 100 tickets numbered from 1 to 100. The probability of getting a ticket with a number divisible by 10 is **[1]**

     a) $\frac{3}{10}$            b) $\frac{1}{10}$

     c) $\frac{4}{10}$            d) $\frac{1}{5}$

17. A bag contains 3 red balls, 5 white balls and 7 black balls. What is the probability that a ball drawn from the bag at random will be neither red nor black? **[1]**

     a) $\frac{1}{3}$            b) $\frac{8}{15}$

     c) $\frac{7}{15}$            d) $\frac{1}{5}$

18. The mean and mode of a frequency distribution are 28 and 16 respectively. The median is **[1]**

     a) 24.5            b) 24

     c) 23.5            d) 22

19. **Assertion (A):** In the given figure, a sphere circumscribes a right cylinder whose height is 8 cm and radius of the base is 3 cm. The ratio of the volumes of the sphere and the cylinder is 125 : 54 **[1]**
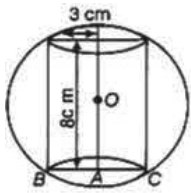
**Reason (R):** Ratio of their volume = $\frac{Volume\ of\ sphere}{Volume\ of\ cylinder}$

- 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):** Three consecutive terms $2k + 1$, $3k + 3$ and $5k - 1$ form an AP than k is equal to 6. **[1]**

    **Reason (R):** In an AP a, a + d, a + 2d, ... the sum to n terms of the AP be $S_n = \frac{n}{2}(2a + (n-1)d)$

- 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.

## Section B

21. Prove that $5 - \sqrt{3}$ is an irrational number. **[2]**

22. State the pair of triangles in the figure below are similar. Write the similarity criterion used by you for answering the question and also write the pair of similar triangles in the symbolic form: **[2]**
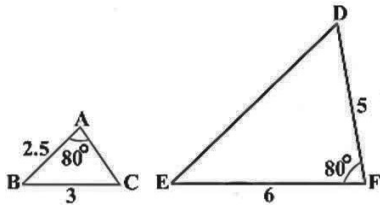


23. Two tangents PQ and PR are drawn from an external point to a circle with centre O. Prove that QORP is a cyclic quadrilateral. **[2]**

24. Prove that: $\sin^6\theta + \cos^6\theta = 1 - 3\sin^2\theta\cos^2\theta$ **[2]**

OR

Evaluate $(\sin^2 30° + 4\cot^2 45° - \sec^2 60°)(\csc^2 45° \sec^2 30°)$.

25. A horse is tethered to one corner of a field which is in the shape of an equilateral triangle of side 12 m. If the length of the rope is 7 m, find the area of the field which the horse cannot graze. Take $\sqrt{3}$ = 1.732. Write the answer correct to 2 places of decimal. **[2]**

OR

Find the area of the segment of a circle of radius 14 cm, if the length of the corresponding arc APB is 22 cm.
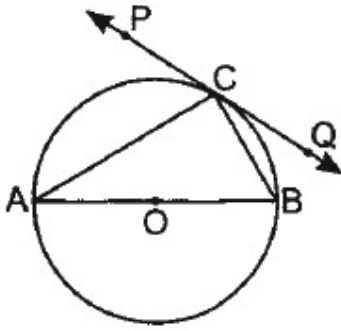
## Section C

26. Maya has two pieces of cloth. One piece is 36 inches wide and the other piece is 24 inches wide. She wants to cut both pieces into strips of equal width that are as wide as possible. How wide should she cut the strips? **[3]**

27. If $\alpha$, $\beta$ 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. The 4th term of an A.P. is three times the first term and the 7th term exceeds twice the third term by 1. Find the first term and the common difference. **[3]**

OR

Determine the AP whose third term is 16 and the 7th term exceeds the 5th term by 12.

29. In figure, PQ is a tangent at a point C to a circle with centre O. If AB is a diameter and ∠CAB = 30°, find ∠PCA.  **[3]**



OR

A chord PQ of a circle is parallel to the tangent drawn at a point R of the circle. Prove that R bisects the arc PRQ.

30. Prove that:  **[3]**

$$\frac{\tan\theta+\sec\theta-1}{\tan\theta-\sec\theta+1} = \frac{1+\sin\theta}{\cos\theta}$$

31. Obtain the median for the following frequency distribution:  **[3]**

| x | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| f | 8 | 10 | 11 | 16 | 20 | 25 | 15 | 9 | 6 |

**Section D**

32. Solve for x  **[5]**

$\frac{1}{a+b+x} = \frac{1}{a} + \frac{1}{b} + \frac{1}{x}$ where $a+b+x \neq 0$ and $a,b\ x \neq 0$

OR

The product of Tanay's age (in years) five years ago and his age ten years later is 16. Determine Tanay's present age.

33. Prove that if a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, then other two sides are divided in the same ratio. By using this theorem, prove that in △ ABC if DE ∥ BC then $\frac{AD}{BD} = \frac{AE}{AC}$.  **[5]**

34. A cylindrical tub of radius 12 cm contains water to a depth of 20 cm. A spherical ball is dropped into the tub and the level of the water is raised by 6.75 cm. Find the radius of the ball.  **[5]**

OR

A hemispherical depression is cut out from one face of a cubical wooden block such that the diameter l of the hemisphere is equal to the edge of the cube. Determine the surface area of the remaining solid.

35. The median of the following data is 525. Find the values of x and y, if the total frequency is 100.  **[5]**

| Class interval | Frequency |
|---|---|
| 0-100 | 2 |
| 100-200 | 5 |
| 200-300 | x |
| 300-400 | 12 |
| 400-500 | 17 |
| 500-600 | 20 |
| 600-700 | y |
| 700-800 | 9 |

| 800-900 | 7 |
| 900-1000 | 4 |

**Section E**

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

Suman is celebrating his birthday. He invited his friends. He bought a packet of toffees/candies which contains 360 candies. He arranges the candies such that in the first row there are 3 candies, in second there are 5 candies, in third there are 7 candies and so on.

(i) Find the total number of rows of candies.

(ii) How many candies are placed in last row?

**OR**

If Aditya decides to make 15 rows, then how many total candies will be placed by him with the same arrangement?

(iii) Find the number of candies in 12th row.

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

A satellite image of a colony is shown below. In this view, a particular house is pointed out by a flag, which is situated at the point of intersection of x and y-axes. If we go 2 cm east and 3 cm north from the house, then we reach to a Grocery store. If we go 4 cm west and 6 cm south from the house, then we reach to an Electricians's shop. If we go 6 cm east and 8 cm south from the house, then we reach to a food cart. If we go 6 cm west and 8 cm north from the house, then we reach a bus stand.

**Scale:**

x-axis : 1 cm = 1 unit

y-axis : 1 cm = 1 unit



(i) What is the distance between the grocery store and food cart?

(ii) What is the distance of the bus stand from the house?

**OR**

What are the ratio of distances of the house from bus stand to food cart?

(iii) If the grocery store and electricians shop lie on a line, then what will be the ratio of distance of house from grocery store to that from electrician's shop?

38. **Read the text carefully and answer the questions:** [4]

An observer on the top of a 40m tall light house (including height of the observer) observes a ship at an angle of depression $30^o$ coming towards the base of the light house along straight line joining the ship and the base of the

light house. The angle of depression of ship changes to 45° after 6 seconds.



(i)    Find the distance of ship from the base of the light house after 6 seconds from the initial position when angle of depression is 45°.

(ii)   Find the distance between two positions of ship after 6 seconds?

**OR**

Find the distance of ship from the base of the light house when angle of depression is 30°.

(iii)  Find the speed of the ship?