Time allowed: 3 hours   Maximum Marks: 90

General Instructions:

a) All questions are compulsory.
b) The question paper consists of 31 questions divided into four sections – A, B, C and D.
c) Section A contains 4 questions of 1 mark each which are multiple choice questions, Section B contains 6 questions of 2 marks each, Section C contains 10 questions of 3 marks each and Section D contains 11 questions of 4 marks each.
d) Use of calculator is not permitted.

Section A

1. The first four terms of an AP, where first term is –1 and the common difference is –1, are

    (a) $-1, 0 -1, 2,.........$ (b) $-1, -2, -3, -4,..........$

    (c) $-1, -2, -4, -8, -16,..........$ (d) $-1, 2, -3, 4,............$

2. If two towers of height x and y subtend angles of 30^0 and 60^0 respectively at the centre of a line joining their feet, then $x : y$ is equal to:

    (a) 1 : 3   (b) 3 : 1   (c) 1: 3   (d)   1

3. A child's game is 8 triangles of which 3 are green and rest are pink and 10 squares of which 6 are green and rest are pink. One piece is list at random. The probability that it is a triangle of green colour is:

    (a) $\dfrac{1}{3}$ (b) $\dfrac{1}{6}$ (c) $\dfrac{1}{4}$ (d) $\dfrac{1}{2}$

4. The value of a so that the point $(3, a)$ lies on the line $2x - 3y = 5$ is:

    (a) 12   (b) 3   (c) $\dfrac{1}{2}$ (d) $\dfrac{1}{3}$

Section B

5. Find the value of p for which the roots of quadratic equation $3x^2 - px + 3 = 0$ are real where $p > 0$.

6. Find the first four terms of an AP whose first term is –3 and the common difference is –3.

7. In figure, calculate OB.
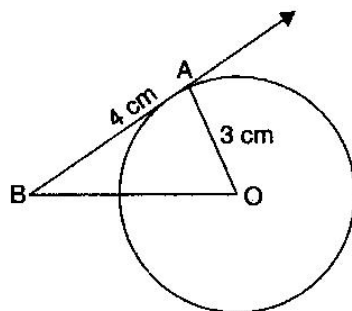
8. The length of the minute hand of a clock is 6 cm. Find the area swept by the minute hand during the time period 8:05 am and 8:45 am.

9. An underground water tank is in the form of a cuboid of edges 48 m, 36 m and 28 m. Find the volume of the tank.

10. The base radius and height of a right circular solid cone are 2 cm and 8 cm respectively. It is melted and recast into spheres of diameter 2 cm each. Find the number of spheres so formed.

Section C

11. Solve for x: $6x^2 - \sqrt{2}x - 2 = 0$

12. Which term of the AP 4, 12, 20, 28, ….. will be 120 more than its 21st term?

13. In the figure, O is the centre of the circle and PT is a tangent at T. If PC = 3 cm and PT = 6 cm, then calculate the radius of the circle.
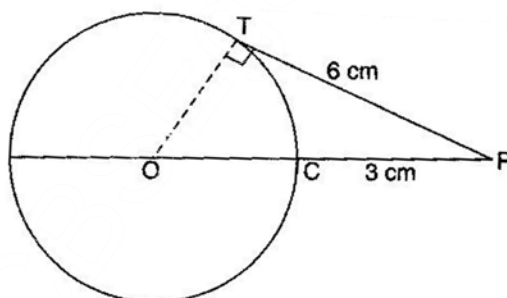
14. The angle of elevation of the top of the hill at the foot of the tower is 60° and the angle of elevation of the top of the tower from the foot of the hill is 30°. If the tower is 50 m high, then find the height of the hill.

15. One card is drawn from a well-shuffled deck of 52 cards. Find the probability of getting:
    (i) a king of red colour   (ii) a face card
    (iii) a red face card   (iv) the jack of hearts
    (v) a spade   (vi) the queen of diamonds

16. Two vertices of a triangle ABC are given by A (2, 3) and B $(-2,1)$ and its centroid G(1,2/3). Find the coordinates of the third vertex C of the $\triangle$ ABC.

17. Determine the ratio in which the point P$(m, 6)$ divides the join of A$(-4,3)$ and B $(2,8)$. Also find the value of m.
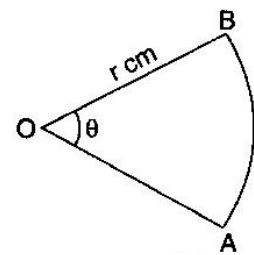
18. AB is a chord of a circle of radius 10 cm. The chord subtends a right angle at the centre of the circle. Find the area of the minor segment. $\left(\text{Use } \pi = 3.14\right)$
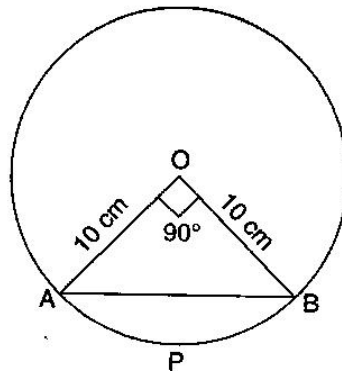
19. The figure given below represents a sector of a circle of radius r cm making an angle θ. The area of the sector is A cm² and the perimeter of the sector is 60 cm. Prove that:

   (i) $\theta = \dfrac{360°}{\pi}\left(\dfrac{30}{r} - 1\right)$

   (ii) $A = 30r - r^2$

20. The radii of the bases of two right circular solid cones of same height r_1 and r_2 respectively. The cones are melted and recast into a solid sphere of radius R. Show that the height of each cone is given by $h = \dfrac{4R^3}{r_1^3 + r_2^3}$.

Section D

21. Solve for x: $\left(a-b\right)x^2 + \left(b-c\right)x + \left(c-a\right) = 0$

22. The sum of the squares of two consecutive off numbers is 394. Find the numbers.

23. The sum of first six terms of an AP is 42. The ratio of its 10th term to its 30th term is 1 : 3. Calculate the first and the thirteenth term of the AP.

24. Prove that opposite sides of a quadrilateral circumscribing a circle subtend supplementary angles at the centre of the circle.

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

26. Draw a $\triangle$ LMN with $\angle$ M = $90°$, MN = 6 cm and NL = 8 cm. Construct another triangle similar to $\triangle$ LMN, such that each of its side is $\dfrac{4}{7}th$ of corresponding sides of $\triangle$ LMN.

27. From an aeroplane vertically above a straight horizontal plane, the angles of depression of two consecutive kilometer stones on the opposite sides of the aeroplane are found to be α and β. Show that the height of the aeroplane is $\dfrac{\tan \alpha \tan \beta}{\tan \alpha + \tan \beta}$.

28. A child's game has 8 triangles of which 3 are blue and rest are red and 10 squares of which 6 are blue and rest are red. One piece is lost at random. Find the probability that it is a:
    (i) triangle   (ii) square
    (iii) square of blue of colour   (iv) triangle of red colour

29. If $D\left(\dfrac{-1}{2},\dfrac{5}{2}\right)$, $E(7,3)$ and $F\left(\dfrac{7}{2},\dfrac{7}{2}\right)$ are the mid-points of sides of $\triangle ABC$, then find the area of the

    $\triangle ABC$.

30. Two types of water tankers are available in a shop. One is in a cubic form of dimensions 1 m x 1 m x 1 m and another is in the form of cylindrical form of diameter 1 m and height is also 1 m. The shopkeeper advises to purchase cuboid tank to a customer.
    (i) Calculate the volume of the both tankers.
    (ii) Which value is depicted by the shopkeeper?

                                                              [Value Based Question]

31. A tent is in the form of a cylinder of diameter 4.2 m and height 4 m, surmounted by a cone of equal base and height 2.8 m. Find the capacity of the tent and the cost of canvas for making the tent at Rs.100 per sq. m.