MATHEMATICS

Sample Question Paper

2

Section 'A'

Question numbers 1 to 10 carry 1 mark each. For each of these questions four alternative choices have been provided of which only one is correct. Select the correct choice.

1. For some integer m, every even integer is of the form :

   (a) m. (b) $m + 1$. (c) $2m$. (d) $2m + 1$.

2. The product of a non-zero rational and an irrational number is :

   (a) always irrational. (b) always rational. (c) rational or irrational. (d) one.

3. Given that one of the zeroes of the cubic polynomial $ax^3 + bx^2 + cx + d$ is zero, the product of the other two zeroes is :

   (a) $-\dfrac{c}{a}$ (b) $\dfrac{c}{a}$ (c) 0 (d) $-\dfrac{b}{a}$

   OR

   The zeroes of the quadratic polynomial $x^2 + kx + k$, $k \neq 0$

   (a) cannot both be positive (b) cannot both be negative

   (c) are always unequal (d) are always equal

4. Which of the following is a quadratic equation?

   (a) $x^2 + 2x + 1 = (4 - x)^2 + 3$

   (b) $-2x^2 = (5 - x)\left(2x - \dfrac{2}{5}\right)$

   (c) $(k + 1)x^2 + \dfrac{3}{2}x = 7$, where $k = -1$

   (d) $x^3 - x^2 = (x - 1)^3$

   OR

   Values of k for which the quadratic equation $2x^2 - kx + k = 0$ has equal roots is :

   (a) 0 only (b) 4 (c) 8 only (d) 0, 8

5. The distance between the points A (0, 6) and B (0, –2) is :

   (a) 6 (b) 8 (c) 4 (d) 2

6. It is given that $\triangle ABC \sim \triangle PQR$, with $\dfrac{BC}{QR} = \dfrac{1}{3}$. Then, $\dfrac{ar\triangle PRQ}{ar\triangle BCA}$ is equal to :

   (a) 9 (b) 3 (c) $\dfrac{1}{3}$ (d) $\dfrac{1}{9}$

7. In the given figure, AB is a chord of the circle and AOC is its diameter, such that $\angle ACB = 50°$. If AT is the tangent to the circle at the point A, then $\angle BAT$ is equal to :

   (a) 65° (b) 60° (c) 50° (d) 40°
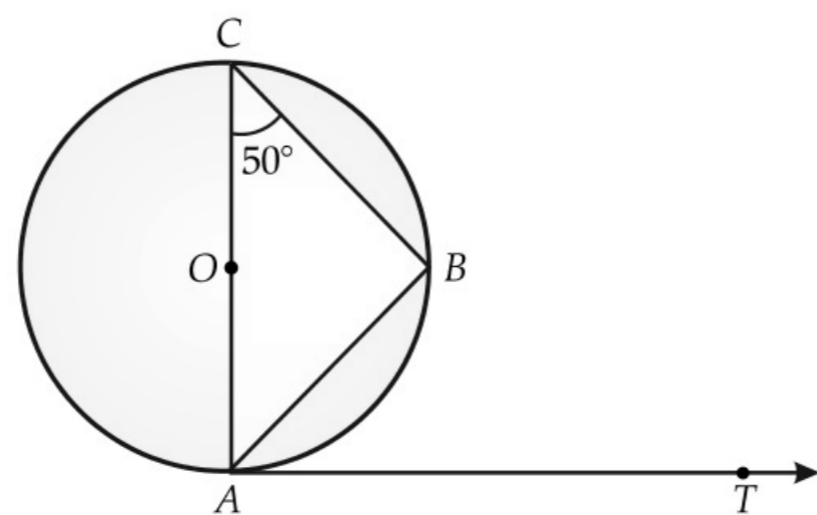
8. If the sum of the areas of two circles with radii R_1 and R_2 is equal to the area of a circle of radius R, then :

   (a) $R_1 + R_2 = R$ (b) $R_1^2 + R_2^2 = R^2$ (c) $R_1 + R_2 < R$ (d) $R_1^2 + R_2^2 < R^2$

9. A cylindrical pencil sharpened at one edge is the combination of :

   (a) a cone and a cylinder   (b) frustum of a cone and a cylinder

   (c) a hemisphere and a cylinder   (d) two cylinders

10. If an event that cannot occur, then its probability is :

    (a) 1   (b) $\dfrac{3}{4}$ (c) $\dfrac{1}{2}$ (d) 0

OR

If $P(A)$ denotes the probability of an event A, then :

(a) $P(A) < 0$ (b) $P(A) > 0$ (c) $0 \le P(A) \le 1$ (d) $-1 \le P(A) \le 1$

Question numbers 11 to 20 carry 1 mark each.

11. Find the least number that is divisible by all the numbers from 1 to 10 (both inclusive) :

12. What type of decimal expansion does a rational number has ? How can you distinguish it from decimal expansion of irrational numbers ?

13. For what value of k, do the equations $3x - y + 18 = 0$ and $6x - ky = -16$ represent coincident lines ?

[AI] 14. Write the nth term of the A.P. $\dfrac{1}{m}, \dfrac{1+m}{m}, \dfrac{1+2m}{m}, \ldots$
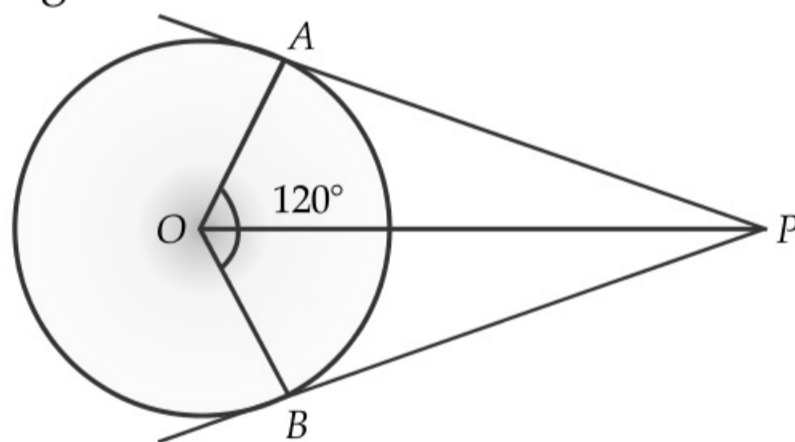
OR

Find the tenth term of the sequence $\sqrt{2}, \sqrt{8}, \sqrt{18}, \ldots,$

15. Q is a point on the line segment AB such that $BQ = \dfrac{5}{7} \times AB$. What is the ratio in which AB is divided ?

OR

Find the area of the triangle with vertices $(0, 0) (6, 0)$ and $(0, 5)$

16. In the figure, PA and PB are tangents to a circle with centre O. If $\angle AOB = 120°$, then find $\angle OPA$.

17. If $\sec\theta . \sin\theta = 0$, then find the value of θ.

OR

Evaluate : $\dfrac{1 + \tan^2 A}{1 + \cot^2 A}$

18. What is the perimeter of the sector with radius 10.5 cm and sector angle 60° ?

19. A rectangular sheet of paper 40 cm × 22 cm is rolled to form a hollow cylinder of height 40 cm. Find the radius of the cylinder.

20. If the median of a series exceeds the mean by 3, find by what number the mode exceeds its mean ?

Section 'B'

Question numbers 21 to 26 carry 2 marks each.
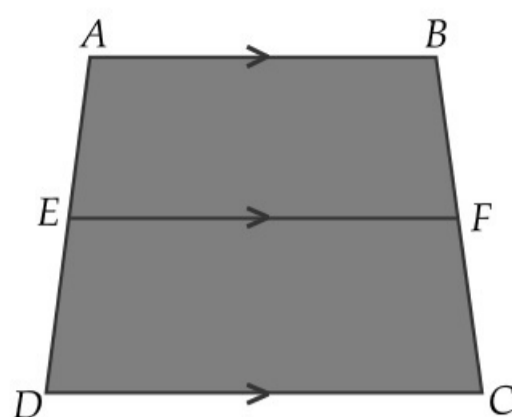
21. Show that $5\sqrt{6}$ is an irrational number.

22. In an equilateral triangle of side $3\sqrt{3}$ cm, find the length of the altitude.

OR

In the given figure, if ABCD is a trapezium in which AB ||CD|| EF, then prove that $\dfrac{AE}{ED} = \dfrac{BF}{FC}$.

23. Evaluate : $\dfrac{3\tan^2 30° + \tan^2 60° + \cosec 30° - \tan 45°}{\cot^2 45°}$

24. If the angles of elevation of the top of a tower from two points distant a and b ($a > b$) from its foot and in the same straight line from it are respectively 30° and 60°, then find the height of the tower.

25. Find the area of minor segment of a circle of radius 14 cm, when its central angle is 60°. Also, find the area of corresponding major segment. [Use $\pi = \dfrac{22}{7}$]

26. The data regarding marks obtained by 48 students of a class in a class test is given below. Calculate the modal marks of students.

Marks obtained	0 – 5	5 – 10	10 – 15	15 – 20	20 – 25	25 – 30	30 – 35	35 – 40	40 – 45	45 – 50
Number of students	1	0	2	0	0	10	25	7	2	1

OR

Find the unknown values in the following table :

Class Interval	Frequency	Cumulative Frequency
0 – 10	5	5
10 – 20	7	x_1
20 – 30	x_2	18
30 – 40	5	x_3
40 – 50	x_4	30

Section 'C'

Question numbers 27 to 34 carry 3 marks each.

27. Find the values of a and b so that $8x^4 + 14x^3 - 2x^2 + ax + b$ is exactly divisible by $4x^2 + 3x - 2$.

28. 2 men and 7 boys can do a piece of work in 4 days. It is done by 4 men and 4 boys in 3 days. How long would it take for one man or one boy to do it ?

29. Solve for x :

$\dfrac{x+1}{x-1} + \dfrac{x-2}{x+2} = 4 - \dfrac{2x+3}{x-2}$; where $x \neq 1, -2, 2$.

OR

If the roots of the equation $(a^2 + b^2) x^2 - 2 (ac + bd) x + (c^2 + d^2) = 0$ are equal, prove that $\dfrac{a}{b} = \dfrac{c}{d}$.

30. In an A.P. the sum of first n terms is $\dfrac{3n^2}{2} + \dfrac{13n}{2}$. Find the 25th term.

30. In an A.P. the sum of first n terms is $\dfrac{3n^2}{2} + \dfrac{13n}{2}$. Find the 25th term.

31. From an airport, two aeroplanes start at the same time. If speed of first aeroplane due to north is 500 km/h and that of other due to East is 650 km/h then find the distance between the two aeroplanes after 2 hours.

32. ABC is a triangle. A circle touches sides AB and AC produced and side BC at X, Y and Z respectively. Show that AX = $\dfrac{1}{2}$ perimeter of $\triangle$ABC.

OR

Prove that the intercept of a tangent between a pair of parallel tangents to a circle subtend a right angle at the centre of the circle.

33. If cosec θ + cot $\theta = p$, then prove that $\cos \theta = \dfrac{p^2 - 1}{p^2 + 1}$.

34. In a single throw of a pair of different dice, what is the probability of getting **(i)** a prime number on each dice ? **(ii)** a total of 9 or 11 ?

OR

AI The probability of selecting a red ball at random from a jar that contains only red, blue and orange balls is $\dfrac{1}{4}$. The probability of selecting a blue balls at random from the same jar is $\dfrac{1}{3}$. If the jar contains 10 orange balls, find the total number of ball in the jar.

Section 'D' Question numbers 35 to 40 carry 4 marks each.

35. The sum of the squares of two consecutive odd numbers is 394. Find the numbers.

36. Point $A(-1, y)$ and $B(5, 7)$ lie on a circle with centre $O(2, -3y)$. Find the values of y. Hence find the radius of the circle.

37. Construct a right triangle whose hypotenuse and one side measures 10 cm and 8 cm respectively. Then construct another triangle whose sides are $\dfrac{4}{5}$ times the corresponding sides of this triangle.

OR

Construct a triangle whose perimeter is 13·5 cm and the ratio of the three sides is 2 : 3 : 4.

AI 38. The angle of elevation of a jet fighter from point A on ground is 60°. After flying 10 seconds, the angle changes to 30°. If the jet is flying at a speed of 648 km/hour, find the constant height at which the jet is flying.

OR

Two posts are k metre apart and the height of one is double that of the other. If from the mid-point of the line segment joining their feet, an observer finds the angles of elevation of their tops to be complementary, then find the height of the shorter post.

39. A well of diameter 4 m is dug 14 m deep. The earth taken out is spread evenly all around the well to form a 40 cm high embankment. Find the width of the embankment.

OR

The internal and external diameters of a hollow hemispherical vessel are 16 cm and 12 cm respectively. If the cost of painting 1 cm^2 of the surface area is ₹ 5·50, find the total cost of painting the vessel all over. (Use $\pi = 3\cdot14$)

40. The following are the ages of 200 patients getting medical treatment in a hospital on a particular day :

Age (in years)	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60	60 – 70
Number of patients	40	22	35	50	23	30

Write the above distribution as 'less than type' cumulative frequency distribution and also draw an ogive to find the median.