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General Instructions:

1. All questions are compulsory.
2. The question paper consists of 31 questions divided into four sections – A, B, C and D. Section A comprises of 4 questions of 1 mark each, Section – B comprises of 6 questions of 2 marks each, Section C has 10 questions of 3 marks each and Section D comprises of 11 questions of 4 marks each.
3. There is no overall choice.
4. Use of calculators is not permitted.

Section – A

Question numbers 1 to 4 carry 1 mark each.

1. The first three terms of an A.P. are $3y - 1, 3y + 5$ and $5y + 1$ respectively. Find the value of y.
2. AB and CD are common tangents to the circles which touch each other at D. If AB = 5 cm, find CD.
3. If the ratio of the height of a lamp post and the length of its shadow is $\sqrt{3} : 1$, then find the angle of elevation of the sun.
4. The coordinates of the centroid of a triangle are (1, 4) and two of its vertices are (– 8, 6) and (9, 5). Find the third vertex.

Section – B

Question numbers 5 to carry 2 marks each.

5. If one root of the equation $x^2 - 3x + q = 0$ is twice the other root, find the value of q.
6. Which term of the A.P. 3, 15, 27, 39,……….. will be more than its 21st term?

7. In the figure, OP is equal to diameter of the circle. Prove that ΔABP is equilateral.
8. A die is thrown once. Find the probability of getting (a) an even price number (b) multiple of 3
9. Find the probability of getting 53 Fridays in a leap year.
10. The long hand of a clock is 6 cm long. Find the distance travelled by its tip in 2 days.

Section – C

Question numbers 11 to 20 carry three marks each.

11. For what value of k, are the roots of quadratic equation $(k + 4)x^2 + (k + 1)x + 1 = 0$ equal?
12. The sum of first 8 terms of an A.P. is 100 and the sum of its first 19 terms is 551. Find the A.P.
13. A circle touches the side BC of ΔABC of P, touches AB at Q and AC at R. Show that AQ = $\frac{1}{2}$ (Perimeter of ΔABC)
14. Draw a ΔABC with side BC = 7 cm, ∠B = 45^0 and ∠A = 105^0. Then construct a triangle whose sides are $\frac{3}{5}$ times the corresponding sides of ΔABC.
15. The horizontal distance between two poles is 15 m. The angle of depression of the top of first pole as seen from the top of the second pole is 30^0. If the second pole is 24 m, find the height of the first pole. (Use $\sqrt{3} = 1,732$)
16. Find the area of the shaded region. OA = 14 cm.
17. Find the ratio in which the line segment joining the points A $(- 2, 7)$ and B $(3, - 3)$ is divided by x – axis. Also find the coordinates of the point of division.
18. The line segment joining the points A $(2, 1)$ and B $(5, - 8)$ is trisected at P and Q such that P is nearer to A. If P lies on the line $2x - y + k = 0$, find k.
19. A toy is in the form of a cone mounted on a hemisphere of same radius 7 cm. If the total height of the toy is 31 cm, find the total surface area. $\left(Use\ \pi = \frac{22}{7} \right)$
20. A bucket is in the form of a frustum of height of 15 cm. The radius of bigger end of the bucket is 14 cm. If the volume of the bucket is 5390 cm³, find the radius of its base.

Section – D

Question numbers 21 to 31 carry 4 marks each.

21. An express train takes 1 hour less than a passenger train to travel 132 km between two stations. If the average speed of the express train is 11 km/hour more than that of the passenger train, find the average speed of both the trains.

22. Solve for x: $\dfrac{1}{2a+b+2x} = \dfrac{1}{2a} + \dfrac{1}{b} + \dfrac{1}{2x}$

23. The sum of first n terms of an A.P. is $5n^2 + 3n$. If its mth term is 168, find the value of m. Also find the 20th term.

24. Prove that the tangent at any point of a circle is perpendicular to the radius at the point of contact.

25. In the figure, l and m are two parallel tangents to a circle with centre O, touching the circle at A and B respectively. Another tangent at C intersects l at D and m at E. Prove that $\angle DOE = 90^0$.

26. From a point 100 m above a lake, the angle of elevation of stationary helicopter is 30^0 and the angle of depression of its reflection in the lake is 60^0. Find, at what height is the helicopter (stationary)?

27. The probability of selecting a green ball at random is $\dfrac{1}{3}$, of selecting a white ball is $\dfrac{1}{4}$ from a bag consisting of green, white and yellow balls. If there are 10 yellow balls, find the total balls.

28. Find the area of the triangle formed by joining the mid – points of the sides of ΔABC with vertices A $(0, -1)$, B$(2, 1)$ and C$(0, 3)$. Find the ratio of area of this triangle to the area of triangle ABC.

29. A school thought of collecting rain water from roof top of building whose dimensions are 44 m $\times$ 40 m by draining it into a cylindrical vessel having diameter 14 m and height 4.2 m. If the vessel is just full, find the rainfall recorded in cm. What values are exemplified by the school management?

30. The height of a cone is 30 cm. A small cone is cut off at the top by a plane parallel to the base. If its volume is $\dfrac{1}{27}$ of the volume of the given cone, at what height above the base is the section made?

31. Three circles each of radius 6 cm, touch each other externally. Find the area enclosed between them. Take $\pi = 3.14$ and $\sqrt{3} = 1.732$