

SECTION A (1X20=20 MARKS)

CHOOSE THE MOST APPROPRIATE OPTION:

1. For what least value of 'n' a natural number, $(24)^n$ is divisible by 8?

- a) 0
- b) -1
- c) 1

2. Which of the following is polynomial?

- a) $x^2 - 6\sqrt{x} + 2$
- b) $\frac{5}{x^2 - 3x + 1}$
- c) none of these

3. Two APs have the same common difference. The 1st term of one of these is -1 and that of other is -8 . Then the difference between their 4th terms is

- a) -1
- b) -8
- c) 7

4. If the square of the 7th term of an arithmetic progression with positive common difference equals the product of the 3rd and 17th terms, then the ratio of the first term to the common difference is

- a) 2:3
- b) 3:2
- c) 3:4

5. If the vertex of a triangle ABC is A(5,7) and its centroid is E(7,5). Find the length of the median of the triangle that cuts side BC at D.

- a) $6\sqrt{2}$
- b) $3\sqrt{2}$
- c) $4\sqrt{3}$

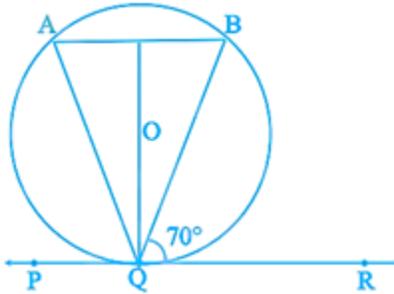
6. If the angles of elevation of the top of a tower from two points at distances a and b from the base and in the same straight line with it are complementary, then the height of the tower is

- a) $(ab)^{1/2}$
- b) ab
- c) $(a/b)^{1/2}$

7. If $\sin\theta + \operatorname{cosec}\theta = 2$, then the value of $\sin^{100}\theta + \operatorname{cosec}^{100}\theta$ is,

- a) 100
- b) 2
- c) 1

8. In the given figure, if PQR is the tangent to a circle at Q, whose centre is O, AB is a chord parallel to PR and $\angle BQR = 70^\circ$, then $\angle AQB$ is equal to



- a) 20°
- b) 40°
- c) 35°

9. Given that $\text{HCF}(63,117) = 63m + 117n$, where m and n are integers, then find $m+n$.

- a) 1
- b) 0
- c) -1

10. If the radii of two concentric circles are 4 cm and 5 cm, then the length of each chord of one circle which is the tangent to the other circle is

- a) 3 cm
- b) 6 cm
- c) 9 cm

11. A right circular cylinder of radius r cm and height h cm ($h > 2r$) just encloses a sphere of diameter:

- a) $2r$ cm
- b) h cm
- c) $2h$ cm

12. If the sum of the circumferences of two circles with radii R_1 and R_2 is equal to the circumference of a circle of Radius R , then

- (a) $R_1 + R_2 = R$
- (b) $R_1 + R_2 > R$
- (c) $R_1 + R_2 < R$

13. Find the simplified value of $(\sec\theta - \cos\theta)^2 + (\text{cosec}\theta - \sin\theta)^2 - (\cot\theta - \tan\theta)^2$.

- a) 0
- b) 1
- c) 3

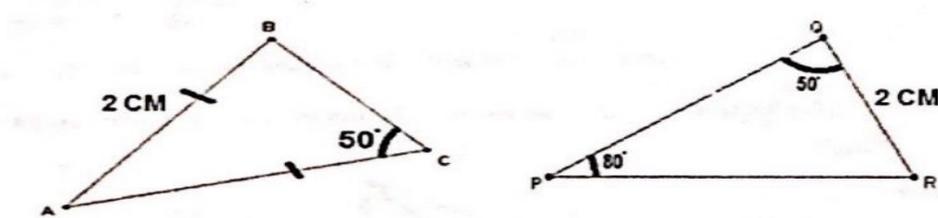
DO AS DIRECTED IN THE MOST CONCISE MANNER:

14. An army contingent of 616 members is to march behind an army band of 32 members in a parade. The two groups are to march in the same number of columns. What is the maximum number of columns in which they can march?

15. Find the value of 'k' such that the quadratic polynomial $x^2 - (k + 6)x + 2(2k + 1)$ has sum of the zeros is half of their product.

16. If the centroid of the triangle ABC with vertices A(a,a), B(b,b) and C(c,c) is at origin, find the value of $a^3 + b^3 + c^3$.

17. In the figure given below, is $\triangle ABC \sim \triangle PQR$?



18. Find the median of a distribution whose mode is 11 and mean is 20.

19. It is given that in a group of 3 students, the probability of 2 students not having the same birthday is 0.992. What is the probability that the 2 students have the same birthday?

20. Is $7 + 7 \times 13 \times 15$ a composite number? Why? Why not?

SECTION B (2X6=12 MARKS)

21. Prove that $\frac{\sqrt{2}}{\sqrt{3} + \sqrt{2}}$ is irrational if $\sqrt{6}$ is irrational.

22. Determine the ratio in which the line $2x + y - 4 = 0$ divides the line segment joining the points A(2, -2) and B(3, 7).

23. Show that
$$\frac{\cos^2(45^\circ + \theta) + \cos^2(45^\circ - \theta)}{\tan(60^\circ + \theta)\tan(30^\circ - \theta)} = 1.$$

24. A number is chosen from all two digit numbers. Find the probability that it is divisible by 3.

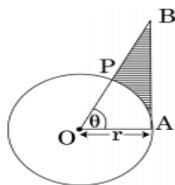
25. Draw a circle of diameter 12 cm and divide it's radius in the ratio 4:3.

26. Solve $\frac{x^{2002} + 4x^{2001}}{4x^{2000}} = 2449.25$

SECTION C (3X8=24 MARKS)

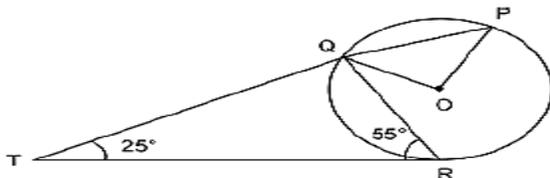
27. Below fig. shows a sector of a circle, centre O, containing an angle θ° . Prove that:

Area of shaded region is $\left(\frac{r^2}{2}\right) \left(\tan\theta - \frac{\pi\theta}{180}\right)$



28. Two poles of equal heights are standing opposite each other on either side of the road, which is 80 m wide. From a point between them on the road, the angles of elevation of the top of the poles are 60° and 30° , respectively. Find the height of the poles and the distances of the point from the poles.

29. In the figure below, P, Q and R are points on a circle with centre O. The tangent to the circle at R intersects secant PQ at T. Find $\angle POQ$.



30. Find all roots of $x^3 - 2x^2 - (4+2\sqrt{3})x + (8+4\sqrt{3})$ given that one of its zero is $(\sqrt{3}+1)$.

31. Find the area of a circle passing through the points $(6, -6)$, $(3, -7)$ and $(3, 3)$.

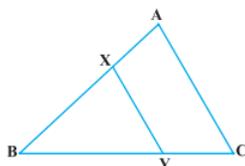
32. Following distribution shows the marks obtained by a class of 100 students:

Marks	10-20	20-30	30-40	40-50	50-60	60-70
Frequency	10	15	30	32	8	5

Change the distribution to less than type distribution and draw its Ogive.

33. Two water taps together can fill a tank in $9\frac{3}{8}$ hours. The tap of larger diameter takes 10 hours less than the smaller one to fill the tank separately. Find the time in which each tap can separately fill the tank.

34. Line segment XY is parallel to side AC of ΔABC and it divides the triangle into two parts of equal areas. Find the ratio $\frac{AX}{AB}$.



SECTION D (4X6=24 MARKS)

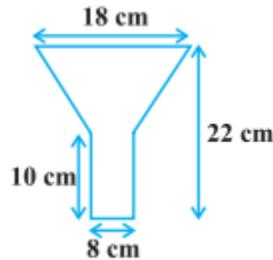
35. Let a_1, a_2, \dots, a_{52} be integers in AP such that $a_1 < a_2 < \dots < a_{52}$. Suppose, their arithmetic mean is one less than the arithmetic mean of a_2, a_3, \dots, a_{52} . If $a_{52} = 100$, then find the sum of the arithmetic progression.

36. Solve the following pair of linear equations:

$$(a - b)x + (a + b)y = a^2 - 2ab - b^2$$

$$(a + b)(x + y) = a^2 + b^2$$

37. An oil funnel made of tin sheet consists of a 10 cm long cylindrical portion attached to a frustum of a cone. If the total height is 22 cm, diameter of the cylindrical portion is 8 cm and the diameter of the top of the funnel is 18 cm, find the area of the tin sheet required to make the funnel.



38. BL and CM are medians of a triangle ABC right angled at A. Prove that $4(BL^2 + CM^2) = 5 BC^2$

39. From the following distribution, find the missing frequencies if the median and mode of the distribution are 33.5 and 34 respectively.

classes	Frequency
0-10	4
10-20	16
20-30	?
30-40	?
40-50	?
50-60	6
60-70	4
total	230

40. Using trigonometric identities, prove that: $\frac{(1 + \cot A + \tan A)(\sin A - \cos A)}{\sec^3 A - \operatorname{cosec}^3 A} = \sin^2 A \cos^2 A$.
