MATHEMATICS BASIC 2024

SECTION - A

20 Marks

*(Q. No. **1** to **20** are Multiple Choice Questions of **1** mark each.)*

1. From an external point P, a tangent PA is drawn to a circle. The number of tangents through P parallel to PA is:

(a) 2 (b) more than 2

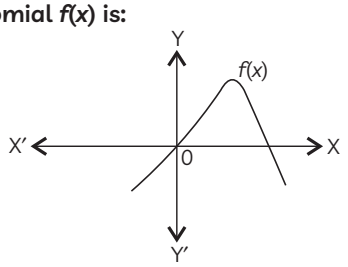
(c) 1 (d) 0 1

2. If the volume of a sphere is $\frac{11}{21}$ cm^3, then the radius of the sphere is:

(a) 2 cm (b) 4 cm

(c) $\frac{1}{2}$ cm (d) $\frac{1}{4}$ cm 1

3. In the given figure, graph of a polynomial $f(x)$ is shown. The number of zeroes of polynomial $f(x)$ is:



(a) 3 (b) 1

(c) 0 (d) 2 1

4. If for a distribution, $\sum_{1}^{n} f_i x_i = 132 + 5p$, $\sum_{1}^{n} f_i$ = 20 and the mean of the distribution is 8.1, then the value of p is:

(a) 3 (b) 6

(c) 4 (d) 5 1

5. If in an A.P., a = 2 and S_{10} = 335, then its 10th term is:

(a) 55 (b) 65

(c) 68 (d) 58 1

6. From a solid cube of side 14 cm, a sphere of maximum diameter is carved out. The radius of sphere is:

(a) 7 cm (b) 14 cm

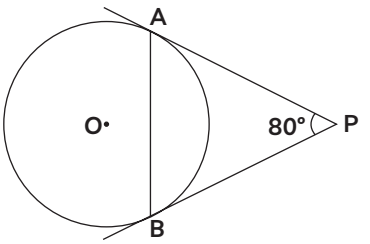
(c) $\frac{7}{2}$ cm (d) $\sqrt{14}$ cm 1

7. If the two zeroes of a quadratic polynomial are $\pm \sqrt{5}$, then the quadratic polynomial is:

(a) $x^2 + 5$ (b) $(x+\sqrt{5})^2$

(c) $4(x^2 - 5)$ (d) $x^2 - \sqrt{5}$ 1

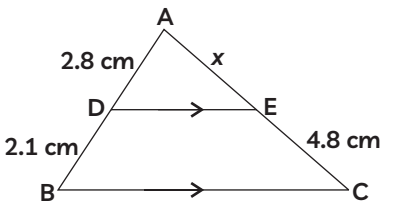
8. In the given figure, tangents PA and PB drawn from P to circle are inclined to each other at an angle of 80°. The measure of ∠PAB is:



(a) 80° (b) 60°

(c) 50° (d) 40° 1

9. If in the given figure, DE || BC. If AD = 2.8 cm, DB = 2.1 cm and EC = 4.8 cm, then the value of x is:



(a) 3.6 cm (b) 2.4 cm

(c) 6.4 cm (d) 4.8 cm 1

10. In a right-angle triangle ABC, ∠A = 90° and AB = AC. The value of sin C is:

(a) 0 (b) $\frac{\sqrt{3}}{2}$

(c) $\frac{1}{2}$ (d) $\frac{1}{\sqrt{2}}$ 1

11. Two fair coins are tossed together. The probability of getting 2 heads, is:

(a) $\frac{1}{2}$ (b) $\frac{3}{4}$

(c) $\frac{1}{4}$ (d) $\frac{3}{8}$ 1

12. If the mean and median of a data are 10 and 11 respectively, then mode of the data is:

(a) 12 (b) 8

(c) 20 (d) 13 1

13. If the distances of the point P(x, y) from (1, 0) and (0, 1) are equal, then which of the following is true?

(a) $x + y = 0$ (b) $x = y + 1$

(c) $y = x + 1$ (d) $x = y$ 1

14. The value(s) of k for which the quadratic equation $5x^2 - 9kx + 5 = 0$ has real and equal roots, is/are:

(a) $\frac{-10}{9}$ (b) $\pm\frac{9}{10}$

(c) $\frac{10}{9}$ (d) $\pm\frac{10}{9}$ 1

15. The lines represented by linear equations $x = a$ and $y = b (a \neq b)$ are:

(a) intersecting at (a, b)

(b) intersecting at (b, a)

(c) parallel

(d) coincident 1

16. If $\cos\theta = \frac{1}{\sqrt{2}}$ then $\tan\theta$ is equal to:

(a) $\frac{1}{\sqrt{2}}$ (b) 0

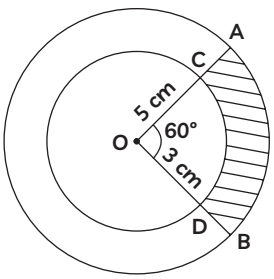
(c) 1 (d) $\sqrt{2} + 1$ 1

17. A die is thrown once. The probability of getting a number less than 6, is:

(a) 0 (b) $\frac{5}{6}$

(c) $\frac{1}{6}$ (d) 1 1

18. In the given figure, two concentric circles of radii 5 cm and 3 cm have their centre O. OAB is a sector of outer circle making an angle of 60° at the centre while OCD is the sector of smaller circle. The area of the shaded region is:



(a) $\frac{7\pi}{2}$ cm^2 (b) $\frac{8\pi}{3}$ cm^2

(c) $\frac{25\pi}{6}$ cm^2 (d) $\frac{3\pi}{2}$ cm^2 1

Assertion-Reason Based Questions

Directions: In question numbers 19 and 20, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct option from the following:

(a) Both Assertion (A) and Reason (R) are true. Reason (R) is the correct explanation of Assertion (A).

(b) Both Assertion (A) and Reason (R) are true. Reason (R) is not the correct explanation of Assertion (A).

(c) Assertion (A) is true, but Reason (R) is false.

(d) Assertion (A) is false, but Reason (R) is true.

19. Assertion (A): The distance of P(a, b) from origin is $a^2 + b^2$.

Reason (R): The distance between two points A(x_1, y_1) and B(x_2, y_2) is $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$. 1

20. Assertion (A): $\sqrt{2}(5 - \sqrt{2})$ is an irrational number.

Reason (R): Product of two irrational numbers is always irrational. 1

SECTION - B

10 Marks

*(Q. No. **21** to **25** are Very Short Answer type questions of **2** marks each.)*

21. Evaluate: $5\sin^2 45° - \sec 60° \cot^2 30°$. 2

22. Point P(x, y) divides the line segment joining the points A$(-1, 3)$ and B$(9, 8)$ such that AP : PB = k : 1. If the co-ordinates of P are such that $x = y$ then find the value of k. 2

23. If Q$(0, 2)$ is equidistant from P$(5, -3)$ and R$(x, 7)$, find the value(s) of x.

OR

If A$(1, 1)$ and B$(7, 9)$ are the end points of a diameter of a circle, then find the co-ordinates of the centre of the circle. 2

24. There are 80 cards numbered from 1 to 80. One card is drawn at random from them. Find the probability that the number on the selected card is not divisible by 8. 2

25. Prove that $-7 - 2\sqrt{3}$ is an irrational number, given that $\sqrt{3}$ is an irrational number.

OR

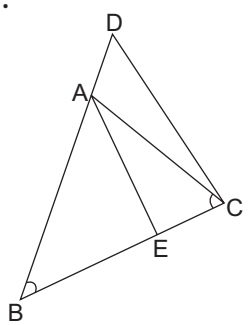
Explain why $(7 \times 11 \times 13 + 2 \times 11)$ is not a prime number. 2

SECTION - C

18 Marks

*(Q. No. **26** to **31** are Short Answer type questions of **3** marks each.)*

26. In the given figure, $\angle ABC = \angle ACB$ and $\frac{BC}{BE} = \frac{BD}{AC}$.



Show that $\Delta ABE \sim \Delta DBC$ and AE || DC. 3

27. A vessel is in the form of a hollow hemisphere surmounted by a hollow cylinder. The diameter of the hemisphere is 14 cm and the total height of the vessel is 13 cm. Find the inner surface area of the vessel.

OR

A solid toy is in the form of a hemisphere surmounted by a right circular cone. The height of the cone is 2 cm and the diameter of the base is 4 cm. Determine the volume of the toy. 3

28. Prove that $(\sin\theta + \text{cosec}\,\theta)^2 + (\cos\theta + \sec\theta)^2 = 7 + \tan^2\theta + \cot^2\theta$.

OR

If $\cos A = \frac{5}{13}$, then verify that $\frac{\cos A}{1-\tan A} + \frac{\sin A}{1-\cot A} = \cos A + \sin A$. 3

29. The altitude of a right-angled triangle is 7 cm less than its base. If its hypotenuse is 17 cm long, then

(A) represent the above information in the form of a quadratic equation.

(B) find the length of the sides of the triangle. 3

30. Find the HCF and LCM of 260 and 910 by prime-factorisation method. 3

31. If one zero of the ploynomial $x^2 - 8x + k$ exceeds the other by 2, then find the zeroes and the value of k. 3

SECTION - D

20 Marks

*(Q. No. **32** to **35** are Long Answer type questions of **5** marks each.)*

32. Using graphical method, solve the following pair of equations:

$x + 2y = 8$ and $3x - 2y = 12$

OR

The sum of the digits of a 2-digit number is 9. Also, nine times this number is twice the number obtained by reversing the order of the digits. Find the number. 5

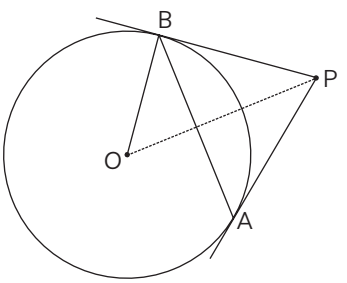
33. The marks obtained by 45 students of a class in a test are given below:

Marks	No. of Students
40-45	8
45-50	9
50-55	10
55-60	9
60-65	5
65-70	4

Find the mean and median marks. 5

34. The angle of elevation of a helicopter in air from a point A on the ground is 45°. After a flight of 25 seconds, the angle of elevation changes to 30°. If the helicopter is flying at a constant height of 2500 m, find the speed of the helicopter. (Use $\sqrt{3} = 1.73$) 5

35. In the given figure, AB is chord of length 6 cm of a circle of radius 5 cm. The tangents at A and B intersect at a point P. Find the length of PB.



OR

Prove that the parallelogram circumscribing a circle is a rhombus. Also, find area of the rhombus, if radius of circle is 3 cm and length of one side of the rhombus is 10 cm. 5

SECTION - E

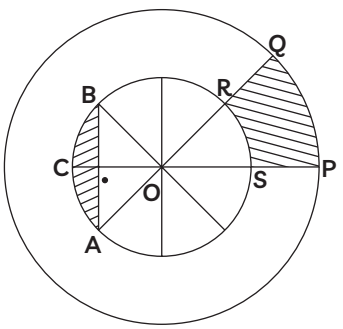
12 Marks

*(Q. No. **36** to **38** are case study based questions of **4** marks each.)*

36. *NSS (National Service Scheme) aims to connect the students to the community and to involve them in problem solving process.*

NSS symbol is based on the 'Rath' wheel of the Konark Sun Temple situated in Odisha. The wheel signifies the progress cycle of life.

The diagrmatic representation of the symbol is given below:



Observe the figure given above. The diameters of inner circle are equally placed. Given that OP = 21 cm, OS = 10 cm.

Based on the above information, answer the following questions:

(A) Find *m* ∠ROS. 1

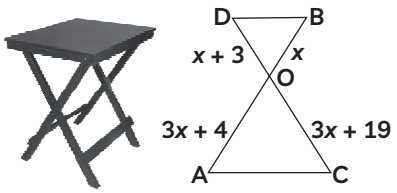
(B) Find the perimeter of sector OPQ. 1

(C) Find the area of shaded region PQRS.

OR

Find the area of shaded region ACB *i.e.*, the segment ACB. 2

37. *In the figure given below, a folding table is shown:*



The legs of the table are represented by line segments AB and CD intersecting at O. Join AC and BD.

Considering table top is parallel to the ground, and OB = x, OD = x + 3, OC = 3x + 19 and OA = 3x + 4, answer the following questions:

(A) Prove that ΔOAC is similar to ΔOBD. 1

(B) Prove that $\frac{OA}{AC} = \frac{OB}{BD}$. 1

(C) Observe the figure and find the value of *x*. Hence, find the length of OC.

OR

Observe the figure and find $\frac{BD}{AC}$. 2

38. *While preparing for a competitive examination, Akbar came across a match-stick pattern based question. The pattern is given below:*

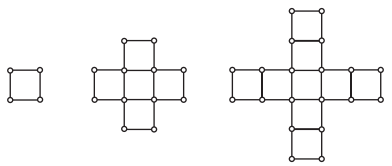


Fig. (1) *Fig. (2)* *Fig. (3)*

Based on the above information, answer the following questions:

(A) Write first term and common difference of the A.P. formed by number of squares in each figure. 1

(B) Write first term and common difference of the A.P. formed by number of sticks used in each figure. 1

(C) How many squares are there in Fig. (10)? Also, write the number of sticks used in Fig. (10).

OR

If 88 sticks are used to make m^{th} figure (Fig. (*m*)), find the value of *m*. How many squares are formed in this figure? 2