MATHEMATICS BASIC 2025

(Maximum Marks: 80)

(Time allowed : Three hours)

General Instructions:

Read the following instructions carefully and follow them:

(i)   *This Question paper contains **38** Questions. **All** questions are compulsory.*

(ii) *Question Paper is divided into **Five** Sections - **Section A, B, C, D** and **E**.*

(iii) *In **Section-A**, question numbers **1** to **18** are Multiple Choice Questions. (MCQs) and question numbers **19** & **20** are Assertion-Reason based questions of **1** mark each.*

(iv) *In **Section-B**, question numbers **21** to **25** are Very Short Answer (VSA) type questions, of **2** marks each.*

(v)   *In **Section-C**, question numbers **26** to **31** are Short Answer (SA) type questions carrying **3** marks each.*

(vi) *In **Section-D**, question numbers **32** to **35** are Long Answer (LA) type questions carrying **5** marks each.*

(vii) *In **Section-E**, question numbers **36** to **38** are **case-based integrated** units of assessment questions carrying **4** marks each. Internal choice is provided in **2** marks question in each case-study.*

(viii)*There is no overall choice. However, an internal choice has been provided in **2** questions in **Section-B**, **2** questions in **Section-C**, **2** question in **Section-D** and **3** questions of **2** marks in **Section-E**.*

(ix) *Draw neat figures wherever required. Take $\pi = \dfrac{22}{7}$ wherever required, if not stated.*
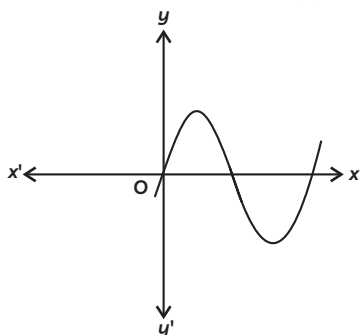
(x)   *Use of calculators is **NOT allowed**.*

SECTION - A   20×1=20 Marks

(Multiple Choice Questions)
*Section-A consists of **20** Multiple Choice Questions of **1** mark each.*

1. In the given figure, graph of polynomial $p(x)$ is shown. Number of zeroes of $p(x)$ is:

(a) 3   (b) 2

(c) 1   (d) 4   1

2. 22nd term of the A. P. : $\dfrac{3}{2}, \dfrac{1}{2}, \dfrac{-1}{2}, \dfrac{-3}{2}$ .... is:

(a) $\dfrac{45}{2}$ (b) -9

(c) $\dfrac{-39}{2}$ (d) -21 1
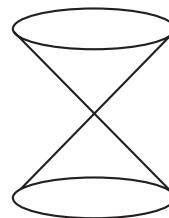
3. The line $2x - 3y = 6$ intersects x – axis at:

(a) $(0, -2)$ (b) $(0, 3)$

(c) $(-2, 0)$ (d) $(3, 0)$ 1

4. Two identical cones are joined as shown in the figure. If radius of base is 4 cm and slant height of the cone is 6 cm, then height of the solid is:

(a) 8 cm   (b) $4\sqrt{5}$ cm

(c) $2\sqrt{5}$ cm   (d) 12 cm   1

5. The value of k for which the system of equations $3x - 7y = 1$ and $kx + 14y = 6$ is inconsistent, is:

(a) – 6   (b) $\dfrac{2}{3}$

(c) 6   (d) $\dfrac{-3}{2}$ 1
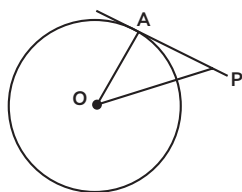
6. Two dice are rolled together. The probability of getting a sum more than 9 is:

(a) $\dfrac{5}{6}$ (b) $\dfrac{5}{18}$

(c) $\dfrac{1}{6}$ (d) $\dfrac{1}{2}$ 1

7. ABCD is a rectangle with its vertices at (2, – 2), (8, 4), (4, 8) and (– 2, 2) taken in order. Length of its diagonal is:

(a) $4\sqrt{2}$ (b) $6\sqrt{2}$

(c) $4\sqrt{26}$ (d) $2\sqrt{26}$ 1

8. In the given figure, PA is tangent to a circle with centre O. If $\angle APO = 30°$ and OA = 2.5 cm, then OP is equal to:

(a) 2.5 cm   (b) 5 cm

(c) $\dfrac{5}{\sqrt{3}}$ cm   (d) 2 cm   1

9. If probability of happening of an event is 57%, then probability of non-happening of the event is:
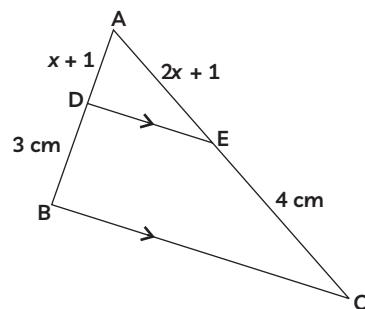
(a) 0.43   (b) 0.57

(c) 53%   (d) $\dfrac{1}{57}$ 1

10. OAB is sector of a circle with centre O and radius 7 cm. If length of arc $\overset{\frown}{AB} = \dfrac{22}{3}$ cm, then $\angle AOB$ is equal to:

(a) $\left(\dfrac{120}{7}\right)^\circ$ (b) 45°

(c) 60°   (d) 30°   1

11. In $\triangle ABC$, DE||BC, If AE = (2x + 1) cm, EC = 4 cm, AD = (x + 1) cm and DB = 3 cm, then value of x is:
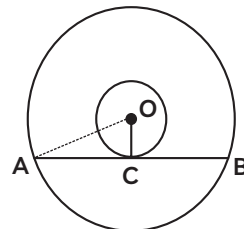

(a) 1   (b) $\dfrac{1}{2}$

(c) – 1   (d) $\dfrac{1}{3}$ 1

12. Three coins are tossed together. The probability that exactly one coin shows head, is:

(a) $\dfrac{1}{8}$ (b) $\dfrac{1}{4}$

(c) 1   (d) $\dfrac{3}{8}$ 1

13. In two concentric circles centred at O, a chord AB of the larger circle touches the smaller circle at C. If OA = 3.5 cm, OC = 2.1 cm, then AB is equal to:

(a) 5.6 cm   (b) 2.8 cm

(c) 3.5 cm   (d) 4.2 cm   1

14. If $\sqrt{3}\sin\theta = \cos\theta$, then value of θ is:

(a) $\sqrt{3}$ (b) 60°

(c) $\dfrac{1}{\sqrt{3}}$ (d) 30°   1

15. To calculate mean of a grouped data, Rahul used assumed mean method. He used $d = (x – A)$, where A is assumed mean. Then $\overline{x}$ is equal to:

(a) $A + \overline{d}$ (b) $A + h\overline{d}$

(c) $h(A + \overline{d})$ (d) $A - h\overline{d}$ 1
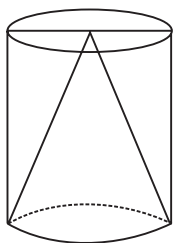
16. If the sum of first n terms of an A.P. is given by $S_n = \dfrac{n}{2}(3n+1)$, then the first term of the A.P. is:

(a) 2   (b) $\dfrac{3}{2}$

(c) 4   (d) $\dfrac{5}{2}$ 1

17. In $\triangle ABC$, $\angle B = 90°$, If $\dfrac{AB}{AC} = \dfrac{1}{2}$, then $\cos C$ is equal to:

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

(c) $\dfrac{\sqrt{3}}{2}$ (d) $\dfrac{1}{\sqrt{3}}$ 1

18. The volume of air in a hollow cylinder is 450 cm^3. A cone of same height and radius as that of cylinder is kept inside it. The volume of empty space in the cylinder is:

(a) 225 cm^3 (b) 150 cm^3

(c) 250 cm^3 (d) 300 cm^3 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:

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

(b) Both Assertion (A) and Reason (R) are true, but Reason (R) is not 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): $(a+\sqrt{b}).(a-\sqrt{b})$ is a rational number, where a and b are positive integers.

    Reason (R): Product of two irrationals is always rational.   1

20. Assertion (A): $\triangle ABC \sim \triangle PQR$ such, that $\angle A = 65°$, $\angle C = 60°$. Hence $\angle Q = 55°$.

    Reason (R): Sum of all angles of a triangle is 180°.   1

SECTION - B   5×2=10 Marks

(Very Short Answer Type Questions)

*Q. Nos. **21** to **25** are Very Short Answer type questions of **2** marks each.*

21. Solve the equation $4x^2 - 9x + 3 = 0$, using quadratic formula.

OR

Find the nature of roots of the equation $3x^2 - 4\sqrt{3}x + 4 = 0$.   2

22. In a trapezium ABCD, AB || DC and its diagonals intersect at O. Prove that $\dfrac{OA}{OC} = \dfrac{OB}{OD}$.   2

23. A box contains 120 discs, which are numbered from 1 to 120. If one disc is drawn at random from the box, find the probability that:

(A) it bears a 2 – digit number

(B) the number is a perfect square.   2

24. Evaluate : $\dfrac{\cos 45°}{\tan 30° + \sin 60°}$

OR

Verify that $\sin 2A = \dfrac{2\tan A}{1+\tan^2 A}$, for $A = 30°$.   2

25. Using prime factorisation, find the HCF of 180, 140 and 210.   2

SECTION - C   6×3=18 Marks

(Short Answer Type Questions)

*Q. Nos. **26** to **31** are Short Answer type questions of **3** marks each.*

26. If α, β are zeroes of the polynomial $8x^2 - 5x - 1$, then form a quadratic polynomial in x whose zeroes are $\dfrac{2}{\alpha}$ and $\dfrac{2}{\beta}$.

OR

Find the zeroes of the polynomial $p(x) = 3x^2 + x - 10$ and verify the relationship between zeroes and its coefficients.   3

27. Find length and breadth of a rectangular park whose perimeter is 100 m and area is 600 m². **3**

28. Three measuring rods are of lengths 120 cm. 100 cm and 150 cm. Find the least length of a fence that can be measured an exact number of times, using any of the rods. How many times each rod will be used to measures the length of the fence? **3**

29. AB and CD are diameters of a circle with centre O and radius 7 cm. If ∠BOD = 30°, then find the area and perimeter of the shaded region. **3**
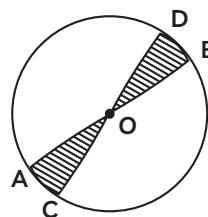
30. Prove that
$$\frac{\tan\theta}{1-\cot\theta}+\frac{\cot\theta}{1-\tan\theta} = \sec\theta\,\csc\theta + 1.$$ **3**

31. Find the A.P. whose third term is 16 and seventh term exceeds the fifth term by 12. Also, find the sum of first 29 terms of the A.P.

OR

Find the sum of the first 20 terms of an A.P. whose nth term is given by $a_n = 5 + 2n$. Can 52 be a term of this A.P. ? **3**

SECTION - D   4×5=20 Marks

(Long Answer Type Questions)

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

32. Solve the following pair of linear equations by graphical method: $2x + y = 9$ and $x – 2y = 2$. **5**

OR

Nidhi received simple interest of ₹ 1,200 when invested ₹ x at 6% p.a. and ₹ y at 5% p.a. for 1 year. Had she invested ₹ x at 3% p.a. and ₹ y at 8% p.a. for that year, she would have received simple interest of ₹ 1,260. Find the values of x and y. **5**

33. The given figures shows a circle with centre O and radius 4 cm circumscribed by ∆ABC, BC touches the circle at D such that BD = 6 cm, DC = 10, Find the length of AE.

5
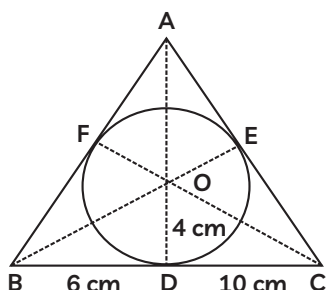
OR

PA and PB are tangents drawn to a circle with centre O. If ∠AOB = 120° and OA = 10 cm, then
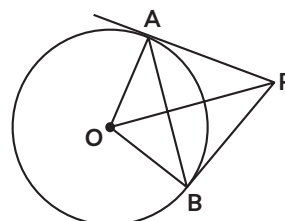
(A) Find ∠OPA. **1**
(B) Find the perimeter of ∆OAP. **3**
(C) Find the length of chord AB. **1**

34. The angle of depression of the top and the foot of a 9 m tall building from the top of a multi-storeyed building are 30° and 60° respectively. Find the height of the multi-storeyed building and the distance between the two buildings. (Use $\sqrt{3}$ = 1.73) **5**

35. Find 'mean' and 'mode' of the following data:

Class	15-20	20-25	25-30	30-35	35-40	40-45
Frequency	12	10	15	11	7	5

5

36.
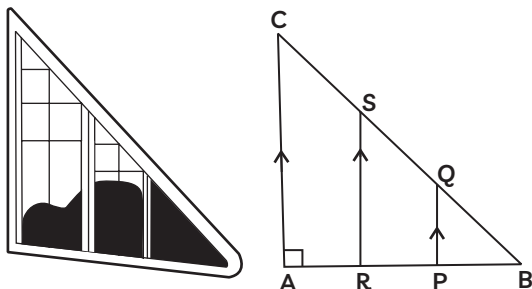
A triangular window of a building is shown above. Its diagram represents a ΔABC with ∠A = 90° and AB = AC. Points P and R trisect AB and PQ ∥ RS ∥ AC.

Based on the above, answer the following questions:

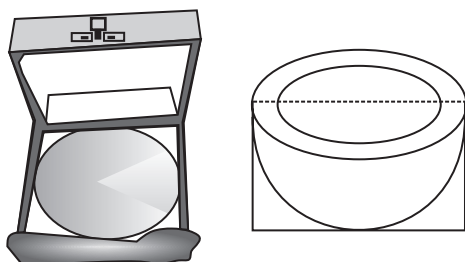(A) Show that ΔBPQ ~ ΔBAC.   1

(B) Prove that $PQ = \dfrac{1}{3}AC$.   1

(C) If AB = 3m, find length BQ and BS. Verify that $BQ = \dfrac{1}{2}BS$.

OR

Prove that $BR^2 + RS^2 = \dfrac{4}{9}BC^2$.   2

37.

A hemispherical bowl is packed in a cuboidal box. The bowl just fits in the box. Inner radius of the bowl is 10 cm. Outer radius of the bowl is 10.5 cm.

Based on the above, answer the following questions:

(A) Find the dimensions of the cuboidal box.   1

(B) Find the total outer surface area of the box.   1

(C) Find the difference between the capacity of the bowl and the volume of the box. (use π = 3.14).

OR

The inner surface of the bowl and the thickness is to be painted. Find the area to be painted.   2

38. *Gurveer and Arushi built a robot that can paint a path as it moves on a graph paper. Some co-ordinate of points are marked on it. It starts from (0, 0), moves to the points listed in order (in straight lines) and ends at (0, 0).*
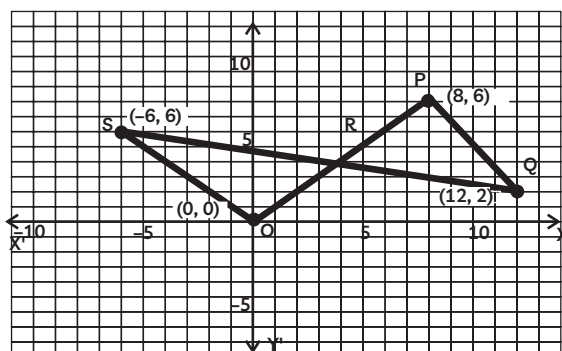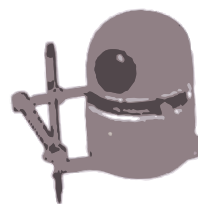
Arushi entered the points P(8, 6), Q(12, 2) and S(−6, 6) in order. The path drawn by robot is shown in the figure.

Based on the above, answer the following questions.

(A) Determine the distance OP.   1

(B) QS is represented by equation $2x + 9y = 42$. Find the co-ordinates of the point where it intersects y-axis.   1

(C) Point R(4.8, y) divides the line segment OP in a certain ratio, find the ratio, Hence, find the value of y.

OR

Using distance formula, show that $\dfrac{PQ}{OS} = \dfrac{2}{3}$.   2