MATHEMATICS BASIC 2023

SECTION - A
20 Marks

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

1. Let E be an event such that $P(\text{not } E) = \dfrac{1}{5}$, then P(E) is equal to:

(a) $\dfrac{1}{5}$ (b) $\dfrac{2}{5}$

(c) 0 (d) $\dfrac{4}{5}$ 1

2. If $p(x) = x^2 + 5x + 6$, then $p(-2)$ is:

(a) 20 (b) 0

(c) –8 (d) 8 1

3. The mode of the numbers 2, 3, 3, 4, 5, 4, 4, 5, 3, 4, 2, 6, 7 is:

(a) 2 (b) 3

(c) 4 (d) 5 1

4. How many tangents can be drawn to a circle from a point on it?

(a) One (b) Two

(c) Infinite (d) Zero 1

5. A quadratic equation whose one root is 2 and the sum of whose roots is zero, is:

(a) $x^2 + 4 = 0$ (b) $x^2 - 2 = 0$

(c) $4x^2 - 1 = 0$ (d) $x^2 - 4 = 0$ 1

6. Which of the following is not a quadratic equation?

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

(b) $2x - x^2 = x^2 + 5$

(c) $(\sqrt{2}x + \sqrt{3})^2 + x^2 = 3x^2 - 5x$

(d) $(x^2 + 2x)^2 = x^4 + 3 + 4x^3$ 1

7. A quadratic polynomial whose sum and product of zeroes are 2 and –1 respectively is:

(a) $x^2 + 2x + 1$ (b) $x^2 - 2x - 1$

(c) $x^2 + 2x - 1$ (d) $x^2 - 2x + 1$ 1

8. (HCF × LCM) for the numbers 30 and 70 is:

(a) 2100 (b) 21

(c) 210 (d) 70 1

9. The length of the arc of a circle of radius 14 cm which subtends an angle of 60° at the centre of the circle is:

(a) $\dfrac{44}{3}$ cm (b) $\dfrac{88}{3}$ cm

(c) $\dfrac{308}{3}$ cm (d) $\dfrac{616}{3}$ cm 1

10. If the radius of a semi-circular protractor is 7 cm, then its perimeter is:

(a) 11 cm (b) 14 cm

(c) 22 cm (d) 36 cm 1

11. The angle of elevation of the top of a 15 m high tower at a point $15\sqrt{3}$ m away from the base of the tower is:

(a) 30° (b) 45°

(c) 60° (d) 90° 1

12. $\left(\dfrac{2}{3}\sin 0° - \dfrac{4}{5}\cos 0°\right)$ is equal to:

(a) $\dfrac{2}{3}$ (b) $\dfrac{-4}{5}$

(c) 0 (d) $\dfrac{-2}{15}$ 1

13. From a well-shuffled deck of 52 cards, a card is drawn at random . What is the probability of getting king of hearts?

(a) $\dfrac{1}{52}$ (b) $\dfrac{1}{26}$

(c) $\dfrac{1}{13}$ (d) $\dfrac{12}{13}$ 1

14. The number $(5 - 3\sqrt{5} + \sqrt{5})$ is:

(a) an integer

(b) a rational number

(c) an irrational number

(d) a whole number 1

15. If the pair of linear equations $x - y = 1$, $x + ky = 5$ has a unique solution $x = 2$, $y = 1$, then the value of k is:

(a) –2 (b) –3

(c) 3 (d) 4 1

16. If □ABC ~ □DEF and ∠A = 47°, ∠E = 83°, then ∠C is equal:

(a) 47° (b) 50°

(c) 83° (d) 130° 1

17. The length of the tangent from an external point A to a circle of radius 3 cm, is 4 cm. The distance of A from the centre of the circle is:

(a) 7 cm (b) 5 cm

(c) $\sqrt{7}$ cm (d) 25 cm 1

18. The pair of linear equations $x + 2y + 5 = 0$ and $-3x - 6y + 1 = 0$ has:

(a) a unique solution

(b) exactly two solutions

(c) infinitely many solutions

(d) no solution 1

Assertion-Reason type questions

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) gives the correct explanation of Assertion (A).

(b) Both Assertion (A) and Reason (R) are true but Reason (R) does not give 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): If one root of the quadratic equation $4x^2 - 10x + (k - 4) = 0$ is reciprocal of the other, then value of k is 8.

Reason (R): Roots of the quadratic equation $x^2 - x + 1 = 0$ are real. 1

20. Assertion (A): A tangent to a circle is perpendicular to the radius through the point of contact.

Reason (R): The lengths of tangents drawn from an external point to a circle are equal. 1
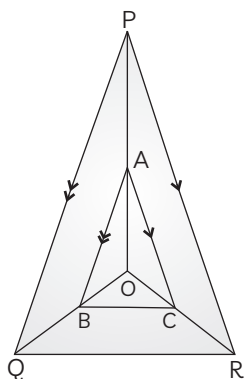
SECTION - B 10 Marks

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

21. Find the discriminant of the quadratic equation $3x^2 - 2x + \frac{1}{3} = 0$ and hence find the nature of its roots.

OR

Find the root of the quadratic equation $x^2 - x - 2 = 0$. 2

22. In the adjoining figure, A, B and C are points on OP, OQ and OR respectively such that AB ∥ PQ and AC ∥ PR. Show that BC ∥ QR.

2

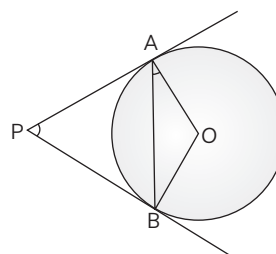**23.** If $\sin \alpha = \frac{1}{2}$, then find the value of $(3 \cos \alpha - 4 \cos^3 \alpha)$. 2

24. Find the coordinates of the point which divides the join of A $(-1, 7)$ and B $(4, -3)$ in the ratio 2 : 3.

OR

If the points A $(2, 3)$, B $(-5, 6)$, C $(6, 7)$ and D $(p, 4)$ are the vertices of a parallelogram ABCD, find the value of p. 2

25. PA and PB are tangents drawn to the circle with centre O as shown in the figure .

Prove that □APB = 2 □OAB.

2

SECTION - C
18 Marks

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

26. Find the area of the sector of a circle of radius 7 cm and of central angle 90°. Also, find the area of corresponding major sector. **3**

27. If α, β are zeroes of the quadratic polynomial $x^2 - 5x + 6$, form another quadratic polynomial whose zeroes are $\frac{1}{\alpha}, \frac{1}{\beta}$. **3**

28. A die is rolled once. Find the probability of getting:
(A) an even prime number.
(B) a number greater than 4.
(C) an odd number. **3**

29. Prove that $\dfrac{1+\tan^2 A}{1+\cot^2 A} = \sec^2 A - 1$ **3**

30. Prove that the lengths of tangents drawn from an external point to a circle are equal .
OR
Two concentric circles with centre O are of radii 3 cm and 5 cm. Find the length of chord AB of the larger circle which touches the smaller circle at P.

3
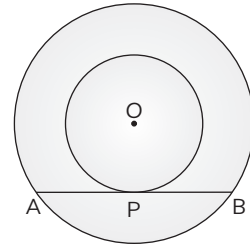
31. If we add 1 to the numerator and subtract 1 from the denominator, a fraction reduces to 1. It becomes $\frac{1}{2}$ if we only add 1 to the denominator. What is the fraction?

OR

For which value of '*k*' will the following pair of linear equations have no solution?

$$3x + y = 1$$

$$(2k - 1)x + (k - 1)y = 2k + 1$$ **3**

SECTION - D
20 Marks

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

32. Find the sum of first 51 terms of an A.P. whose second and third terms are 14 and 18, respectively.

OR

The first term of an A.P. is 5, the last term is 45 and the sum is 400. Find the number of terms and the common difference. **5**

**33.** The distribution below gives the weights of 30 students of a class. Find the median weight of the students:

Weight in kg	Number of Students
40-45	2
45-50	3
50-55	8
55-60	6
60-65	6
65-70	3
70-75	2

5

34. The boilers are used in thermal power plants to store water and then used to produce steam. One such boiler consists of a cylindrical part in middle and two hemispherical parts at its both ends.

Length of the cylindrical part is 7 m and radius of cylindrical part is $\frac{7}{2}$ m.

Find the total surface area and the volume of the boiler. Also, find the ratio of the volume of cylindrical part to the volume of one hemispherical part.
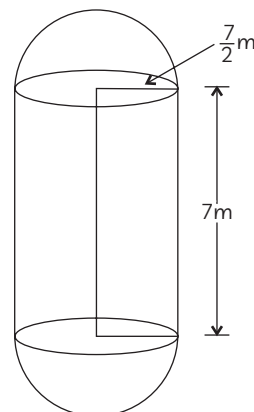
5

35. The shadow of a tower standing on a level ground is found to be 40 m longer when the Sun's altitude is 30° then when it was 60°. Find the height of the tower.

OR

From the top of a 7m high building, the angle of elevation of the top of a cable tower is 60° and the angle of depression of its foot is 45°. Determine the height of the tower.   5

SECTION - E   12 Marks

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

36. Observe the figures given below carefully and answer the questions:
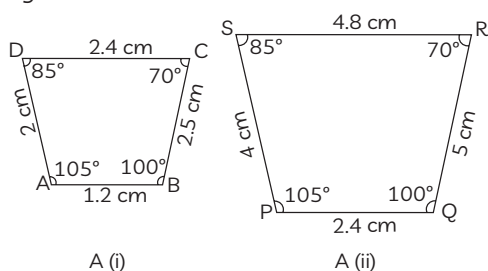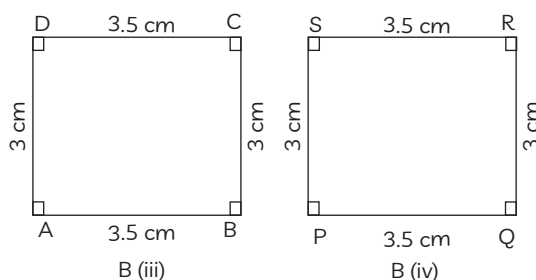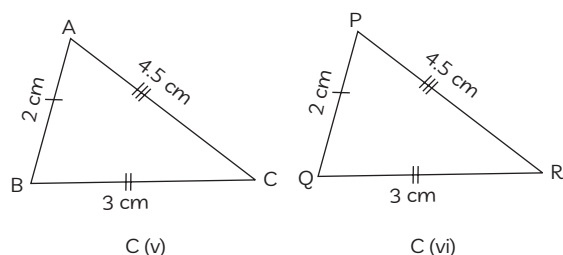
Figure A

A (i)   A (ii)

Figure B

B (iii)   B (iv)

Figure C

C (v)   C (vi)

(A) Name the figure(s) where in two figures are similar.   1
(B) Name the figure(s) where in the figures are congruent.   1
(C) Prove that congruent triangles are also similar but not the converse.

OR

What more is least needed for two similar triangles to be congruent?   2

37. Use of mobile screen for long hours makes your eye sight weak and give you headaches. Children who are addicted to play "PUBG" can get easily stressed out. To raise social awareness about ill effects of playing PUBG, a school decided to start 'BAN PUBG' campaign, in which students are asked to prepare campaign board in the shape of a rectangle. One such campaign board made by class X student of the school is shown in the figure.
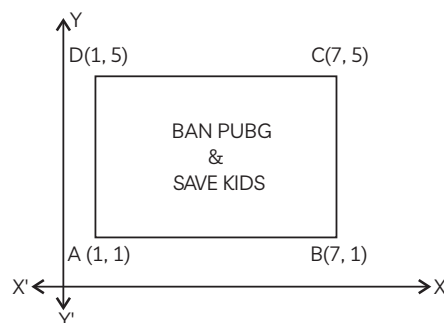
Based on the above information, answer the following questions:

(A) Find the coordinates of the point of intersection of diagonals AC and BD.   1
(B) Find the length of the diagonal AC.   1
(C) Find the area of the campaign Board ABCD.

OR

Find the ratio of the length of side AB to the length of the diagonal AC.   2

38. Khushi wants to organise her birthday party. Being health conscious, she decided to serve only fruits in her birthday party. She bought 36 apples and 60 bananas and decided to distribute fruits equally among all.

Based on the above information, answer the following questions:

(A) How many guests Khushi can invite at the most?   1
(B) How many apples and bananas will each guest get?   1
(C) If Khushi decides to add 42 mangoes, how many guests Khushi can invite at the most?

OR

If the cost of 1 dozen of bananas is ₹ 60, the cost of 1 apple is ₹ 15 and cost of 1 mango is ₹ 20, find the total amount spent on 60 bananas, 36 apples and 42 mangoes.   2