Maximum Marks: 80   *Time allowed: 3 hours*

General Instructions:

1. This Question Paper has 5 Sections A - E.

2. Section **A** has 20 Multiple Choice Questions (MCQs) carrying 1 mark each.

3. Section **B** has 5 questions carrying 02 marks each.

4. Section **C** has 6 questions carrying 03 marks each.

5. Section **D** has 4 questions carrying 05 marks each.

6. Section **E** has 3 Case Based integrated units of assessment (04 marks each) with sub-parts of the values of 1, 1 and 2 marks each respectively.

7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided. An internal choice has been provided in the 2 marks questions of Section E.

8. Draw neat figures wherever required. Take $\pi = \frac{22}{7}$, wherever required if not stated.

SECTION A
Section A consists of 20 questions of 1 mark each.

1 The area of a circle is $49\,\pi$ cm^2. Its circumference is:

(A) 7π cm   **(B)** 14π cm   **(C)** 21π cm   **(D)** 28π cm

2 Graphically, a pair of equations $6x - 3y + 10 = 0$; $2x - y + 9 = 0$ represents two lines which are:

(A) intersecting at exactly one point   **(B)** intersecting at exactly two points

(C) coincident   **(D)** parallel

3 The probability of getting a rotten apple in a lot of 400 apples is 0.035. The number of rotten apples in the lot is:

(A) 7 (B) 14 (C) 21 (D) 28

4 ΔABC is such that AB = 3 cm, BC = 2 cm and CA = 2.5 cm. If ΔABC ∼ ΔDEF and EF = 4 cm, then perimeter of ΔDEF is:

(A) 7.5 cm (B) 30 cm (C) 22.5 cm (D) 15 cm

5 If zeroes of the polynomial $x^2 + ax - b$ are reciprocals of each other, then b is equal to:

(A) -1 (B) 1 (C) a (D) $\dfrac{1}{a}$

6 The ratio of volume of a cone and volume of a cylinder of equal diameter and equal height is:

(A) 1 : 2 (B) 3 : 1 (C) 1 : 3 (D) 2 : 1

7 The quadratic equation $2x^2 - \sqrt{5}x + 1$ has:

(A) two distinct real roots (B) two equal real roots

(C) more than two real roots (D) no real roots

8 Consider the following distribution:

Classes	0-5	5-10	10-15	15-20	20-25
Frequency	10	15	12	20	9

The sum of lower limit of the modal class and upper limit of median class is:

(A) 15 (B) 25 (C) 30 (D) 35

9 Rohit is 6 feet tall. At an instant his shadow is 5 feet long. At the same instant, the shadow of a pole is 30 feet long. The length of the pole is:

(A) 12 feet (B) 24 feet (C) 30 feet (D) 36 feet

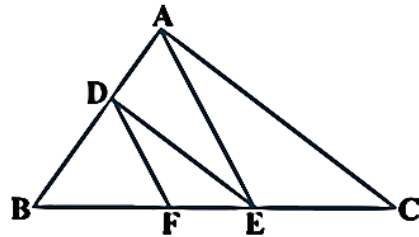**10** If 2sin²β – cos²β = 2, then β is:

    (A)   0°   **(B)**   90°   **(C)**   45°   **(D)**   30°

11 If $\tan \alpha + \cot \alpha = 2$, then $tan^{20} \alpha + cot^{20} \alpha$ is equal to:

    (A)   20   **(B)**   0   **(C)**   2   **(D)** 2^{20}

12 In the given figure, DE || AC and DF || AE. Which of these is equal to $\dfrac{BF}{FE}$?
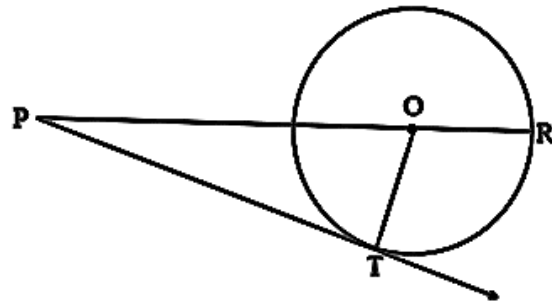

    (A) $\dfrac{DF}{AE}$ **(B)** $\dfrac{BE}{EC}$ **(C)** $\dfrac{BA}{AC}$ **(D)** $\dfrac{FE}{EC}$

13 The median and mode respectively for a frequency distribution are 26 and 29. Then its mean is:

    (A)   28.4   **(B)**   25.8   **(C)**   27.5   **(D)**   24.5

14 Given a circle with centre O and radius 7 cm, tangent PT is drawn from the point P such that PT = 24 cm. The length of PR is:

    (A)   30 cm   **(B)**   28 cm   **(C)**   32 cm   **(D)**   25 cm

15 The number of revolutions made by a circular wheel of radius 0.7 m in covering a distance of 176 m is:

    (A)   22   **(B)**   24   **(C)**   75   **(D)**   40

16 In ΔABC right angled at B, $\sin A = \dfrac{7}{25}$, then the value of cos C is:

    (A) $\dfrac{7}{25}$ **(B)** $\dfrac{24}{25}$ **(C)** $\dfrac{7}{24}$ **(D)** $\dfrac{24}{7}$

17	If HCF (26, 169) = 13, then LCM (26, 169) is:							
	(A)	26	**(B)**	52	**(C)**	338	**(D)**	13
18	The vertices of a parallelogram in order are A(1, 2), B(4, y), C(x, 6) and D(3, 5).Then (x, y) is:							
	(A)	(6, 3)	**(B)**	(3, 6)	**(C)**	(5, 6)	**(D)**	(1, 4)

Direction for questions 19 & 20: In question numbers 19 and 20, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct option.

19   **Assertion(A)**: The point (-1, 6) divides the line segment joining the points (-3, 10) and (6, -8) in the ratio 2: 7 internally.

Reason(R): Midpoint of line segment PQ whose coordinates are $P(x_1, y_1)$ and $Q(x_2, y_2)$ is given by $\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A)

(b) Both assertion (A) and reason (R) are true and 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.

20   **Assertion(A)**: 6^n ends with digit 0, where n is a natural number.

Reason(R): Any number ends with digit 0, if its prime factor is of the form $2^m \times 5^n$, where m, n are natural numbers.

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A)

(b) Both assertion (A) and reason (R) are true and 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.

SECTION B
Section B consists of 5 questions of 2 marks each.

21   Find c if the system of equations cx + 3y + (3 − c) = 0; 12x + cy − c = 0 has infinitely many solutions.

22 In the given figure, a quadrilateral ABCD is drawn to circumscribe a circle.
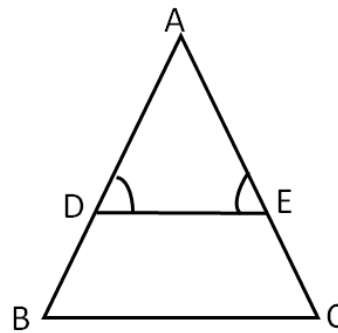
Prove that AB + CD = BC + AD
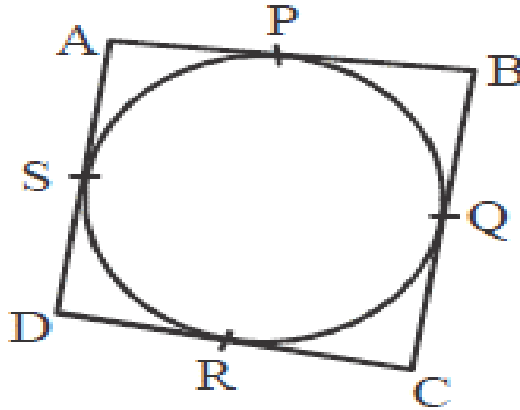
23 If 5 tan θ = 3, then find the value of $\left(\dfrac{5\sin\theta - 3\cos\theta}{4\sin\theta + 3\cos\theta}\right)$

OR

If $\cos(A - B) = \dfrac{\sqrt{3}}{2}$ and $\sin(A + B) = \dfrac{\sqrt{3}}{2}$, find A and B where (A + B) and (A − B) are acute angles.

24 In Figure ∠ADE = ∠AED and $\dfrac{AD}{DB} = \dfrac{AE}{EC}$, prove that ΔBAC is an isosceles triangle.

25 The length of the minute hand of a clock is 14 cm. Find the area swept by the minute hand from 9 a.m. to 9.35 a.m.
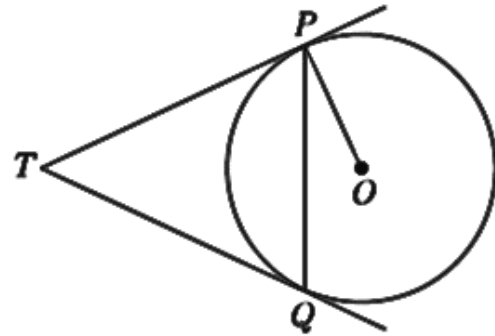
OR

Find the area of the corresponding major sector of a circle of radius 28 cm and the central angle 45°.

SECTION C

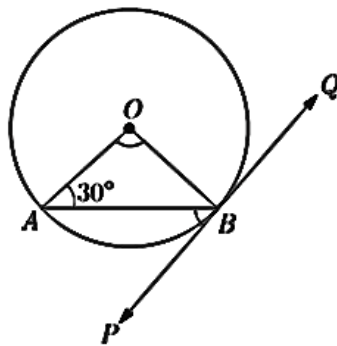**Section C consists of 6 questions of 3 marks each.**

26 Two tangents TP and TQ are drawn to a circle with centre O from an external point T.

Prove that ∠ PTQ = 2 ∠ OPQ.

OR

In the figure, PQ is a tangent to a circle with centre O. If ∠OAB = 30°, find ∠ABP and ∠AOB.

27 Prove that $\sqrt{3}$ is irrational.

28 Prove that: $\dfrac{\cos A}{1-\tan A} - \dfrac{\sin^2 A}{\cos A - \sin A}$ = cos A + sin A

29 A box contains cards numbered from 1 to 20. A card is drawn at random from the box.

Find the probability that number on the drawn card is

(i) a prime number

(ii) a composite number

(iii) a number divisible by 3

30 If α and β are the zeroes of the quadratic polynomial $3x^2 + 8x + 2$, find the value of $\alpha^2 + \beta^2$.

31	Solve the following pair of equations graphically:

$$2x - y = 10, \; x - 3y = 15$$

OR

A and B are two points 150 km apart on a highway. Two cars start A and B at the same time. If they move in the same direction they meet in 15 hours. But if they move in the opposite direction, they meet in 1hour. Find their speeds.

SECTION D

Section D consists of 4 questions of 5 marks each.

32	Sum of the areas of two squares is 468 m². If the difference of their perimeters is 24 m, find the sides of the two squares.

OR

Solve for x:

$$\frac{3}{x+1} + \frac{4}{x-1} = \frac{29}{4x-1}; \; x \neq \text{-1, 1,} \frac{1}{4}$$

33	Prove that, If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, the other two sides are divided in the same ratio.

Using the above theorem prove that a line drawn through the mid-point of one side of a triangle parallel to another side bisects the third side.

34	A circus tent is in the shape of a cylinder surmounted by a conical top of same diameter. If their common diameter is 56 m, the height of cylindrical part is 6 m and the total height of the tent above the ground is 27 m, find the area of canvas used to make the tent.

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. If a right circular cylinder circumscribes the toy, find the difference of the volumes of the cylinder and the toy.

(Take π = 3.14)

35	Find the mean and mode of the following frequency distribution.

Class	10-30	30-50	50-70	70-90	90-110	110-130
Frequency	5	8	12	20	3	2

36

Case Study -1

Ronit is the captain of his school football team. He has decided to use a 4-4-2-1 formation in the next match. The figure below shows the positions of the players in a 4-4-2-1 formation on a coordinate grid.

One square box represents 1 square unit
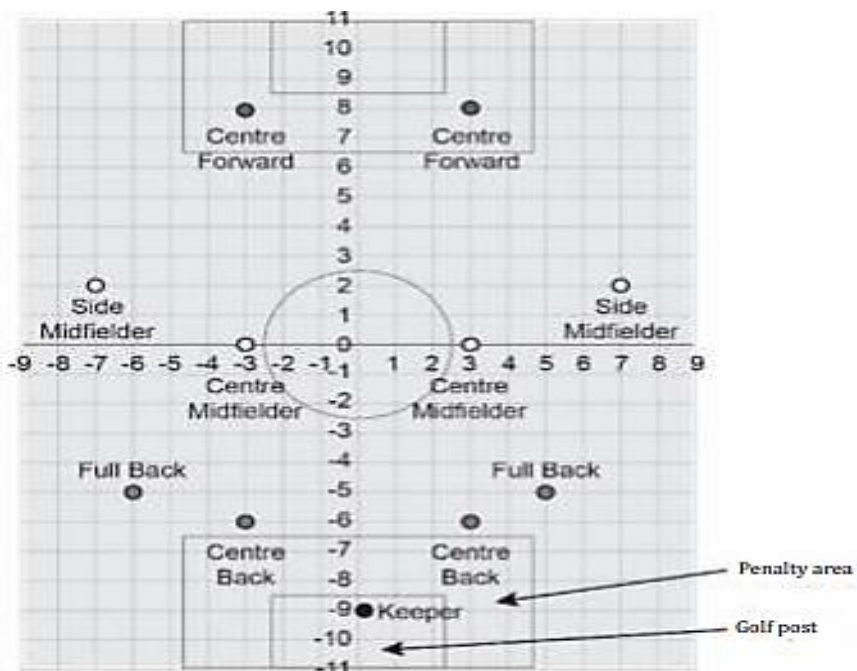
Based on the above information answer the following questions.

I	Write the coordinates representing the position of the goal keeper.	1m
II	What is the distance between the two Centre Forward positions in Ronit's plan?	1m
III	Find the distance between the points representing Centre forward in the second quadrant and Full back in the fourth quadrant? **OR** Find the coordinates of the midpoint of the line segment joining the Centre Forward and Side Midfielder in the first quadrant?	2m

37

Case Study – 2

Water Tower: A water tower is a building that is used to hold and give out water. It is almost always built on a high place. It works because a pump gives water to the tower, and gravity makes the saved water go out to the places that need water. Those places are connected to the tower by pipes. A water tower is good when there is no power because it uses gravity to send out the water.

60 m
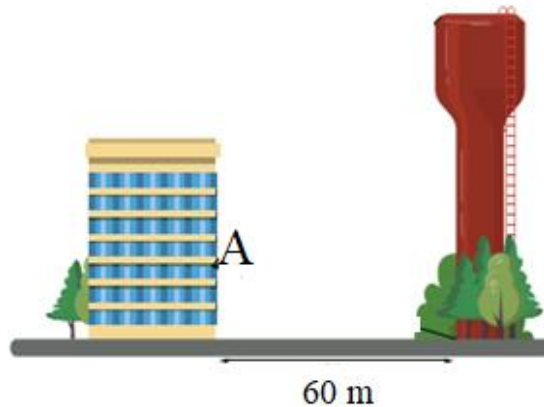
A water tower is located 60 m from a building (see the figure). From a window A of the building, an observer notes that the angle of elevation to the top of the tower is 45° and that the angle of depression to the bottom of the tower is 30°.

Based on the above information answer the following questions.

I	Draw a neat labelled figure for the given situation.	1m
II	What is the distance from point A to the top of the tower?	1m
III	Find the height of the tower? **OR** At what height above the ground is the window where the observer is observing the water tank?	2m

38 **Case Study -3**

A road roller (sometimes called a roller-compactor, or just roller) is a compactor-type engineering vehicle used to compact soil, gravel, concrete, or asphalt in the construction of roads and foundations.

RCB Machine Pvt Ltd started making road roller 10 years ago. Company increased its production uniformly by fixed number every year. The company produces 800 rollers in the

6th year and 1130 roller in the 9th year.

Based on the above information answer the following questions.

I	What was the company's production in first year?	1m
II	What was the increase in the company's production every year?	1m
III	In which year will the production of rollers will reach 1460? **OR** What was the company's total production for the first 6 years?	2m

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