General Instructions :

Read the following instructions very carefully and strictly follow them :

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

(ii) *This question paper is divided into **five** Sections – **A**, **B**, **C**, **D** and **E**.*

(iii) *In **Section A**, Questions no. **1** to **18** are multiple choice questions (MCQs) and questions number **19** and **20** are Assertion-Reason based questions of **1** mark each.*

(iv) *In **Section B**, Questions no. **21** to **25** are very short answer (VSA) type questions, carrying **2** marks each.*

(v) *In **Section C**, Questions no. **26** to **31** are short answer (SA) type questions, carrying **3** marks each.*

(vi) *In **Section D**, Questions no. **32** to **35** are long answer (LA) type questions carrying **5** marks each.*

(vii) *In **Section E**, Questions no. **36** to **38** are case study based questions carrying **4** marks each. Internal choice is provided in **2** marks questions 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 questions in Section D and 3 questions in Section E.*

(ix) *Draw neat diagrams wherever required. Take* $\pi = \frac{22}{7}$ *wherever required, if not stated.*

(x) *Use of calculator is **not** allowed.*

SECTION A

*This section has **20** Multiple Choice Questions (MCQs) carrying **1** mark each.* $20 \times 1 = 20$

1. The distance of the point A(4a, 3a) from x-axis is :

(A) 3a (B) – 3a

(C) 4a (D) – 4a

2. The natural number 1 is :

(A) a prime number.

(B) a composite number.

(C) prime as well as composite.

(D) neither prime nor composite.

3. Given $\cot \theta = 3$, the value of $\cos \theta$ is :

(A) $\frac{1}{3}$ (B) $\frac{1}{\sqrt{10}}$

(C) $\frac{3}{\sqrt{10}}$ (D) $\frac{\sqrt{10}}{3}$

4. For any natural number n, 5^n ends with the digit :

(A) 0 (B) 5

(C) 3 (D) 2

5. If $2 \sin A = 1$, then the value of $\tan A + \cot A$ is :

(A) $\sqrt{3}$ (B) $\frac{4}{\sqrt{3}}$

(C) $\frac{\sqrt{3}}{2}$ (D) 1

6. The LCM of 960 and 240 is :

(A) 960

(B) 240

(C) 60

(D) 15

7. From a point on the ground, which is 60 m away from the foot of a vertical tower, the angle of elevation of the top of the tower is found to be 45°. The height (in metres) of the tower is :

(A) $10\sqrt{3}$ (B) $30\sqrt{3}$

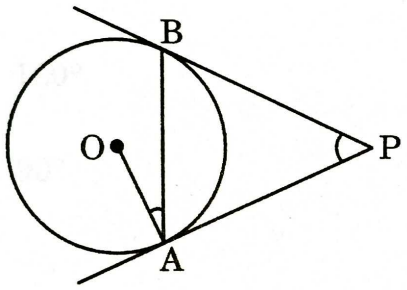
(C) 60 (D) 30

8. How many zeroes does $p(x) = (x - 2)(x + 3)$ have ?

(A) Zero (B) One

(C) Two (D) Three

9. In the given figure, PA and PB are tangents to a circle centred at O. If $\angle OAB = 15°$, then $\angle APB$ equals :



(A) 30° (B) 15°

(C) 45° (D) 10°

10. If α and β are two zeroes of a polynomial $f(x) = px^2 - 2x + 3p$ and $\alpha + \beta = \alpha\beta$, then value of p is :

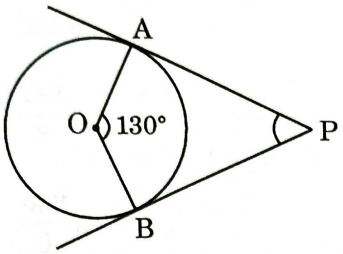
(A) $-\frac{2}{3}$

(B) $\frac{2}{3}$

(C) $\frac{1}{3}$

(D) $-\frac{1}{3}$

11. In the given figure, PA and PB are tangents to a circle centred at O. If $\angle AOB = 130°$, then $\angle APB$ is equal to :



(A) 130°

(B) 50°

(C) 120°

(D) 90°

12. If the pair of linear equations : $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ is consistent and dependent, then

(A) $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$

(B) $\frac{a_1}{a_2} \neq \frac{b_1}{b_2} = \frac{c_1}{c_2}$

(C) $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$

(D) $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

13. A hemispherical bowl is made of steel of thickness 1 cm. The outer radius of the bowl is 6 cm. The volume of steel used (in cm^3) is :

(A) $182\,\pi$

(B) $\frac{182}{3}\pi$

(C) $\frac{682}{3}\pi$

(D) $\frac{364}{3}\pi$

14. Which of the following sequence is ***not*** an A.P. ?

(A) $2, \frac{5}{2}, 3, \frac{7}{2}, \ldots$

(B) $-1{\cdot}2, -3{\cdot}2, -5{\cdot}2, -7{\cdot}2, \ldots$

(C) $\sqrt{2}, \sqrt{8}, \sqrt{18}, \ldots$

(D) $1^2, 3^2, 5^2, 7^2, \ldots$

15. The area of a semicircle of diameter 'd' is :

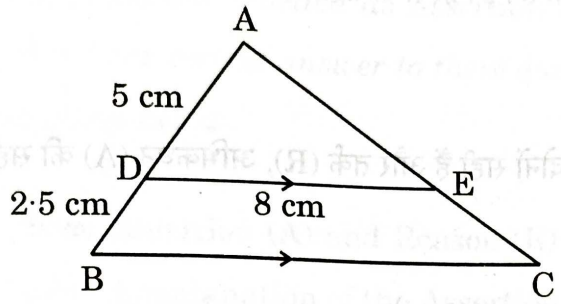
(A) $\frac{\pi d^2}{16}$

(B) $\frac{\pi d^2}{4}$

(C) $\frac{\pi d^2}{8}$

(D) $\frac{\pi d^2}{2}$

16. In the given figure Δ ABC is shown, in which DE || BC. If AD = 5 cm, DB = 2·5 cm and DE = 8 cm, then the length of BC is :



(A) 10 cm

(B) 6 cm

(C) 12 cm

(D) 7·5 cm

17. The mean and median of a frequency distribution are 43 and 43·4 respectively. The mode of the distribution is :

(A) 43·4

(B) 42·4

(C) 44·2

(D) 49·3

18. The probability for a randomly selected number out of 1, 2, 3, 4, ..., 25 to be a composite number is :

(A) $\frac{15}{25}$

(B) $\frac{10}{25}$

(C) $\frac{11}{25}$

(D) $\frac{9}{25}$

Questions number **19** *and* **20** *are Assertion and Reason based questions. Two statements are given, one labelled as Assertion (A) and the other is labelled as Reason (R). Select the correct answer to these questions from the options (A), (B), (C) and (D) as given below.*

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

(B) Both Assertion (A) and Reason (R) are true, but Reason (R) is ***not*** the correct explanation of the 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 surface area of the cuboid formed by joining two cubes of sides 4 cm each, end-to-end, is 160 cm^2.

Reason (R): The surface area of a cuboid of dimensions $l \times b \times h$ is $(lb + bh + hl)$.

20. *Assertion (A) :* The mean of first 'n' natural numbers is $\frac{n-1}{2}$.

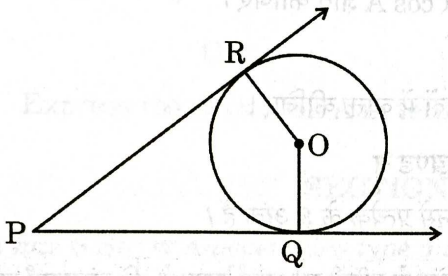
Reason (R): The sum of first 'n' natural numbers is $\frac{n(n+1)}{2}$.

SECTION B

*This section has **5** Very Short Answer (VSA) type questions carrying **2** marks each.* *5×2=10*

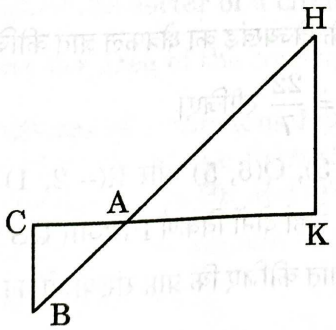
21. If the distance between the points (4, p) and (1, 0) is 5, what is the value of p ?

22. In the given figure, O is the centre of the circle. PQ and PR are tangents. Show that the quadrilateral PQOR is cyclic.



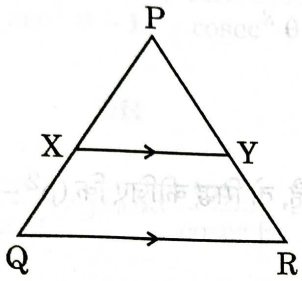
23. If α, β are the zeroes of the quadratic polynomial $px^2 + qx + r$, then find the value of $\alpha^3\beta + \beta^3\alpha$.

24. (a) In the given figure, $\Delta AHK \sim \Delta ABC$. If AK = 10 cm, BC = 3·5 cm and HK = 7 cm, find the length of AC.



OR

(b) In the given figure, XY || QR, $\frac{PQ}{XQ} = \frac{7}{3}$ and PR = 6·3 cm. Find the length of YR.



25. (a) If $\tan A = \frac{4}{3}$, find sin A and cos A.

OR

(b) Express cos A and tan A in terms of sin A.

SECTION C

*This section has **6** Short Answer (SA) type questions carrying **3** marks each.* 6×3=18

26. (a) Prove that the lengths of tangents drawn from an external point to a circle are equal.

OR

(b) Two tangents TP and TQ are drawn to a circle with centre O from an external point T. Prove that $\angle PTQ = 2 \angle OPQ$.

27. Prove that $\sqrt{5}$ is an irrational number.

28. Find the area of the sector of a circle of radius 42 cm and of central angle 30°. Also, find the area of the corresponding major sector. [Use $\pi = \frac{22}{7}$]

29. The three vertices of a rhombus PQRS are P(2, – 3), Q(6, 5) and R(– 2, 1). Find the coordinates of the fourth vertex S and coordinates of the point where both the diagonals PR and QS intersect.

30. Two different dice are thrown together. Find the probability that the numbers obtained have :

(i) even sum,

(ii) even product.

31. (a) Prove that :

$$\frac{\sec^3\theta}{\sec^2\theta - 1} + \frac{\text{cosec}^3\theta}{\text{cosec}^2\theta - 1} = \sec\theta \cdot \text{cosec}\,\theta\,(\sec\theta + \text{cosec}\,\theta)$$

OR

(b) If $\frac{\sec\alpha}{\text{cosec}\,\beta} = p$ and $\frac{\tan\alpha}{\text{cosec}\,\beta} = q$, then prove that $(p^2 - q^2)\sec^2\alpha = p^2$.

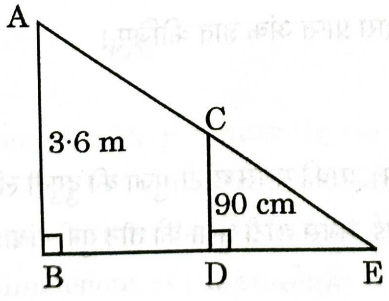
SECTION D

*This section has **4** Long Answer (LA) type questions carrying **5** marks each.* *4×5=20*

32. (a) Prove that if a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, then the other two sides are divided in the same ratio.

OR

(b) As shown in the given figure, a girl of height 90 cm is walking away from the base of a lamp post at a speed of 1·2 m/s. If the lamp is 3·6 m above the ground, find the length of her shadow after 4 seconds.



33. An SBI health insurance agent found the following data for distribution of ages of 100 policy holders. The health insurance policies are given to persons of age 15 years and onwards, but less than 60 years.

Age (in yrs)	*Number of policy holders*
15 – 20	2
20 – 25	4
25 – 30	18
30 – 35	21
35 – 40	33
40 – 45	11
45 – 50	3
50 – 55	6
55 – 60	2

Find the modal age and median age of the policy holders.

34. Represent the following pair of linear equations graphically and hence comment on the condition of consistency of this pair :

$x - 5y = 6$; $2x - 10y = 12$

35. (a) In a class test, the sum of Anamika's marks obtained in Maths and Science is 30. Had she got 2 marks more in Maths and 3 marks less in Science, the product of the marks would have been 210. Find the marks she got in the two subjects.

OR

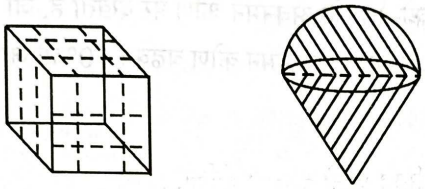
(b) The length of hypotenuse (in cm) of a right-angled triangle is 6 cm more than twice the length of its shortest side. If the length of its third side is 6 cm less than thrice the length of its shortest side, find the dimensions of the triangle.

SECTION E

This section has 3 case study based questions carrying 4 marks each. 3×4=12

Case Study – 1

36. On a Sunday your parents took you to a fair. You could see lot of toys displayed and you wanted them to buy a Rubik's cube and a strawberry ice-cream for you.



Based on the information given above, answer the following questions :

(i) Find the length of the diagonal of Rubik's cube if each edge measures 6 cm. 1

(ii) Find the volume of Rubik's cube if the length of the edge is 7 cm. 1

(iii) (a) What is the curved surface area of hemisphere (ice-cream) if the base radius is 7 cm ? 2

OR

(iii) (b) If two cubes of edges 4 cm are joined end-to-end, then find the surface area of the resulting cuboid. 2

Case Study – 2

37. Your elder brother wants to buy a car and plans to take a loan from a bank for his car. He repays his total loan of ₹ 1,18,000 by paying every month, starting with the first instalment of ₹ 1,000 and he increases the instalment by ₹ 100 every month.

Based on the information given above, answer the following questions :

(i) Find the amount paid by him in the 30^{th} instalment. 1

(ii) If the total number of instalments is 40, what is the amount paid in the last instalment ? 1

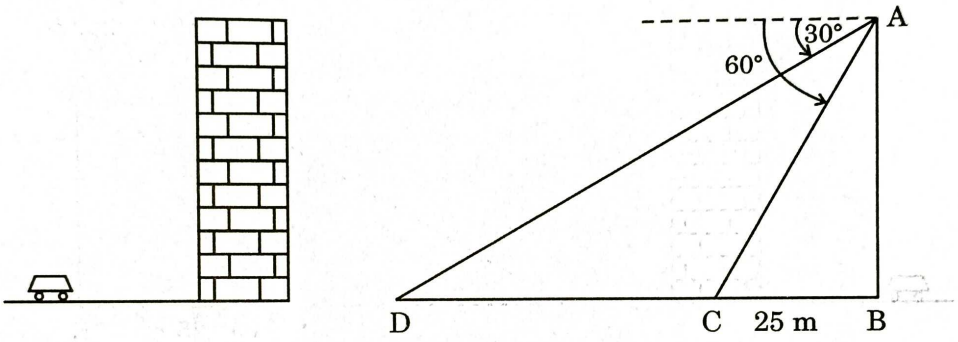
(iii) (a) What amount does he still have to pay after the 30th instalment ? 2

OR

(iii) (b) Find the ratio of the tenth instalment to the last instalment. 2

Case Study – 3

38. Tejas is standing at the top of a building and observes a car at an angle of depression of 30° as it approaches the base of the building at a uniform speed. 6 seconds later, the angle of depression increases to 60°, and at that moment, the car is 25 m away from the building.



Based on the information given above, answer the following questions :

(i) What is the height of the building ? 1

(ii) What is the distance between the two positions of the car ? 1

(iii) (a) What would be the total time taken by the car to reach the foot of the building from the starting point ? 2

OR

(iii) (b) What is the distance of the observer from the car when it makes an angle of 60° ? 2