General Instructions:

Read the following instructions very carefully and strictly follow them:

1. This question paper has 5 sections A-E

2. Section A has 20 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 1, 1 and 2 marks each respectively.

7. All questions are compulsory. However internal choice in 2 questions of 5 marks, 2 questions of 3 marks and 2 questions of 2 marks have been provided. An internal choice has been provided in 2 marks questions of section E.

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

SECTION-A   1× 20

This section comprises of Multiple-Choice Questions (**MCQ**s) of **1** mark each. Select the correct option (Question **1** to Question **18**):

1. The greatest number which divides both 83 and 138, leaving remainders 5 and 8 respectively, is:
    (a) 13   (b) 65   (c) 26   (d) 39

2. If common difference of an A.P. is -6, then value of $a_{20} - a_{14}$ is:
    (a) 36   (b) 6   (c) -36 (d) -6

3. In the given figure, PA and PB are tangents to a circle centred at O. If ∠APB = 30^0, then ∠OAB equals:

    (a) 30^0 (b) 15^0
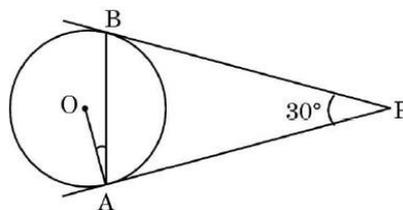
    (b) 45^0 (d) 10^0

4. If the quadratic equation $9x^2 + bx + \frac{1}{4} = 0$ has equal roots, then the value of b is:
    (a) 0   (b) -3 only   (c) 3 only   (d) ± 3

5. Graph of a polynomial p(x) is given in the figure. The number of zeroes of p(x) is:
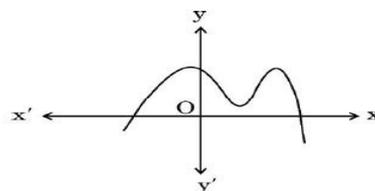
    (a) 2   (b) 3

    (c) 4   (d) 5

6. The pair of linear equations $3x - 15y = 7$ and $2x - 10y = \frac{14}{3}$ has:
    (a) One solution   (b) two solutions
    (c) infinitely many solutions   (d) no solutions

7. The non-zero value of k for which the quadratic equation $2x^2 - kx + k = 0$ has equal roots, is:
    (a) 1   (b) 8   (c) 4   (d) -8

8. In an A.P., if $d = -4$ and $a_7 = 4$, then the first term 'a' is equal to
    (a) 6   (b) 7   (c) 20   (d) 28

9. The distance of the point (5, 4) from the origin is
    (a) 41   (b) $\sqrt{41}$ (c) 3   (d) 9

10. 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:
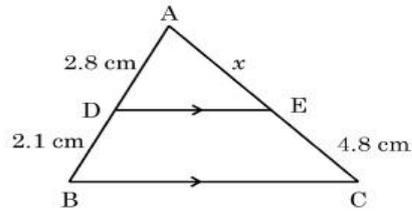
    (a) 3.6 cm   (b) 2.4 cm

    (c) 6.4 cm   (d) 4.8 cm

11. In a right-angled triangle ABC. $\angle A = 90^0$ and AB=AC. The value of $\sin c$ is:
    (a) 0   (b) $\frac{\sqrt{3}}{2}$ (c) $\frac{1}{2}$ (d) $\frac{1}{\sqrt{2}}$

12. $\left(\frac{1}{tan^2\theta} - \frac{1}{sin^2\theta}\right)$ is equal to:
    (a) 1   (b) -1   (c) $sec^2\theta$ (d)$sin^2\theta$

13. In a circle of radius 21 cm, if an arc subtends an angle of 60° at the centre of the circle, then the length of the arc is:
    (a) 11 cm   (b) 44 cm   (b) $\frac{22}{7}$ cm   (d) 22 cm

14. If the area of a circle is 154 cm², then its perimeter is
    (a) 11 cm   (b) 22 cm   (c) 44 cm   (d) 55 cm

15. If the sum of the areas of two circles with radii R1 and R2 is equal to the area of a circle of radius R, then
    (a) $R_1 + R_2 = R$ (b) $R_1^2+R_2^2 = R^2$ (c) $R_1 + R_2 < R$ (d) $R_1^2+R_2^2 < R^2$

16. A cylindrical pencil sharpened at one edge is the combination of
    (a) a cone and a cylinder   (b) frustum of a cone and a cylinder
    (c) a hemisphere and a cylinder   (d) two cylinders

17. Volumes of two spheres are in the ratio 64:27. The ratio of their surface areas is
    (a) 3: 4   (b) 4: 3   (c) 9: 16   (d) 16: 09

18. The empirical relationship between the three measures of central tendency is:
    (a) 3 Median = Mode + 2 Mean   (b) 3 Median = Mode – 2 Mean
    (c) 3 Mode = Median + 2 Mean   (d) 3 Mean = Mode – 2 Median

Assertion-Reason Based Questions

DIRECTIONS: In the question number 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 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

19. **Assertion(A)**: The probability of getting number 8 on rolling a die is zero (0).
    Reason(R): The probability of an impossible event is zero (0).

20. **Assertion(A)**: Area of a sector of a circle with radius r and angle with degree measure θ is

$$\frac{\theta}{360^0} \times 2\pi r$$

    Reason(R): Area of segment of a circle = Area of the corresponding sector – Area of the corresponding triangle.

Questions Number **21** to **25** are Very Short Answer (VSA) type questions of **2** marks each.

21. In a school, there are two Sections A and B of Class X. There are 48 students in Section A and 36 students in Section B. Determine the minimum number of books required for their class library so that they can be distributed equally among the students of Section A or that of Section B.

22. **(A)** Determine the 36th term of the A.P. whose first two terms are −3 and 4 respectively.

<div align="center">OR</div>

    (B) Write the next two terms of the A.P.: $\sqrt{26}, \sqrt{48}, \sqrt{75}, \ldots$

23. Two dice are thrown together. Find the probability that the product of the numbers on the top of the dice is 6.

24. For $A = 30^0$ and $B = 60^0$, verify that $\tan(B - A) = \dfrac{\tan B - \tan A}{1 + \tan B \ \tan A}$

25. **(A)** Find the coordinates of the point which divides the join of (− 1, 7) and (4, − 3) in the ratio 2: 3.

<div align="center">OR</div>

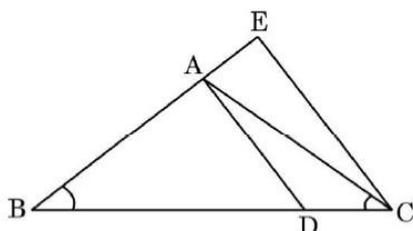   **(B)** Using distance formula, prove that the points A (3, 1), B (6, 4) and C (8, 6) are collinear.

Questions Number **26** to **31** are Short Answer (SA) type questions of **3** marks each.

26. Prove that $\sqrt{2} + \sqrt{3}$ is an irrational.
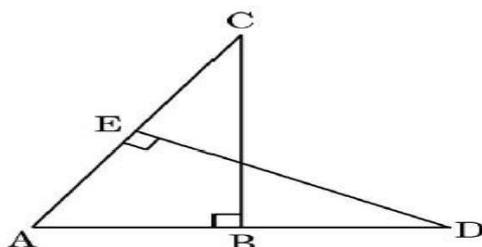
27. Solve the following pair of equations:
$$x - y + 1 = 0;$$
$$3x + 2y - 12 = 0$$

28. **(A)** In the given figure, $\dfrac{BC}{BD} = \dfrac{BE}{AC}$ and $\angle ABD = \angle ACD$. Show that $\triangle ABD \sim \triangle EBC$

<div align="center">OR</div>

    (B) In the given figure, ABC and AED are two right triangles, right angled at B and E respectively.

    Prove that:

    (i) $\triangle ABD \sim \triangle AED$

    (ii) $AB \times AD = AC \times AE$

29. (A) A horse is tied with a 14 m long rope at one corner of an equilateral triangular field having side 20 m. Find the area of the field where the horse cannot graze.

OR

(B) The length of the minute hand of a clock is 14 cm. Find the area swept by the minute hand between 8:00 am and 8:05 am.

30. Find a relation between x and y such that the point P (x, y) is equidistant from the points A (0, 3) and B (-2, 1).

31. The following table shows the marks obtained by 110 students of class X in a school during a particular academic session. Find the mode of the distribution.

Mark obtained:	$0-20$	$20-40$	$40-60$	$60-80$	$80-100$
Number of students:	21	25	30	24	10

SECTION-D   5× 4

Questions number **32** to **35** are Long Answer (LA) type questions of **5** marks each.

32. (A) A train travels a distance of 480 km at a uniform speed. If the speed had been 8 km/h less, then it would have taken 3 hours more to cover the same distance. Find the reduced speed of the train. Also, find the original speed.   [5
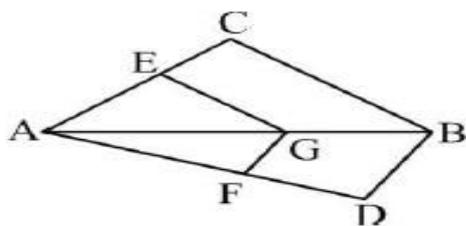
OR

(B) Check whether the following equation is quadratic or not. If yes, find its roots.

$$(x^3 - 4x^2 + 3x + 1) = (x - 2)^3$$ [5

33. If a line is drawn parallel to one side of a triangle intersecting the other sides in distinct points, prove that it divides the other sides in the same ratio. Use the above result to prove the following:

In the given figure, if $EG \parallel CB$ and $FG \parallel DB$, then prove that $\frac{AE}{EC} = \frac{AF}{FD}$

34. As observed from the top of a 75 m high lighthouse from the sea level, the angles of depression of two ships are 30∘ and 45∘. If one ship is exactly behind the other on the same side of the lighthouse, find the distance between the two ships (Use √3=1.732)

35. (A) The following table gives the distribution of the life time of 400 neon lamps: [5]

Life time (in hours)	Number of lamps
1500-2000	14
2000-2500	56
2500-3000	60
3000-3500	86
3500-4000	74
4000-4500	62
4500-5000	48

Find the average life time of a lamp.

OR

(B) A life insurance agent found the following data for distribution of ages of 100 policy holders. Calculate the median age, if policies are given only to persons having age 18 years onwards but less than 60 years.

Age (in years)	Number of policy holders
Below 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

SECTION E   **4× 3**

Questions number **36** to **38** are case-study based questions of **4** marks each.

36. In a charming village, there is a street called 'Maplewood Avenue', where the houses are numbered from 1 to 49. A community group has decided to undertake a green renovation project, aiming to install solar panels on the houses.

   They have a few questions before they begin the project.

    (i)   How many houses are there on 'Maplewood Avenue' ?   [1]
    (ii)   The house numbers follow an Arithmetic Progression. What is the first term of the A.P.   [1]
               and the common difference ?
    (iii) (A) If the group wanted to calculate the sum of all house numbers from 1 to 49, how   [2]
               much would that be ?
                                    OR
               (B) What is the sum of the house numbers between 15 and 30 ?   [2]

37. A short circuit can happen on electric poles due to several reasons, like
    (a) If the insulation is damaged or old, it may allow the hot wires to touch with neutral. This will cause a short circuit.
    (b) If there are any loose wire connections or attachments, it will allow the live and neutral wires to touch.
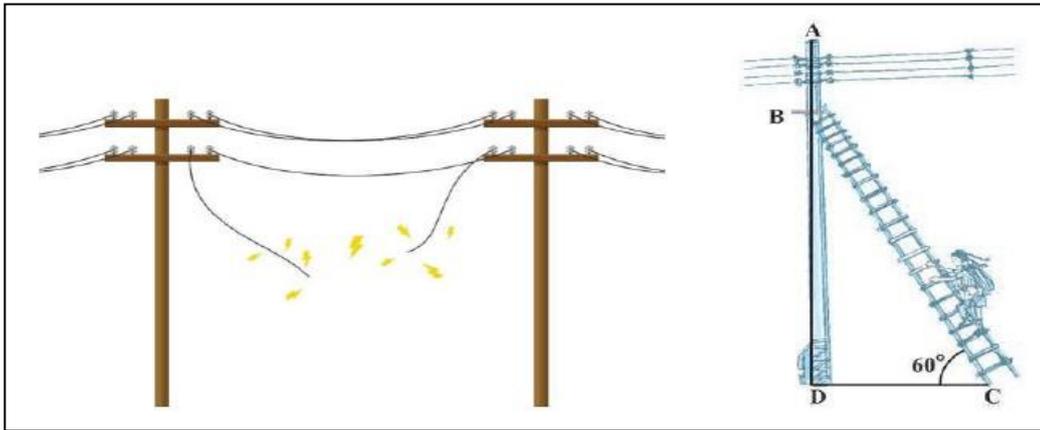
An electrician has to repair an electric fault on a pole of height 5 m. He needs to reach a point 1 m below the top of the pole to undertake the repair work.

Based on the above information answer the following questions:

(i) What should be the length of the ladder that he should use which, when inclined at an angle of 60° to the horizontal, enables him to reach the required position? [2]

(ii) (A) How far from the foot of the pole should he place the foot of the ladder? [2]

OR

(B) What is the length of the ladder if its foot is kept at a distance of 4 m from the foot of the pole? [2]

38. Electric buses are becoming popular nowadays. These buses have the electricity stored in a battery. Electric buses have a range of approximately 280 km with just one charge. These buses are superior to diesel buses as they reduce brake wear and also reduce pollution. Transport department of a city wants to buy some electric buses for the city. So, the department wants to know the distance travelled by existing public transport buses in a day.

The following data shows the distance travelled by 50 existing public transport buses in a day.

Daily distance travelled (in KM)	100-120	120-140	140-160	160-180	180-200
Number of Buses	12	14	8	6	10

(i) Find the median class of the above data. [1]

(ii) Find the modal class of the above data. [1]

(iii) (A) Find the median distance travelled by a bus. [2]

OR

(B) Find the 'mean (average)' distance travelled by a bus. [2]