

MATHEMATICS

Maximum Marks: 80

Time allowed: Three hours

1. *Answers to this Paper must be written on the paper provided separately.*
 2. *You will **not** be allowed to write during first 15 minutes.*
 3. *This time is to be spent in reading the question paper.*
 4. *The time given at the head of this Paper is the time allowed for writing the answers.*
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5. *Attempt **all** questions from **Section A** and **any four** questions from **Section B**.*
 6. *All working, including rough work, must be clearly shown, and must be done on the same sheet as the rest of the answer.*
 7. *Omission of essential working will result in loss of marks.*
 8. *The intended marks for questions or parts of questions are given in brackets []*
 9. *Mathematical tables and graph papers are to be provided by the school.*

Instruction for the Supervising Examiner

Kindly read aloud the Instructions given above to all the candidates present in the Examination Hall.

This paper consists of 16 printed pages.

SECTION A (40 Marks)

(Attempt *all* questions from this *Section*.)

Question 1

Choose the correct answers to the questions from the given options.

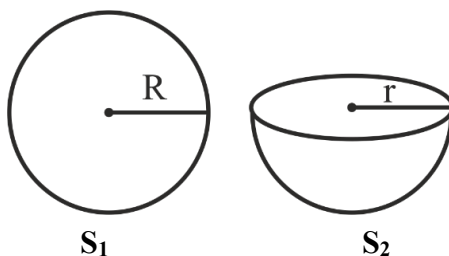
[15]

(Do not copy the questions, write the correct answers only.)

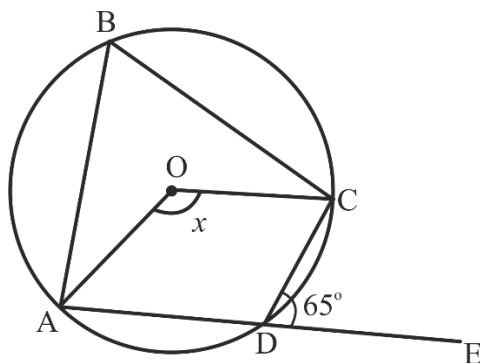
- (i) $(x + 3)$, 1 , $(3x - 7)$ and -5 are **in proportion**. The value of x is:
- (a) -1
 - (b) 1
 - (c) -5
 - (d) 5
- (ii) The marked price of a refrigerator is ₹ 12,000 and GST paid by the customer is ₹ 2,160. The rate of GST is:
- (a) 5%
 - (b) 12%
 - (c) 18%
 - (d) 28%
- (iii) Rakhi's mobile number has the following integers:
- 1, 6, 9, 8, 9, 1, 7, 8, 9
- The **mode** of the above given data is:
- (a) 1
 - (b) 6
 - (c) 8
 - (d) 9

- (iv) **A** and **B** opened a recurring deposit account in a bank which is paying simple interest at 9% per annum. **A** deposited ₹ 1,500 for one year and **B** deposited ₹ 1,200 for 15 months. The amount invested by:
- (a) **A** is ₹ 27 more than **B**
 - (b) **A** is ₹ 300 more than **B**
 - (c) **A** is ₹ 300 less than **B**
 - (d) Both **A** and **B** are same (₹ 18,000)
- (v) Find the equation of a line whose y -intercept is 6 and is parallel to x -axis.
- (a) $y = 6$
 - (b) $x = 6$
 - (c) $x + y = 6$
 - (d) $y - x = 6$
- (vi) Asha buys ₹ 20 shares of a company which pays 9% dividend at such a price that she gets a **return of 12%** on her investment. At what price did she buy each share?
- (a) ₹ 20
 - (b) ₹ 15
 - (c) ₹ 25
 - (d) ₹ 18

- (vii) The total surface area of a solid sphere (S_1) and a solid hemisphere (S_2), as shown in the diagram, **are equal**. The ratio of radii R and r is:



- (a) $1 : 1$
 (b) $2 : 1$
 (c) $\sqrt{3} : 2$
 (d) $2 : \sqrt{3}$
- (viii) In the given diagram, O is the centre of the circle and $ABCD$ is a cyclic quadrilateral. If $\angle CDE = 65^\circ$, then the value of x is:



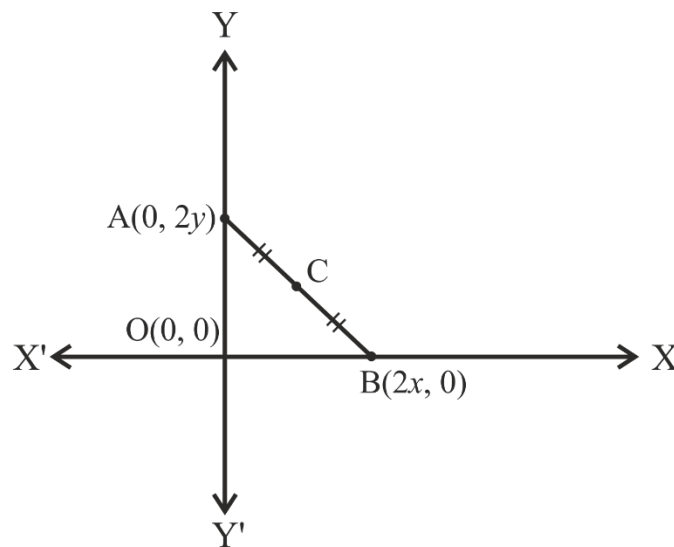
- (a) 32.5°
 (b) 65°
 (c) 115°
 (d) 130°

- (ix) The nature of roots of quadratic equation $3x^2 - 6x - 3 = 0$ are:
- (a) real and equal
 - (b) real, distinct and rational
 - (c) real, distinct and irrational
 - (d) no real roots
- (x) **Assertion (A):** If a die is rolled, the probability of getting a number greater than 6 is $\frac{1}{6}$.
- Reason (R):** There are six possible outcomes when rolling a die, $\{1, 2, 3, 4, 5, 6\}$.
- (a) (A) is true and (R) is false.
 - (b) (A) is false and (R) is true.
 - (c) Both (A) and (R) are true and (R) is the correct explanation of (A).
 - (d) Both (A) and (R) are true but (R) is not the correct explanation of (A).
- (xi) If the areas of two similar triangles are in the ratio **9 : 64**, then the ratio of their corresponding **altitudes** is:
- (a) 3 : 8
 - (b) 2 : 1
 - (c) 9 : 64
 - (d) 8 : 3

(xii) What must be added to $x^3 + 7x^2 + 3x + 2$ so that the result is completely **divisible** by $(x + 2)$?

- (a) -40
- (b) -16
- (c) 16
- (d) 40

(xiii) In the given diagram, $\triangle AOB$ is a right-angled triangle and C is the mid-point of AB. The **coordinates** of the point which is **equidistant** from the three vertices of $\triangle AOB$ is:



- (a) (x, y)
- (b) (y, x)
- (c) $\left(\frac{x}{2}, \frac{y}{2}\right)$
- (d) $\left(\frac{2x}{3}, \frac{2y}{3}\right)$

(xiv) Given matrix $A = \begin{bmatrix} 2 & 3 \\ 1 & 2 \end{bmatrix}$ and matrix $B = \begin{bmatrix} 2 & -4 \end{bmatrix}$. Product AB is a matrix of **order**:

- (a) 2×2
- (b) 2×1
- (c) 1×2
- (d) product AB is not possible

(xv) **Assertion (A):** The 9th term of a Geometric Progression (**G.P.**)
 $6, -12, 24, -48 \dots$ is a positive term.

Reason (R): The value of $(-2)^8$ is always positive.

- (a) (A) is true and (R) is false.
- (b) (A) is false and (R) is true.
- (c) Both (A) and (R) are true and (R) is the correct explanation of (A).
- (d) Both (A) and (R) are true but (R) is not the correct explanation of (A).

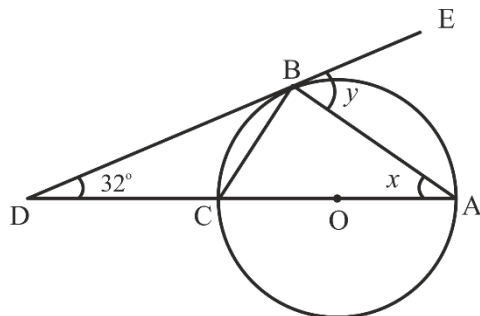
Question 2

(i) The **fourth** and **seventh** terms of an Arithmetic Progression (**A.P.**), are **60** [4]
and **114** respectively. Find the:

- (a) first term and common difference.
- (b) sum of its first 10 terms.

(ii) Given, $A = \begin{bmatrix} 3 & 1 \\ 5 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} -1 & a \\ 3 & -5 \end{bmatrix}$ and product $AB = \begin{bmatrix} b & 7 \\ 4 & 5 \end{bmatrix}$. [4]
Find the values of ' a ' and ' b '.

- (iii) In the given diagram, O is the centre of the circle and the tangent DE touches the circle at B. If, $\angle ADB = 32^\circ$. Find the values of x and y . [4]



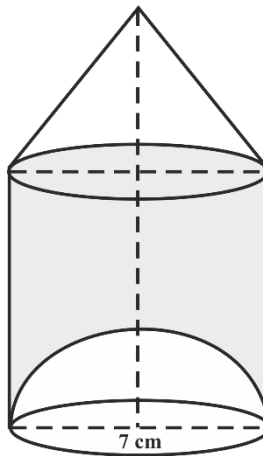
Question 3

- (i) The polynomial $kx^3 + 3x^2 - 11x - 6$ when divided by $(x + 1)$, leaves a remainder of 6. [4]

- Find the value of k .
- Using the value of k factorise completely the polynomial $kx^3 + 3x^2 - 11x - 6$

- (ii) An eye drop bottle is prepared consisting of a hemisphere, a cylinder and a conical **cap**, as shown in the given diagram. **Height** of the cylindrical and conical parts are each, **equal to the diameter (7 cm)**. Find the: [4]

- minimum height of the cylindrical box required to pack this bottle.
- volume of the liquid medicine (shaded part) in the bottle. Give your answer to the nearest whole number. (Use $\pi = \frac{22}{7}$)



(iii) Use ruler and compass for the following construction: [5]

- construct an **equilateral** triangle ABC of side 5 cm.
- construct the **circumcircle** of $\triangle ABC$.
- construct the locus of points which are **equidistant** from AB and BC.
Mark the point where the circumcircle and locus meet, as D.
- give the **geometrical** name of quadrilateral ABCD.

SECTION B (40 Marks)

(Attempt **any four** questions from this Section.)

Question 4

(i) Prove that: [3]

$$(\sec\theta - \cos\theta)(\operatorname{cosec}\theta - \sin\theta) = \sin\theta\cos\theta$$

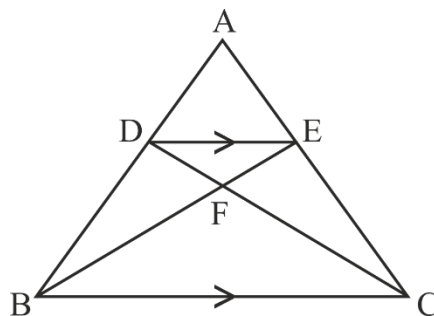
(ii) The cost price of a TV set is ₹ 20,000. The shopkeeper marked it for ₹ 24,000. [3]

He sells it to a customer at a **discount of 10%** on the marked price. If the sale is intra-state and the rate of **GST** is 12%, find the:

- discounted price of the TV set.
- amount paid by the customer to clear the bill.

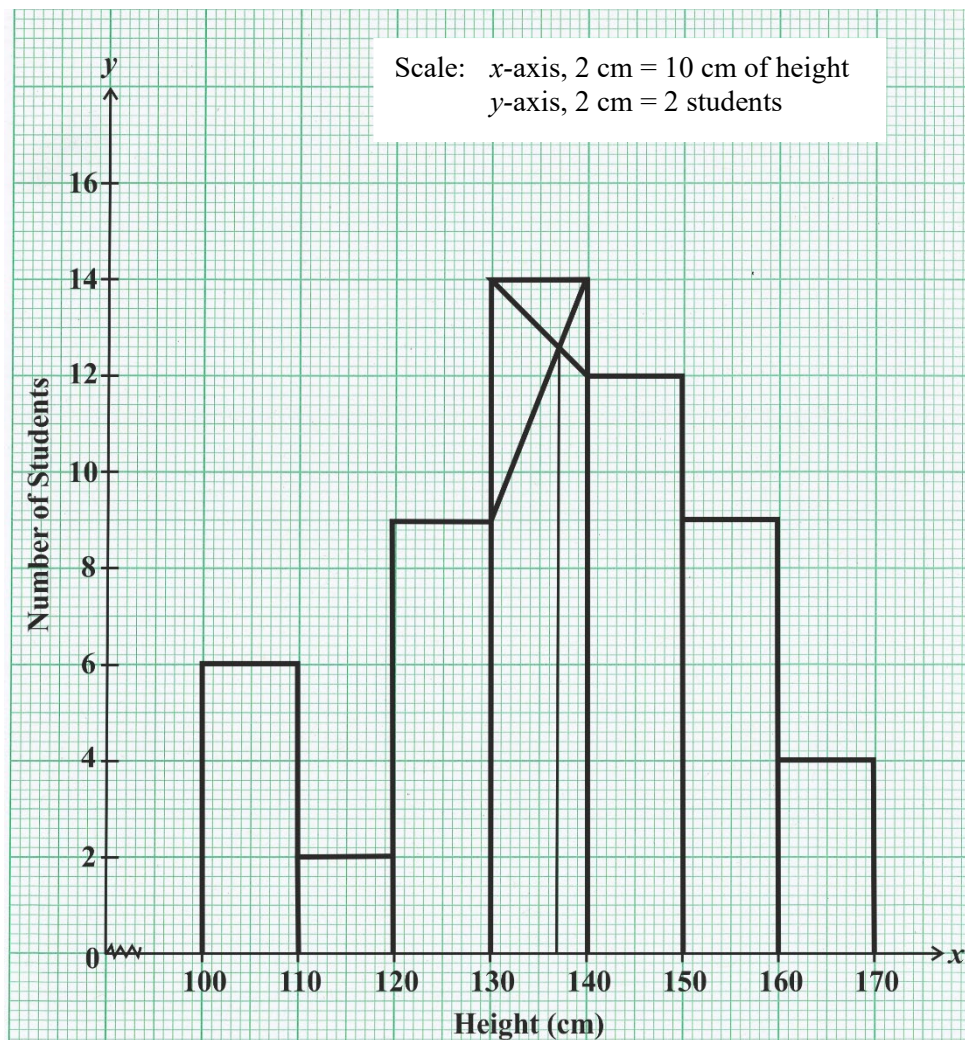
(iii) In the given diagram, $DE \parallel BC$ and $AD : DB = 2 : 3$. [4]

- Prove that: $\triangle ADE \sim \triangle ABC$ and hence find $DE : BC$
- Prove: $\triangle DFE \sim \triangle CFB$
- Given, area of $\triangle DFE = 16$ square units, find the **area of $\triangle CFB$** .



Question 5

- (i) The histogram drawn on the graph represents the number of students of different heights (in cm). [3]



Using the graph, answer the following:

- (a) the number of students whose height is **150 cm** and above.
- (b) the modal height.
- (c) the total number of students.

- (ii) **A(-10, -2)** and **B(2, 10)** are two end points of a line segment. If AB intersects the **x-axis** at P, find the: [3]
- (a) ratio in which 'P' divides AB.
- (b) coordinates of point P.
- (iii) Solve the quadratic equation $(x - 2)^2 - 5x - 3 = 0$ and give your answer correct to 3 significant figures. [4]
- (Use Mathematical Tables for this question if necessary.)*

Question 6

- (i) Kabir bought 120 shares of a company with nominal value ₹ 100, available at a **premium** of ₹ 25. Find: [3]
- (a) the money invested by Kabir in buying these shares.
- (b) the rate of dividend, if he received ₹ 1,080 as dividend from these shares after one year.
- (c) his rate of return.
- (ii) Find the **mean** of the following frequency distribution using **step-deviation** method. [3]

Take assumed mean = 28

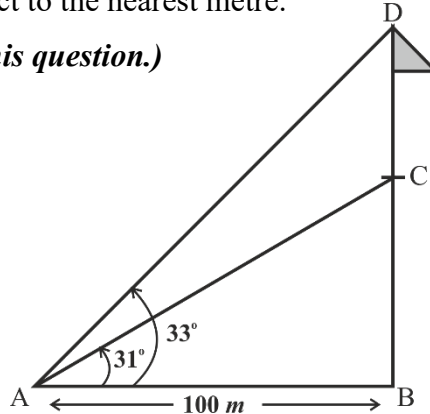
Class Interval	0 – 8	8 – 16	16 – 24	24 – 32	32 – 40	40 – 48
Frequency	10	20	14	16	18	22

- (iii) The **difference** of two natural numbers is **5** and sum of their reciprocals is $\frac{3}{10}$. [4]
- Find the two numbers.

Question 7

- (i) A flagpole is erected at the top of a building. The angle of elevation of the top and foot of the flagpole from a point **100 m** away, on the same level as that of the foot of the building, are **33°** and **31°** respectively. Find the height of the flagpole. Give your answer correct to the nearest metre. [5]

(Use Mathematical Tables for this question.)



- (ii) Using a graph paper, draw an ogive for the following distribution which shows a record of weight in kilograms of **100** students. [5]

Weight (in kg)	Number of students
35 – 40	4
40 – 45	6
45 – 50	10
50 – 55	24
55 – 60	26
60 – 65	17
65 – 70	8
70 – 75	5

Use your ogive to estimate the following:

- the median weight of the students.
- percentage of students whose weight is 60 kg or more.
- the weight above which 20% of the students lie.

Question 8

- (i) Rohit and Vinay both opened a recurring deposit account in a bank for 2 years [3]
at 8% simple interest. Vinay deposited ₹ 300 per month. On maturity, Rohit's
interest was ₹ 800 **more** than Vinay's interest. Find the:
- (a) interest earned by Vinay.
- (b) sum deposited by Rohit every month.
- (ii) The **fourth** term of a Geometric Progression (**G.P.**) is 16 and its **seventh** term [3]
is 128. Find its:
- (a) common ratio
- (b) first term
- (iii) Use graph sheet for this question. Take **2 cm = 1 unit** along both **x** and **y** axis. [4]
Graphically represent parallelogram **OABC**, where O(0, 0), A(2, 3), B(5, 3)
and C(3, 0).
- Reflect OABC:
- (a) on the **x**-axis and name its image as ODEC.
- (b) through the origin and name its image as OIJH.
- (c) on the **y**-axis and name its image as OFGH.

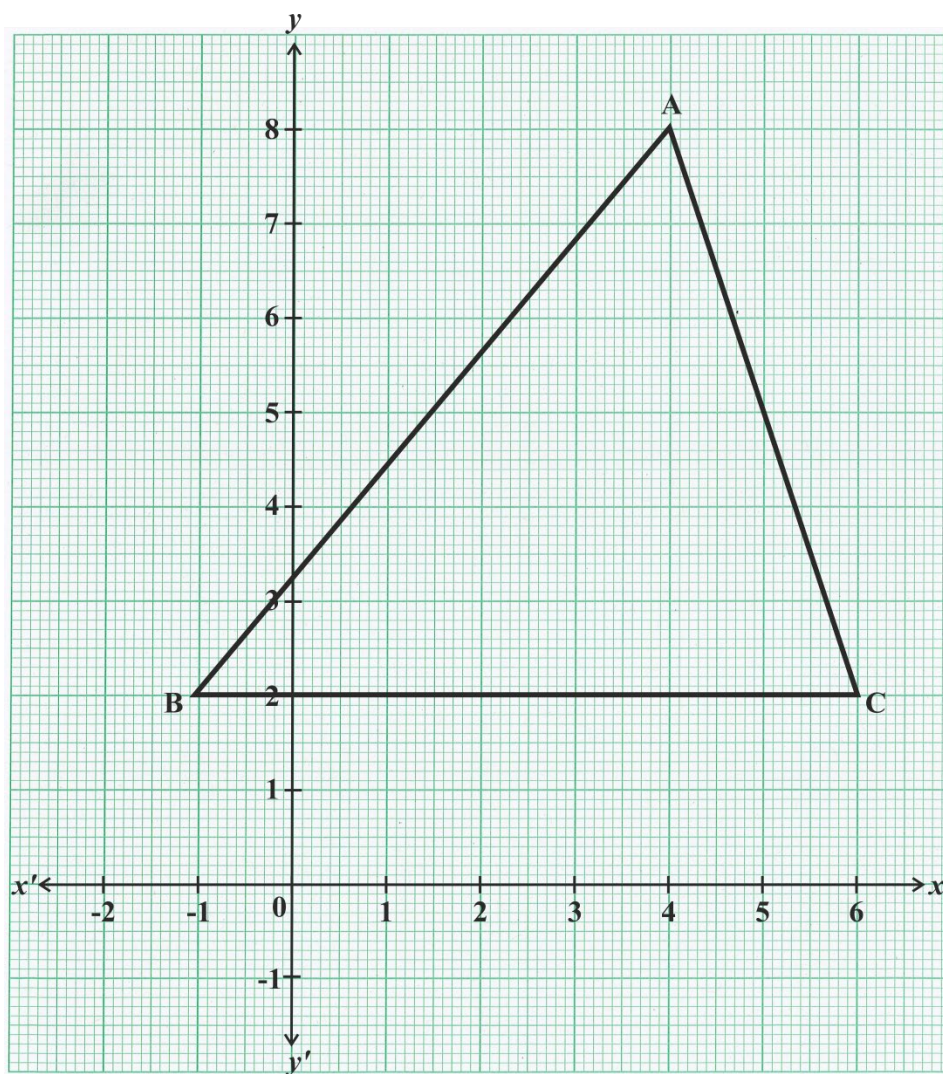
Question 9

- (i) Solve the following inequation, write the **solution set** and represent it on the [3]
real number line.

$$-1 < \frac{2x - 3}{3} - \frac{x}{5} \leq 1, x \in R$$

(ii) Use the following graph and answer the given questions:

[3]

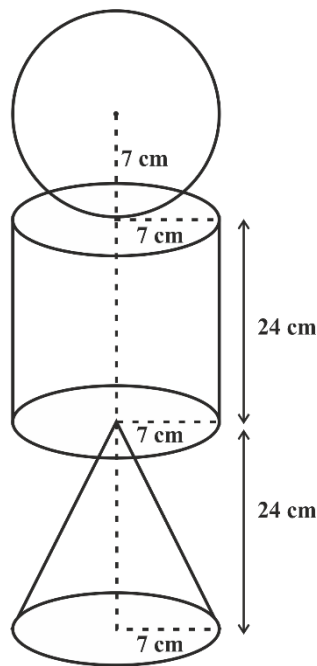


- (a) Write the co-ordinates of points **A**, **B** and **C**.
- (b) Find the equation of a line passing through the **mid-point** of **AC** and parallel to **AB**.

- (iii) A solid wooden toy is prepared by joining a cone, a cylinder and a sphere, as shown in the given diagram. **The radius of each of the three solids is 7 cm** and **heights** of each of the cone and the cylinder is **24 cm**. Find: [4]

- (a) the **total surface area** of the given solid.
- (b) the **cost** of painting the total surface at the rate of **₹ 0.50** per cm^2 .

(Use $\pi = \frac{22}{7}$)



Question 10

- (i) If $x = \frac{5ab}{a-b}$, $a \neq b$, [3]

(a) Find: $\frac{x}{a}$

(b) Using properties of proportion, find: $\frac{x+a}{x-a}$

- (ii) A survey was conducted on **300** families having **2** children each. The results obtained are given below. [3]

Number of girl child	2	1	0	Total
Number of families	95	165	40	300

If one family is selected at random, find the probability that it will have:

- (a) one girl child
 (b) one or more girl child
 (c) no boy child
- (iii) In the given figure 'O' is the centre of the circle. PQ is a tangent to the circle at B and $\mathbf{AB = AC}$. If $\angle \mathbf{CBQ} = 40^\circ$, find the unknown angles $\mathbf{x, y, z}$ and $\mathbf{w}$. [4]

