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.***

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.

Turn Over

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?

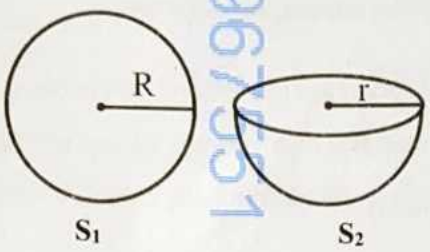
(a) ₹ 20

(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:



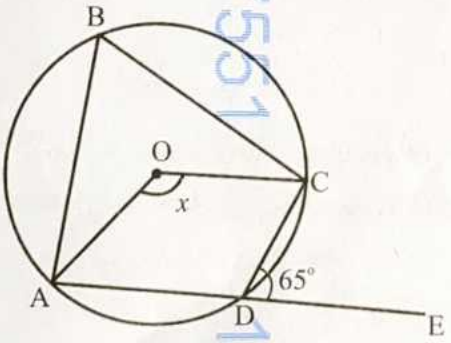
(a) 1 : 1

(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 $(x + 2)$?

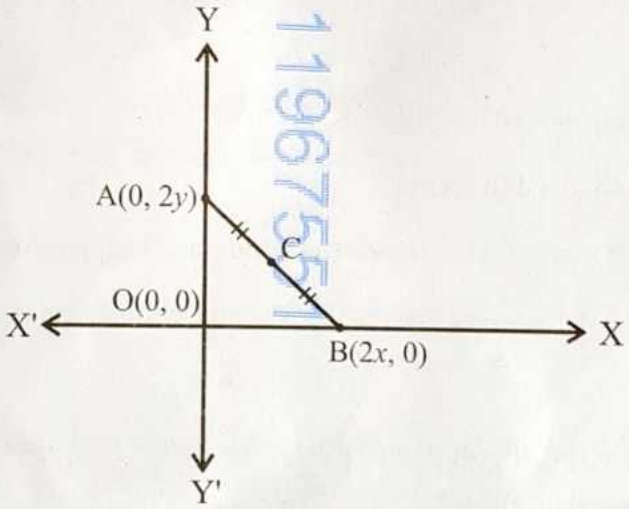
(a) -40

(b) -16

(c) 16

(d) 40

(xiii) In the given diagram, ΔAOB 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 ΔAOB 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 $B = [2 \quad -4]$. 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… 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** and **114** respectively. Find the: [4]

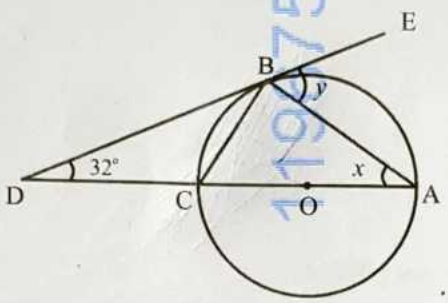
(a) first term and common difference.

(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, $\angle \mathbf{ADB} = \mathbf{32^o}$. Find the values of $\boldsymbol{x}$ and $\boldsymbol{y}$. [4]



Question 3

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

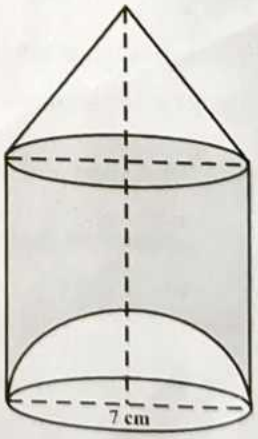
(a) Find the value of $\boldsymbol{k}$.

(b) Using the value of $\boldsymbol{k}$ 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]

(a) minimum height of the cylindrical box required to pack this bottle.

(b) 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]

(a) construct an **equilateral** triangle ABC of side 5 cm.

(b) construct the **circumcircle** of ΔABC.

(c) construct the locus of points which are **equidistant** from AB and BC. Mark the point where the circumcircle and locus meet, as D.

(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]

$$(sec\theta - cos\theta)(cosec\theta - sin\theta) = sin\theta cos\theta$$

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

(a) discounted price of the TV set.

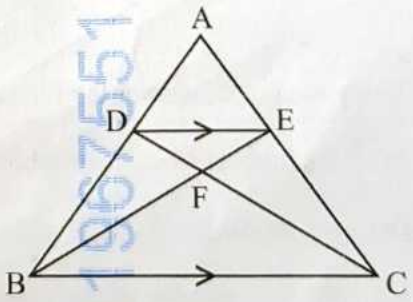
(b) amount paid by the customer to clear the bill.

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

(a) Prove that: ΔADE ~ ΔABC and hence find DE : BC

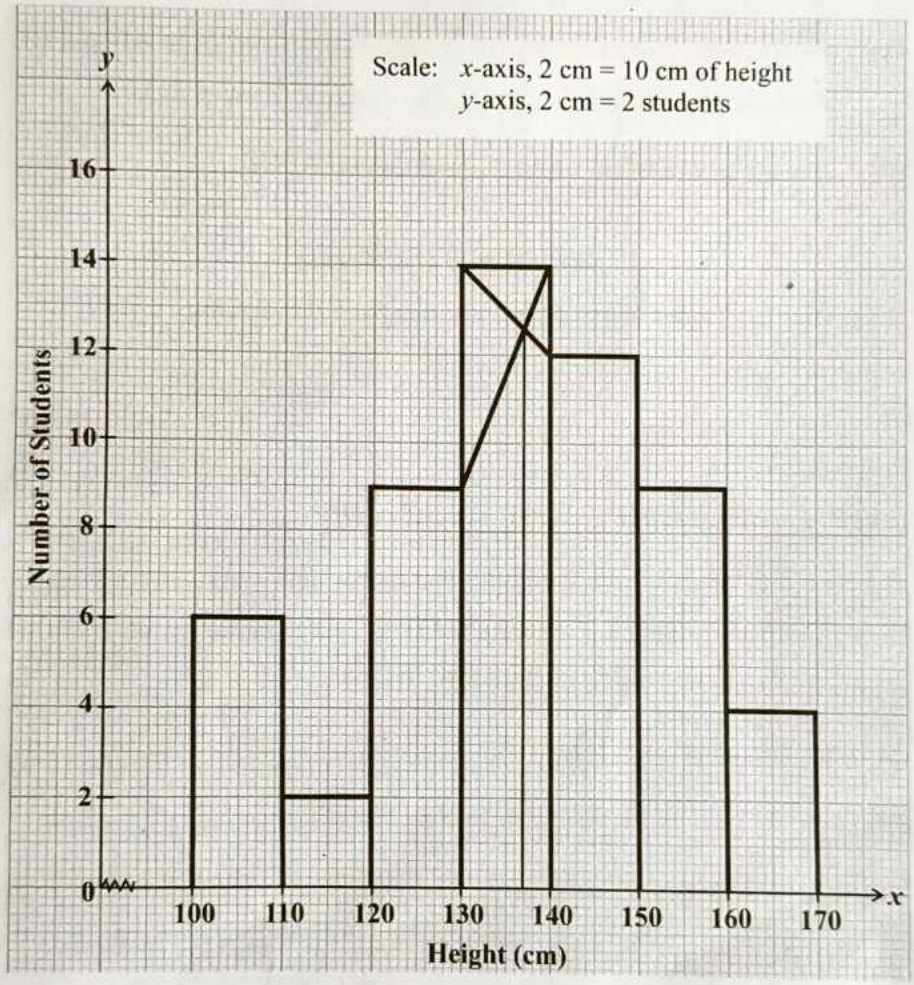
(b) Prove: ΔDFE ~ ΔCFB

(c) Given, area of ΔDFE = 16 square units, find the **area of ΔCFB.**



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

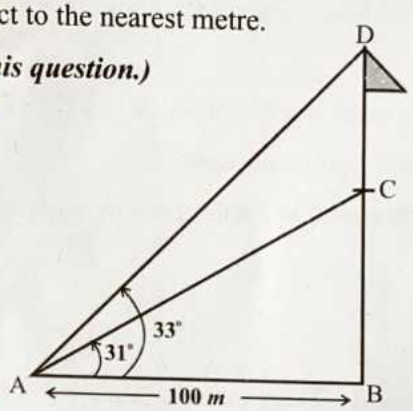
(iii) The **difference** of two natural numbers is **5** and sum of their reciprocals is $\frac{3}{10}$. [4]

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:

(a) the median weight of the students.

(b) percentage of students whose weight is 60 kg or more.

(c) 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 at 8% simple interest. Vinay deposited ₹ 300 per month. On maturity, Rohit's interest was ₹ 800 **more** than Vinay's interest. Find the: [3]

(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 is 128. Find its: [3]

(a) common ratio

(b) first term

(iii) Use graph sheet for this question. Take **2 cm = 1 unit** along both x and y axis. Graphically represent parallelogram **OABC**, where O(0, 0), A(2, 3), B(5, 3) and C(3, 0). [4]

Reflect OABC:

(a) on the x-axis and name its image as ODEC.

(b) through the origin and name its image as OIJH.

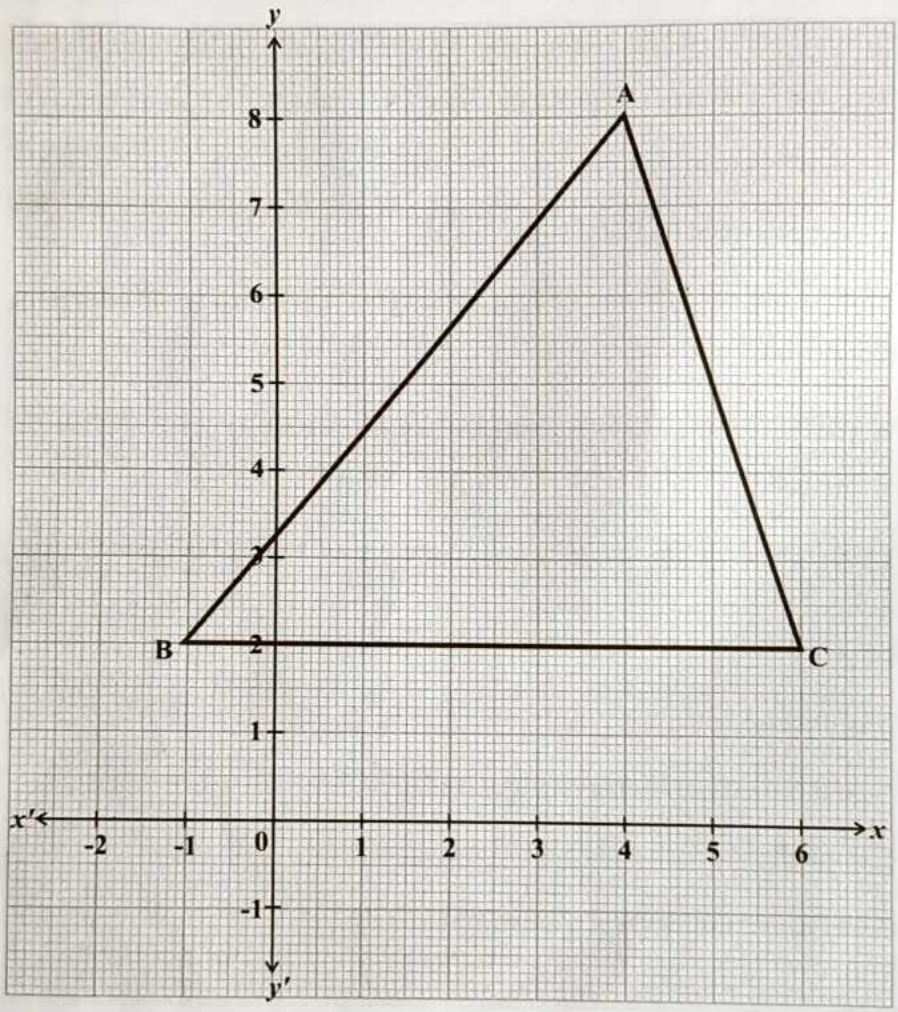
(c) on the y-axis and name its image as OFGH.

Question 9

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

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

(ii) Use the following graph and answer the given questions: [3]



(a) Write the co-ordinates of points **A**, **B** and **C**.

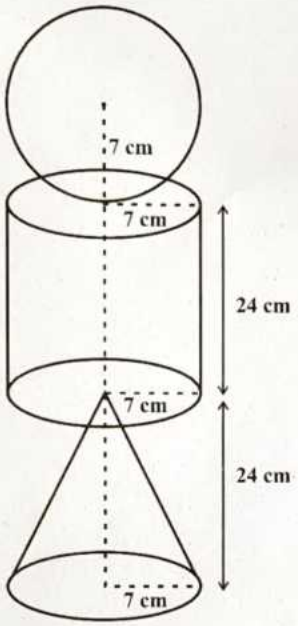
(b) Find the equation of a line passing through the **mid-point** of **AC** and parallel to **AB**.

(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 **AB = AC**. If $\angle CBQ = 40°$, find the unknown angles x, y, z *and* w. [4]