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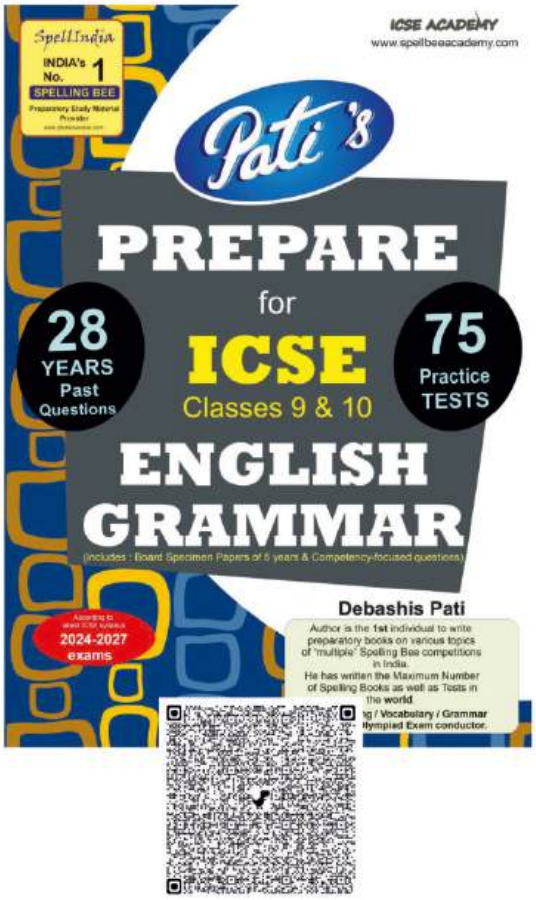

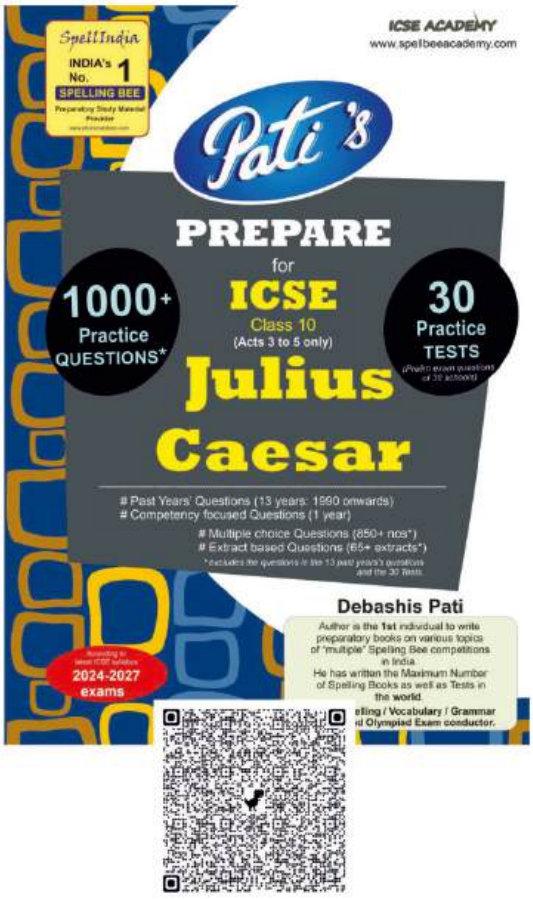

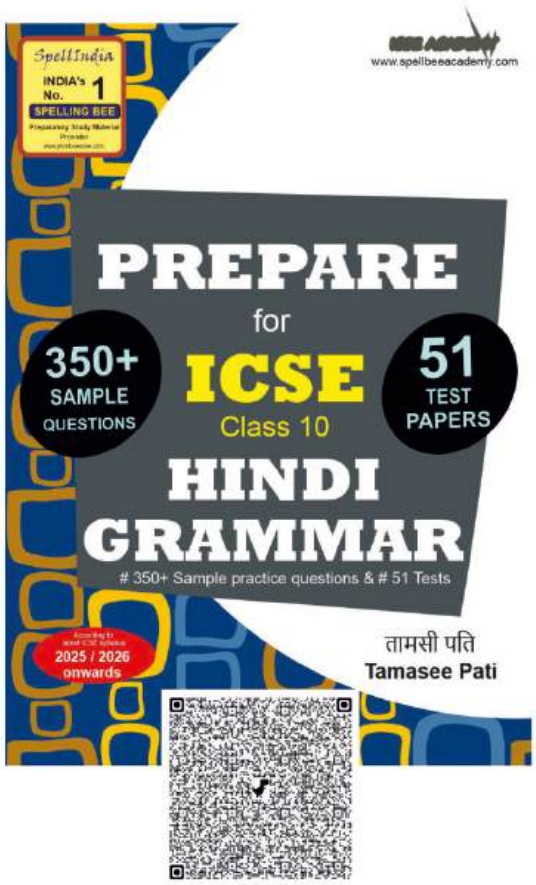

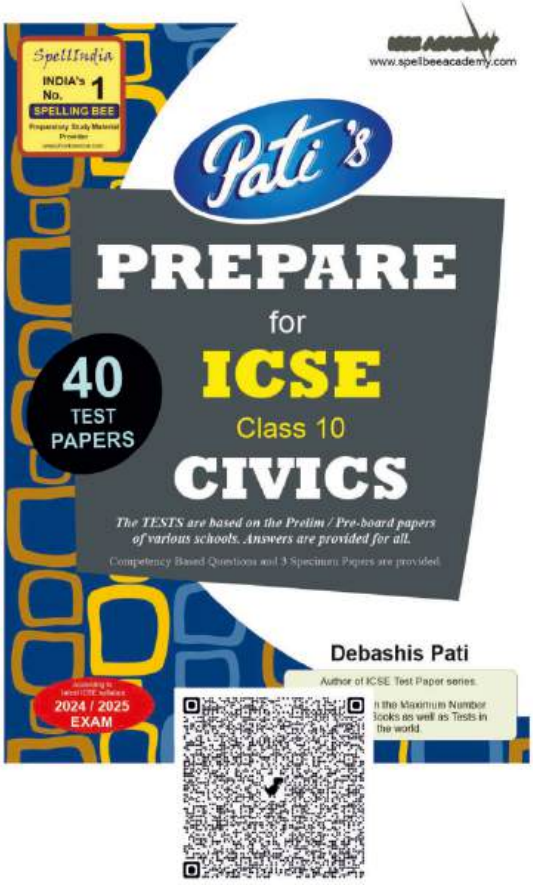

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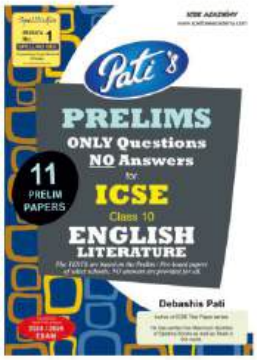

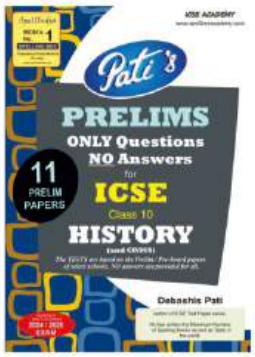

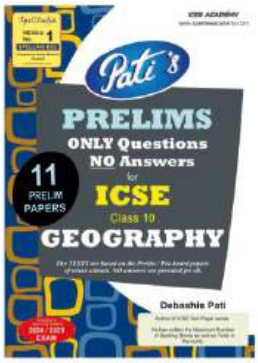

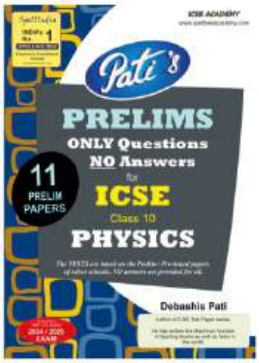

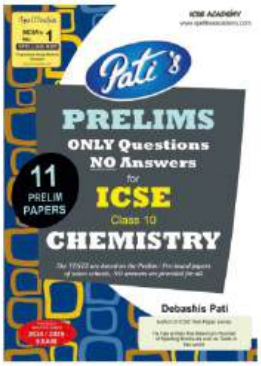

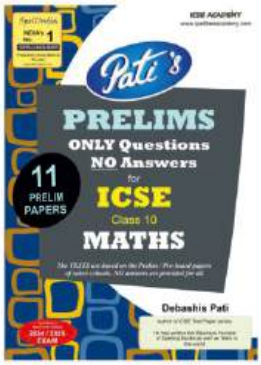

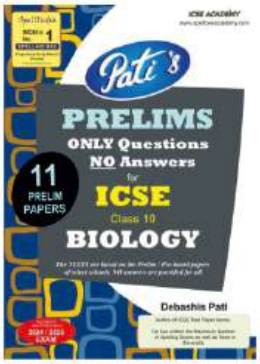

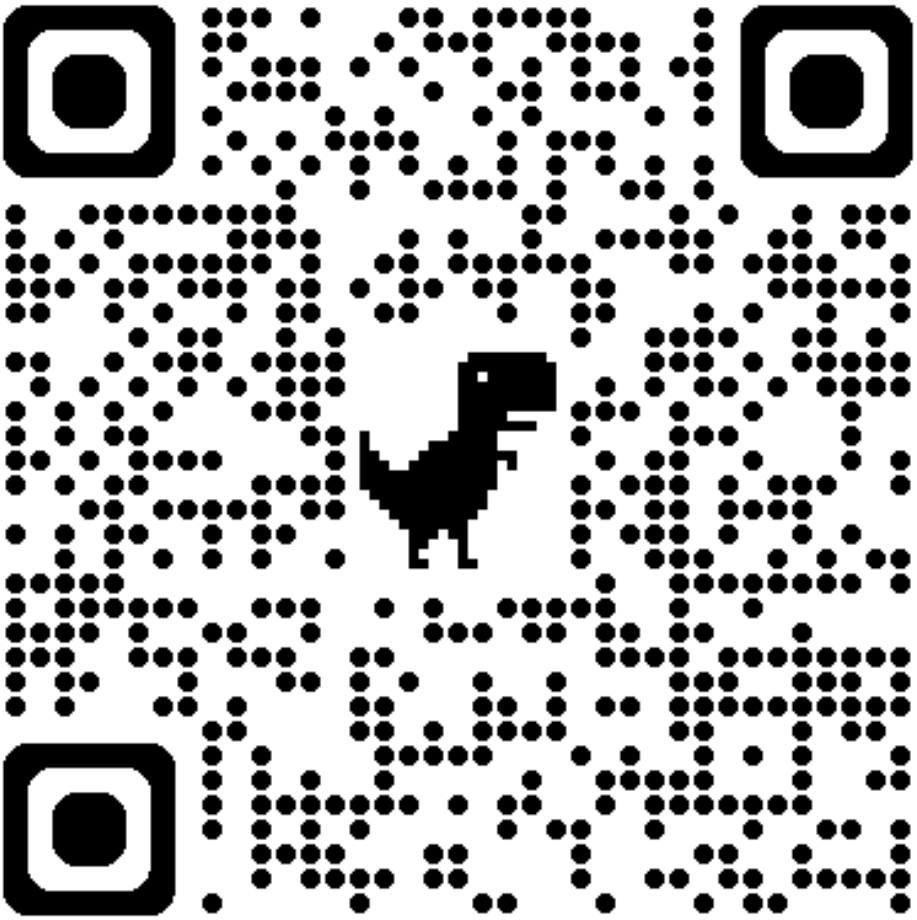

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MATHEMATICS

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 bœlearly 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 15 printed pages and 1 blank page.

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) When polynomial $x^3 - 3x^2 - 6x + 8$ is divided by $(x + 2)$, the remainder is zero. The **probability** of $(x + 2)$ to be one of the factors of the given polynomial is:

(a) 0

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

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

(d) 1

(ii) **Assertion (A):** In **ΔABC** and **ΔPQR**, if **∠BAC = ∠QPR** and **∠ABC = ∠PQR**, then **ΔABC ~ ΔPQR**

Reason (R): **ΔABC ~ ΔPQR** by **SSS** axiom

(a) (A) is true, (R) is false.

(b) (A) is false, (R) is true.

(c) Both (A) and (R) are true, and (R) is the correct reason for (A).

(d) Both (A) and (R) are true, and (R) is the incorrect reason for (A).

(iii) The ratio of **diameters** of two right circular cones is **3 : 7** and that of their **heights** is **14 : 9**, then their **volumes** are in ratio:

(a) 3 : 7

(b) 2 : 7

(c) 3 : 2

(d) 9 : 49

(iv) The value of p for which $(x - p)$ is a factor of $x^3 - px^2 + x + 5$ is:

(a) – 5

(b) – 4

(c) 5

(d) $p + 5$

(v) The **GST** of an article is reduced from **12%** to **5%** and due to this, the price paid for the article is cut down by **₹14**. The original price of the article is:

(a) ₹50

(b) ₹98

(c) ₹100

(d) ₹200

(vi) The mean of 1^2, 2^2, 3^3 and 4^4 is:

(a) 24

(b) 72

(c) 144

(d) 264

(vii) If $\boldsymbol{2x - 15 > 4x + 9}$, then:

(a) $x < -12$

(b) $x < 12$

(c) $x > -12$

(d) $x > 12$

(viii) **Assertion(A):** If the length of shadow of a person is equal to his height, then the angle of elevation of the sun is **45°**.

Reason(R): For any right-angled triangle, $tan\,\theta = \frac{Perpendicular}{Base}$

(a) (A) is true, (R) is false.

(b) (A) is false, (R) is true.

(c) Both (A) and (R) are true, and (R) is the correct reason for (A).

(d) Both (A) and (R) are true, and (R) is the incorrect reason for (A).

(ix) The roots of the quadratic equation $\boldsymbol{3x^2 = 6x}$ is:

(a) 0

(b) 2

(c) 0 and 2

(d) 0 and 6

(x) The **locus** of a toy bird fixed at the tip of one of the blades of a rotating ceiling fan is a:

(a) straight line

(b) circle

(c) semi-circular arc

(d) diameter of the circle so formed

(xi) Percentage return on **₹100, 12%** share of a company bought at **4%** discount is:

(a) 10%

(b) 12%

(c) 12.5%

(d) 16%

(xii) If matrix **A** of order **2 × 1** and matrix **B** of order **2 × 2** are added, then the order of the matrix A + B is:

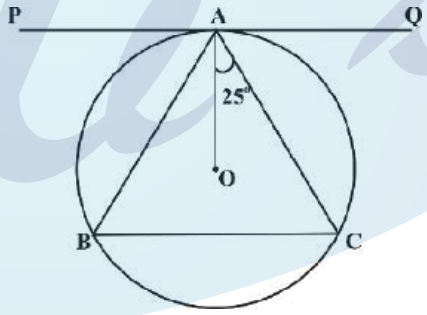
(a) 2 × 2

(b) 2 × 1

(c) 1 × 2

(d) A + B is not possible

(xiii) In the adjoining diagram, **PQ** is a tangent at **A** to the circle with centre **O**. If **∠OAC = 25°**, then **∠ABC** is:



(a) 20°

(b) 65°

(c) 70°

(d) 130°

(xiv) The line segment joining **A(–7, 2)** and **B(3, –8)** is divided by the ***x*-axis** in the ratio:

(a) 1 : 4

(b) 3 : 7

(c) 4 : 1

(d) 7 : 3

(xv) Mr. Rahul deposited **₹11,700** in a recurring deposit account for $\mathbf{1\frac{1}{2}}$ years.

The amount deposited by him per month is:

(a) ₹650

(b) ₹780

(c) ₹6,500

(d) ₹7,800

Question 2

(i) A retailer purchased an air conditioner (A.C.) for **₹30,000**. He marked up its price by **20%** and then allows a discount of **10%** on the marked price to a customer. If the sale is intra-state and the rate of GST is **28%**, find the: [4]

(a) marked price of A.C.

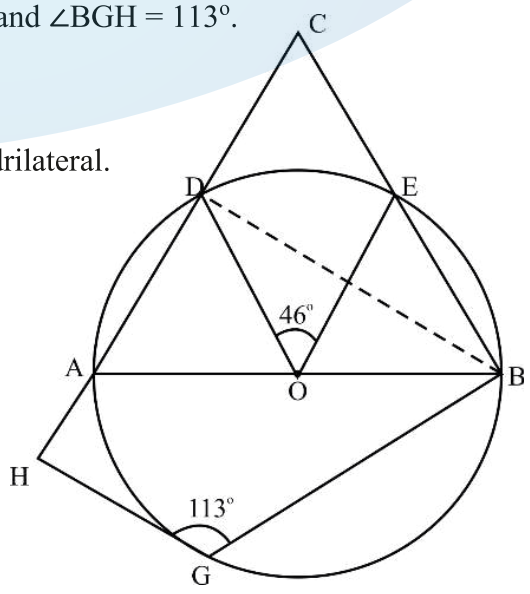
(b) total amount paid by the customer including GST.

(c) tax collected by the central and the state governments respectively.

(ii) In the adjoining diagram ∠DOE = 46° and ∠BGH = 113°. [4]

(a) Find ∠DBC and ∠DCE.

(b) Prove that CBGH is a cyclic quadrilateral.



(iii) The table given below shows a record of the weight in kilogram of **200** students of a school. [4]

Weight (kg)	Number of students
40 – 45	8
45 – 50	19
50 – 55	24
55 – 60	45
60 – 65	51
65 – 70	31
70 – 75	22

Draw a histogram and find the **modal weight**.

[Take 2 cm = 5 kg along one axis and 2 cm = 5 students along the other axis]

Question 3

(i) Prove that: [4]

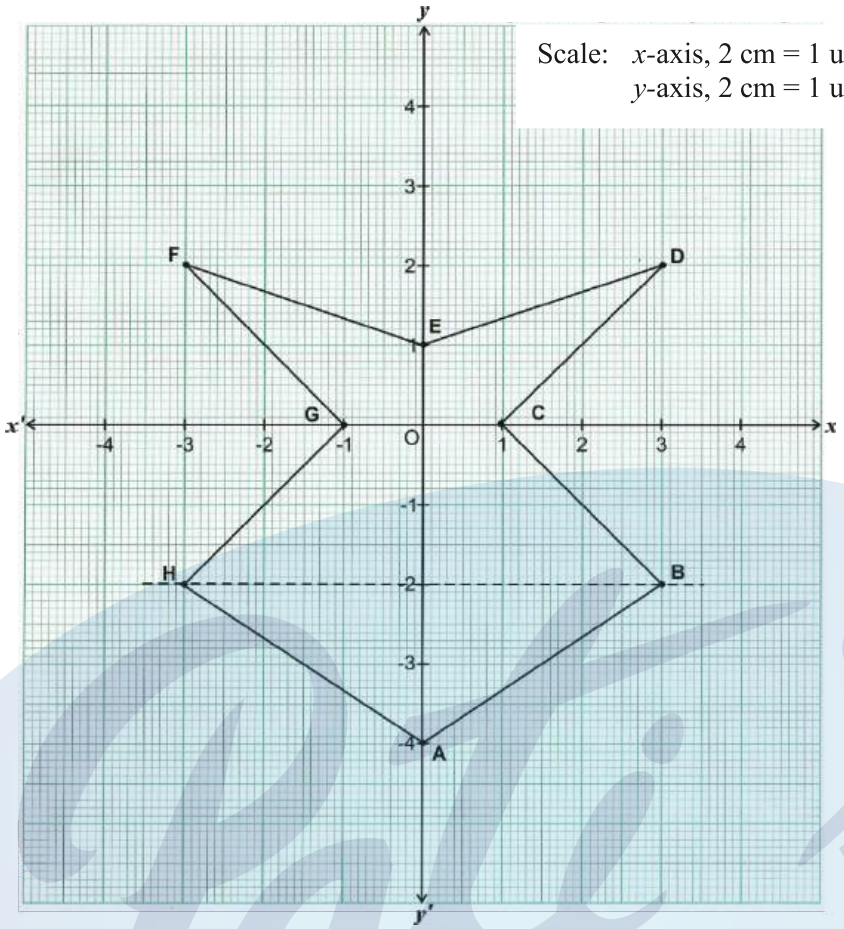
$$\frac{(sinA - \sin^3 A)}{(\cos^3 A - cosA)} \times (secA - cosecA) = cosecA(cotA - 1)$$

(ii) $If\ 2x^3 - 3x^2 - 3x + 2 = (2x - 1)(x^2 + ax + b)$: [4]

(a) using Remainder and Factor theorem, find the value of ***'a'*** and ***'b'***.

(b) **hence**, factorise the polynomial $2x^3 - 3x^2 - 3x + 2$ completely.

(iii) [5]



Using the given graph, answer the following:

(a) Write down the coordinates of the points **A**, **B**, **C**, and **E**.

(b) Name and write down the coordinates of the image of **B** under reflection in ***x*-axis**.

(c) Name and write the coordinates of the image of **D** under reflection through the **origin**.

(d) Which point is the image of **A** under reflection on the line **BH?** Write its coordinates.

(e) Name the closed figure **ABCDEFGH.**

SECTION B (40 Marks)

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

Question 4

(i) The sum of two numbers is **2** and the sum of their reciprocals is **2.25**. Find the numbers. [3]

(ii) A right circular cone of radius **20 cm** has its volume **8800 cm^3**. Find its: [3]

(a) height

(b) curved surface area

Give your answer to the nearest whole number.

[Use $\pi = \frac{22}{7}$]

(iii) Construct a regular hexagon of side **4.5 cm**. Hence, construct a circle circumscribing the regular hexagon. Use ruler and compass for the construction. Measure and write down the radius of the circle. [4]

Question 5

(i) **164, 160, 156, 152, ……** are in Arithmetic Progression (A.P.). Find: [3]

(a) which term is equal to 0.

(b) the sum of its first 20 terms.

(ii) Solve the following quadratic equation: [3]

$3x^2 + 6x - 4 = 0$

Give your answer correct to two places of decimals

(Use Mathematical tables, if necessary)

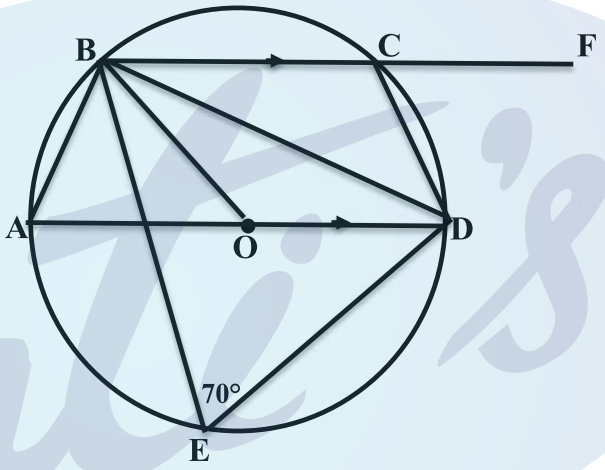
(iii) In the adjoining figure of a circle with centre **O** and diameter **AD**, **∠BED = 70°** and **BC** is parallel to **AD**. Find: [4]

(a) ∠BAD

(b) ∠BOD

(c) ∠DBC

(d) ∠DCF



Question 6

(i) Solve the inequation, write down the solution set and represent it on a real number line: [3]

$$3x - 16 < \frac{2x}{5} - 3 \leq -\frac{3}{5} + 2x; \quad x \in R$$

(ii) If the **6th** term of a series in Geometric Progression (G.P.) is **32** and the **9th** term is **256**, find the: [3]

(a) first term and the common ratio.

(b) sum of its first 10 terms.

(iii) An ice cream cone has a diameter of **7 cm** and its height is **9 cm**. It is filled with a scoop of spherical shaped ice cream of radius **3.5 cm.** [4]

Find: (Give all answers correct to the nearest whole number)

(a) on melting, is the ice cream sufficient to fill the cone completely without any wastage?

(b) the volume of ice cream, if any, is in excess or less.

[Use $\pi = \frac{22}{7}$]

Question 7

(i) There are some red, green and white marbles in a box. One marble is picked up at random from this box If the probability of picking up a red marble is $\frac{2}{9}$ and that of picking up a green marble is $\frac{4}{9}$ then find the: [3]

(a) probability of picking up a white marble.

(b) number of green marbles, if total number of marbles is **54**.

(c) probability of **not** picking up a red marble.

(ii) Mr. Anil has a recurring deposit account. He deposits a certain amount of money per month for **2** years. If he received an interest whose value is the double of the deposit made per month, then find the rate of interest. [3]

(iii) If a, b, c and d are in continued proportion, prove that [4]

$$ad(c^2 + d^2) = c^3(b + d)$$

Question 8

(i) **₹100** shares of a company giving **10%** dividend are selling at **₹150**. Mr. Saha invests **₹18000** to buy these shares. He sells **80%** of his sharesafter one year. Find: [3]

(a) the number of shares he purchased.

(b) the number of shares he sold.

(c) his annual income from the remaining **20%** shares he still holds.

(ii) Equation of a line **AB** is $x + 2y + 6 = 0$. A perpendicular **PQ** is dropped on AB from the point **P(3, –2)** meeting AB at **Q**. Find the: [3]

(a) equation of PQ.

(b) coordinates of the point Q.

(iii) Divide **20** into two parts such that the sum of their squares is **272**. The larger of two parts is square of the other. Assuming the smaller part to be ' x ', form an equation and solve it to find the two parts. [4]

Question 9

(i) Use a graph paper for this question: [5]

The Marks out of **80** obtained by **160** students in a Mathematics test were recorded as given in the table:

Marks	0–10	10–20	20–30	30–40	40–50	50–60	60–70	70–80
No. of Students	12	20	28	35	29	16	12	8

(Take 2 cm = 10 Marks on one axis and 2 cm = 20 students on the other axis).

Draw an Ogive and use it to find the following:

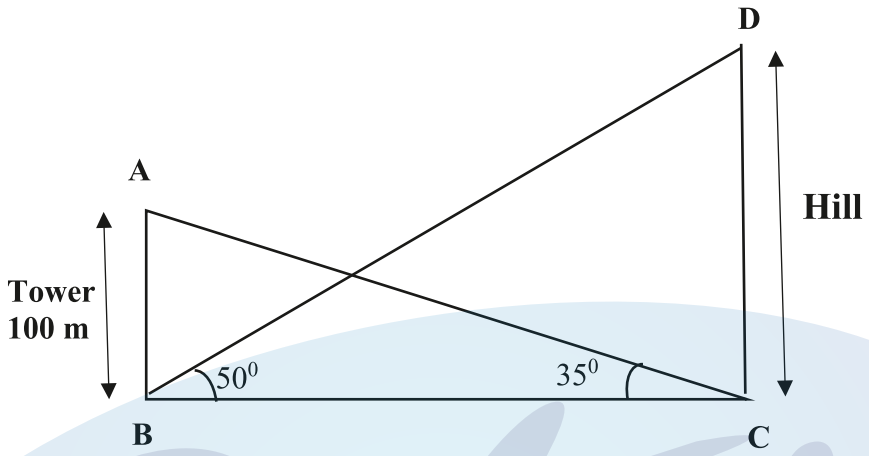
(a) median marks

(b) upper quartile marks

(c) number of students who scored above 65 marks

(d) the lowest marks scored by the top 30% students.

(ii) The angle of elevation of the top of a hill from the foot of a tower at **B** is **50°.** The angle of elevation of the top of the tower **100 m** high from the foot of the hill at **C** is **35°**. [5]



Find the:

(a) horizontal distance **BC** between the Hill and the Tower.

(b) height **CD** of the Hill. *(Take tan50° = 1.20)*

(c) time taken by a cyclist to cover the distance **BC,** cycling at **20 m/sec**.

Question 10

(i) Using Remainder and Factor theorem factorise the given polynomial completely. [3]

$$6x^3 + x^2 - 4x + 1$$

(ii) Using **short-cut** method, find Mean of the given frequency distribution: [3]

Class	20 - 30	30 - 40	40 - 50	50 - 60	60 - 70	70 - 80
Frequency	6	9	14	10	7	4

(iii) Use ruler and compass for the following constructions: [4]

Construct:

(a) an isosceles **ΔABC** in which **AB = AC = 7 cm** and **BC = 6 cm**.

(b) the locus of points which moves such that it is **2.5 cm** from the point **A**.

(c) the locus of points equidistant from **B** and **C**. Mark point **P** which satisfies both the conditions mentioned in **(b)** and **(c)**.

(d) a circle passing through **P**, **B** and **C**.

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 bœlearly 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) The given quadratic equation $3x^2 + \sqrt{7}x + 2 = 0$ has:

(a) two equal real roots.

(b) two distinct real roots.

(c) more than two real roots.

(d) no real roots.

(ii) Mr. Anuj deposits **₹500** per month for **18** months in a recurring deposit account at a certain rate. If he earns **₹570** as interest at the time of maturity, then his matured amount is:

(a) ₹(500 × 18 + 570)

(b) ₹(500 × 19 + 570)

(c) ₹(500 × 18 × 19 + 570)

(d) ₹(500 × 9 × 19 + 570)

(iii) Which of the following **cannot** be the probability of any event?

(a) $\frac{5}{4}$

(b) 0.25

(c) $\frac{1}{33}$

(d) 67%

(iv) The equation of the line passing through origin and parallel to the line $\mathbf{3x + 4y + 7 = 0}$ is:

(a) $3x + 4y + 5 = 0$

(b) $4x - 3y - 5 = 0$

(c) $4x - 3y = 0$

(d) $3x + 4y = 0$

(v) If $\boldsymbol{A} = \begin{bmatrix} \mathbf{0} & \mathbf{1} \\ \mathbf{1} & \mathbf{0} \end{bmatrix}$, then $\boldsymbol{A^2}$ is equal to:

(a) $\begin{bmatrix} 1 & 1 \\ 0 & 0 \end{bmatrix}$

(b) $\begin{bmatrix} 0 & 0 \\ 1 & 1 \end{bmatrix}$

(c) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

(d) $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$

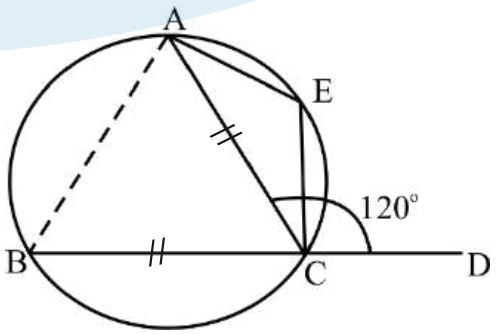
(vi) In the given diagram, chords **AC** and **BC** are equal. If $\angle\mathbf{ACD} = \mathbf{120°}$, then $\angle\mathbf{AEC}$ is:

(a) 30°

(b) 60°

(c) 90°

(d) 120°



(vii) The factor **common** to the two polynomials $x^2 - 4$ and $x^3 - x^2 - 4x + 4$ is:

(a) $(x + 1)$

(b) $(x - 1)$

(c) $(x - 2)$

(d) $(x - 4)$

(viii) A man invested in a company paying **12%** dividend on its share. If the percentage return on his investment is **10%**, then the shares are:

(a) at par

(b) below par

(c) above par

(d) cannot be determined

(ix) **Statement 1:** The point which is equidistant from three non-collinear points **D**, **E** and **F** is the **circumcentre** of the **ΔDEF**.

Statement 2: The **incentre** of a triangle is the point where the bisector of the angles intersects.

(a) Both the statements are true.

(b) Both the statements are false.

(c) Statement 1 is true, and Statement 2 is false.

(d) Statement 1 is false, and Statement 2 is true.

(x) **Assertion(A):** If $\boldsymbol{sin^2A + sinA = 1}$ then $\boldsymbol{cos^4A + cos^2A = 1}$

Reason(R): $\boldsymbol{1 - sin^2A = cos^2A}$

(a) (A) is true, (R) is false.

(b) (A) is false, (R) is true.

(c) Both (A) and (R) are true, and (R) is the correct reason for (A).

(d) Both (A) and (R) are true, and (R) is the incorrect reason for (A).

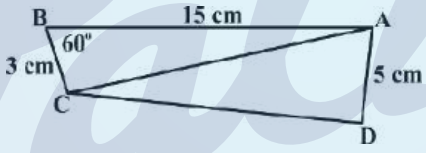
(xi) In the given diagram **Δ ABC ~ ΔEFG**. If **∠ABC = ∠ EFG = 60°**, then the length of the side **FG** is:

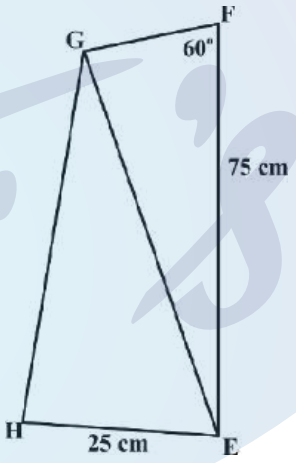
(a) 15 cm

(b) 20 cm

(c) 25 cm

(d) 30 cm





(xii) If the volume of two spheres is in the ratio **27 : 64**, then the ratio of their **radii** is:

(a) 3 : 4

(b) 4 : 3

(c) 9 : 16

(d) 16 : 9

(xiii) The marked price of an article is **₹1375**. If the **CGST** is charged at a rate of **4%**, then the price of the article **including GST** is:

(a) ₹55

(b) ₹110

(c) ₹1430

(d) ₹1485

(xiv) The solution set for $\mathbf{0 < -\frac{x}{3} < 2, x \in Z}$ is:

(a) $\{-5, -4, -3, -2, -1\}$

(b) $\{-6, -5, -4, -3, -2, -1\}$

(c) $\{-5, -4, -3, -2, -1, 0\}$

(d) $\{-6, -5, -4, -3, -2, -1, 0\}$

(xv) **Assertion(A):** The mean of first **9** natural numbers is **4.5**.

Reason(R): $\text{Mean} = \frac{Sum\ of\ all\ the\ observations}{Total\ number\ of\ observations}$

(a) (A) is true, (R) is false.

(b) (A) is false, (R) is true.

(c) Both (A) and (R) are true, and (R) is the correct reason for (A).

(d) Both (A) and (R) are true, and (R) is the incorrect reason for (A).

Question 2

(i) Solve the following quadratic equation $\mathbf{2x^2 - 5x - 4 = 0}$ [4]

Give your answer correct to **three significant figures**.

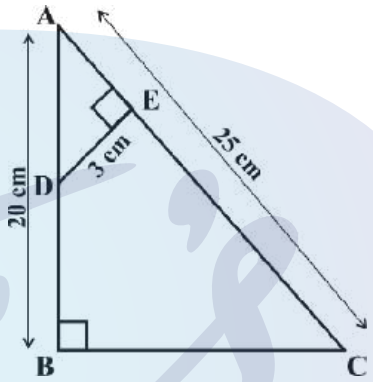
(Use mathematical tables for this question)

(ii) Mrs. Rao deposited **₹250** per month in a recurring deposit account for a period of **3** years. She received **₹10,110** at the time of maturity. Find: [4]

(a) the rate of interest.

(b) how much **more** interest Mrs. Rao will receive if she had deposited **₹50** more per month at the same rate of interest and for the same time.

(iii) In **ΔABC, ∠ABC = 90°, AB = 20 cm, AC = 25 cm , DE** is perpendicular to **AC** such that **∠DEA = 90°** and **DE = 3 cm** as shown in the given figure. [4]



(a) Prove that **ΔABC ~ ΔAED.**

(b) Find the lengths of **BC**, **AD** and **AE**.

(c) If **BCED** represents a plot of land on a map whose actual area on ground is **576 m²**, then find the **scale factor** of the map.

Question 3

(i) Use ruler and compass for the following construction. Construct a ΔABC, where **AB =6 cm**, **AC = 4.5 cm** and **∠BAC = 120°**. Construct a circle circumscribing the ΔABC. Measure and write down the length of the radius of the circle. [4]

(ii) If $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$, $B = \begin{bmatrix} 2 & 1 \\ 4 & 2 \end{bmatrix}$ and $C = \begin{bmatrix} -5 & 1 \\ 7 & -4 \end{bmatrix}$ [4]

Find:

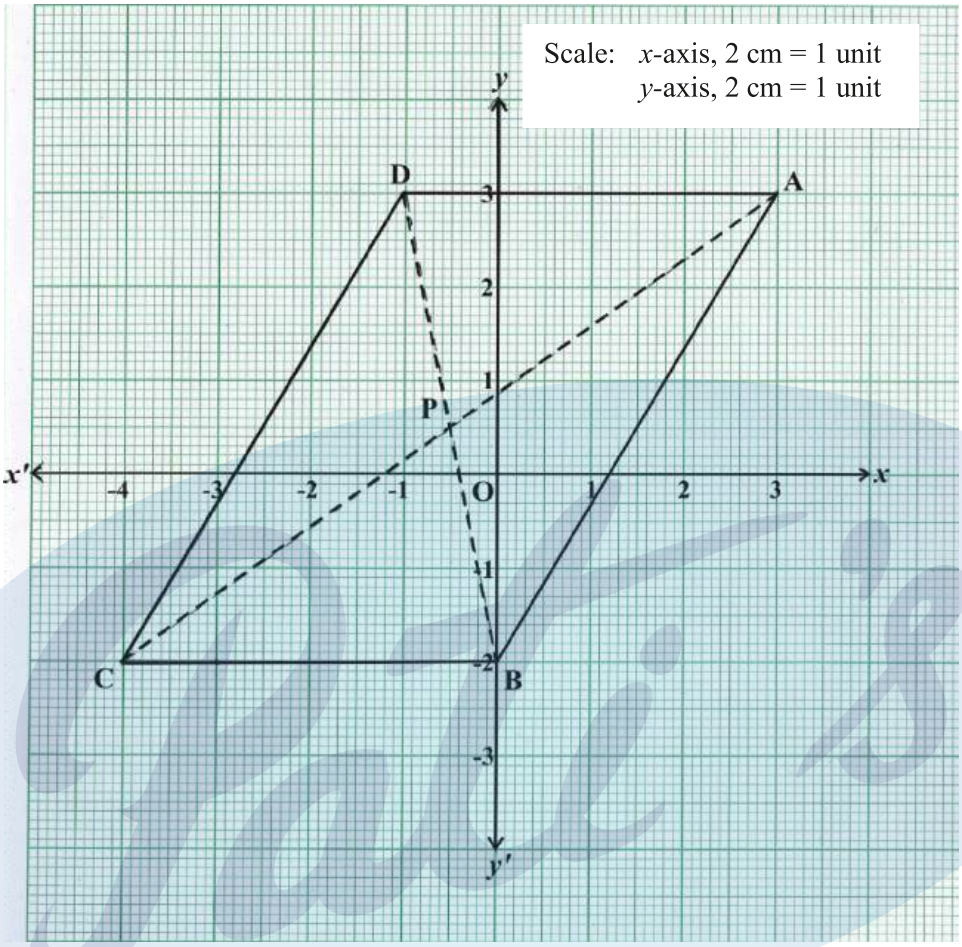
(a) A + C

(b) B(A+C)

(c) 5B

(d) B(A+C) – 5B

(iii) In the given graph **ABCD** is a parallelogram. [5]



Using the graph, answer the following:

(a) write down the coordinates of **A**, **B**, **C** and **D**.

(b) **calculate** the coordinates of **P'**, the point of intersection of the diagonals **AC** and **BD**.

(c) find the slope of sides **CB** and **DA** and verify that theyrepresent parallel lines.

(d) find the equation of the diagonal **AC**.

SECTION B (40 Marks)

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

Question 4

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

$$2x - \frac{5}{3} < \frac{3x}{5} + 10 \leq \frac{4x}{5} + 11;\ x \in R$$

(ii) The first term of an Arithmetic Progression (A.P.) is **5**, the last term is **50** and their sum is **440**. Find: [3]

(a) the number of terms

(b) common difference

(iii) Prove that: [4]

$$\frac{(cotA + tanA - 1)(sinA + cosA)}{sin^3A + cos^3A} = secA.cosecA$$

Question 5

(i) Using properties of proportion, find the value of 'x': [3]

$$\frac{6x^2 + 3x - 5}{3x - 5} = \frac{9x^2 + 2x + 5}{2x + 5}\ ;\ x \neq 0$$

(ii) It is given that $(x - 2)$ is a factor of polynomial $2x^3 - 7x^2 + kx - 2$. [3]

Find:

(a) the value of 'k'.

(b) **hence,** factorise the resulting polynomial completely.

(iii) A solid wooden capsule is shown in **Figure 1**. The capsule is formed of a cylindrical block and two hemispheres. [4]

Find the **sum** of total surface area of the three parts as shown in **Figure2**. Given, the radius of the capsule is **3.5 cm** and the length of the cylindrical block is **14 cm**.

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

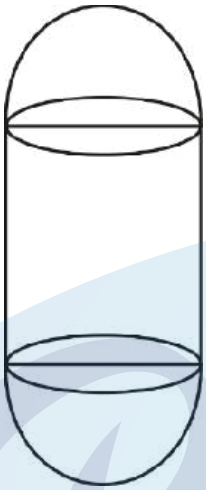


Figure 1

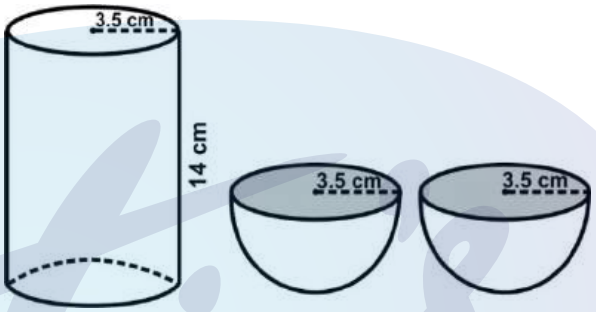


Figure 2

Question 6

(i) Use a graph paper for this question taking 2 cm = 1 unit along both axes. [5]

(a) Plot **A(1, 3)**, **B(1, 2)** and **C(3, 0)**.

(b) Reflect **A** and **B** on the ***x*-axis** and name their images as **E** and **D** respectively. Write down their coordinates.

(c) Reflect **A** and **B** through the **origin** and name their images as **F** and **G** respectively.

(d) Reflect **A**, **B** and **C** on the ***y*-axis** and name their images as **J**, **I** and **H** respectively.

(e) Join all the points **A**, **B**, **C**, **D**, **E**, **F**, **G**, **H**, **I** and **J** in order and name the closed figure so formed.

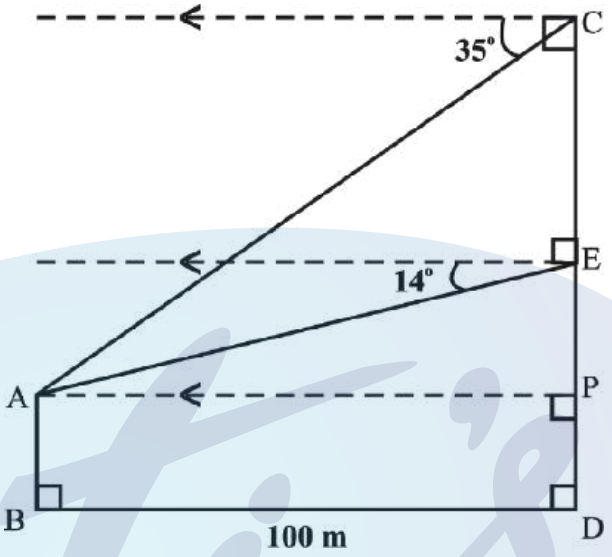
(ii) In the given diagram, **AB** is a vertical tower **100 m** away from the foot of a 30 storied building **CD**. The angles of depression from the point **C** and **E**, (E being the **mid-point** of CD), are **35°** and **14°** respectively. [5]

(Use mathematical table for the required values **rounded off** correct to **two places** of decimals only)

Find the height of the:

(a) tower **AB**

(b) building **CD**



Question 7

(i) Use a graph paper for this question. [3]

(Take 2 cm = 10 Marks along one axis and 2 cm = 10 students along another axis).

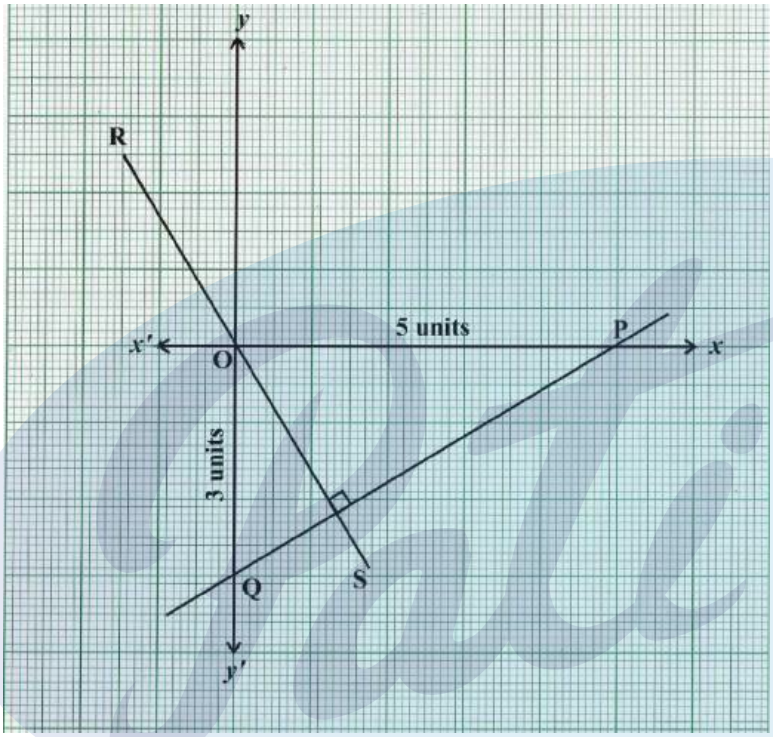
Draw a Histogram for the following distribution which gives the marks obtained by 164 students in a particular class and hence find the **Mode**.

Marks	30 – 40	40 – 50	50 – 60	60 – 70	70 – 80
Number of Students	10	26	40	54	34

(ii) In the given graph, **P** and **Q** are points such that **PQ** cuts off intercepts of **5 units** and **3 units** along the ***x*-axis** and ***y*-axis** respectively. Line **RS** is perpendicular to **PQ** and passes through the **origin**. Find the: [3]

(a) coordinates of **P** and **Q**

(b) equation of line **RS**



(iii) Refer to the given bill. [4]

A customer paid **₹2000** (rounded off to the nearest ₹10) to clear the bill.

Note: 5% discount is applicable on an article if **10 or more** such articles are purchased.

BILL			
Article	**M.P. (₹)**	**Quantity**	**G.S.T.**
A	190	06	12%
B	50	12	18%

Check whether the total amount paid by the customer is correct or not. Justify your answer with necessary working.

Question 8

(i) A man bought **₹200** shares of a company at **25%** premium. If he received a return of **5%** on his investment. Find the: [3]

(a) market value

(b) dividend percent declared

(c) number of shares purchased, if annual dividend is **₹1000.**

(ii) For the given frequency distribution, find the: [3]

(a) mean, to the nearest whole number

(b) median

x	10	11	12	13	14	15	16
f	3	2	2	6	3	5	3

(iii) Mr. and Mrs. Das were travelling by car from Delhi to Kasauli for a holiday. Distance between Delhi and Kasauli is approximately**350 km** (via NH 152D). Due to heavy rain they had to slow down. The average speedof the car was reduced by**20 km/hr** and time of the journey increased by **2 hours**. Find: [4]

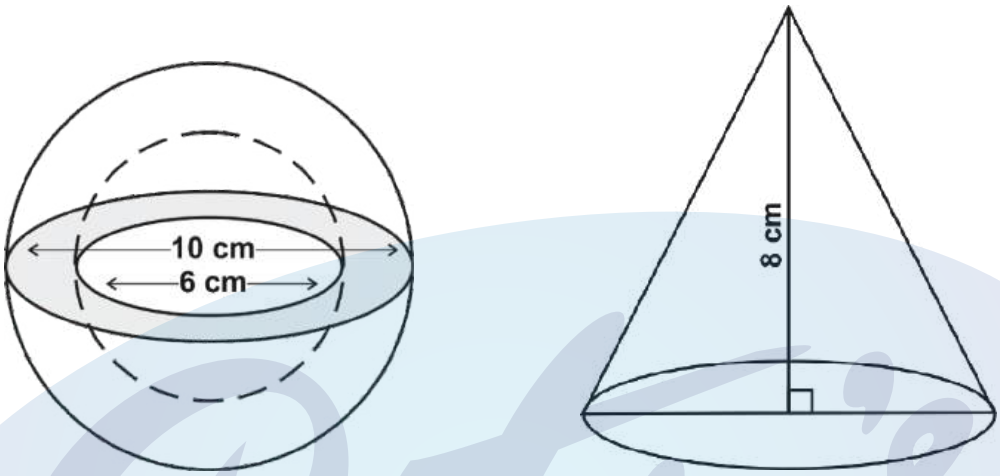
(a) the original speed of the car.

(b) with the reduced speed, the number of hours they took to reach their destination.

Question 9

(i) A hollow sphere of external diameter **10 cm** and internal diameter **6 cm** is melted and made into a solid right circular cone of height **8 cm**. Find the radius of the cone so formed. [3]

[Use $\pi = \frac{22}{7}$]



(ii) Ms. Sushmita went to a fair and participated in a game. The game consisted of a box having number cards with numbers from **01 to 30.** The three prizes were as per the given table: [3]

Prize	**Number on the card drawn at random is a**
Wall Clock	perfect square
Water Bottle	even number which is also a multiple of 3
Purse	prime number

Find the probability of winning a:

(a) Wall Clock

(b) Water Bottle

(c) Purse

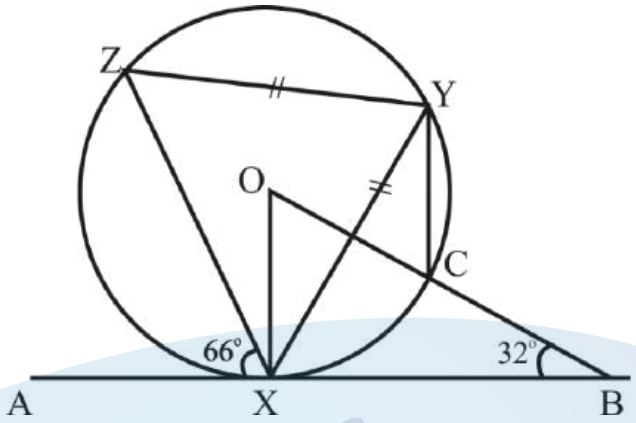
(iii) **X**, **Y**, **Z** and **C** are the points on the circumference of a circle with centre **'O'**. **AB** is a tangent to the circle at **'X'** and **ZY = XY**. Given ∠**OBX = 32°** and ∠**AXZ = 66°**. Find: [4]

(a) ∠BOX

(b) ∠CYX

(c) ∠ZYX

(d) ∠OXY



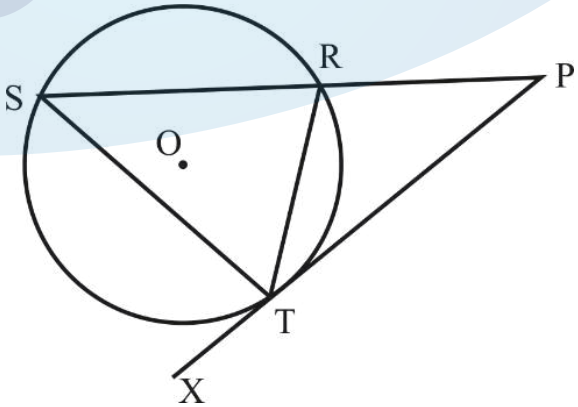
Question 10

(i) If **1701** is the n^{th} term of the Geometric Progression (G.P.) 7, 21, 63 ……., find: [3]

(a) the value of ***'n'***

(b) hence find the **sum** of the ***'n'*** terms of the G.P.

(ii) In the given diagram **'O'** is the centre of the circle. Chord **SR** produced meets the tangent **XTP** at **P**. [3]

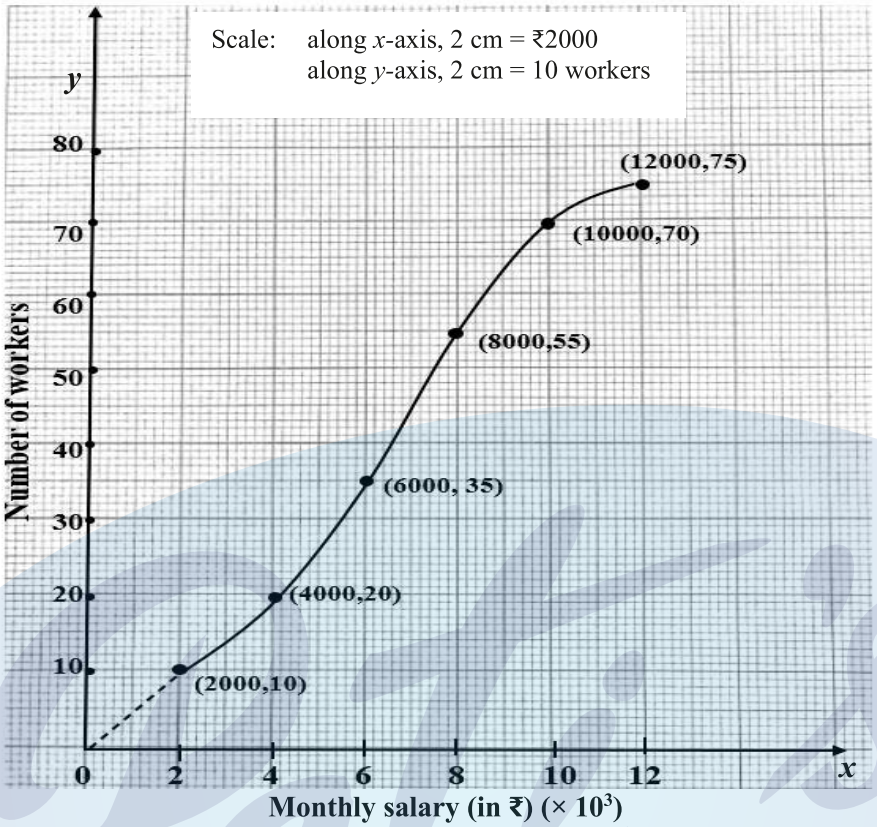


(a) Prove that **ΔPTR ~ ΔPST**

(b) Prove that $\mathbf{PT^2 = PR \times PS}$

(c) If **PR = 4 cm** and **PS = 16 cm**, find the length of the tangent **PT**.

(iii) The given graph represents the monthly salaries (in ₹) of workers of a factory. [4]



Using graph answer the following:

(a) the total number of workers.

(b) the median class.

(c) the lower-quartile class.

(d) number of workers having monthly salary more than or equal to ₹6,000 but less than ₹10,000.

MATHEMATICS

Maximum Marks: 80

Time allowed: Two and half hours

Answers to this Paper must be written on the paper provided separately.

*You will **not** be allowed to write during first **15** minutes.*

This time is to be spent in reading the question paper.

The time given at the head of this Paper is the time allowed for writing the answers.

*Attempt **all** questions from **Section A** and **any four** questions from **Section B**.*

All working, including rough work, must be clearly shown, and must be done on the same sheet as the rest of the answer.

Omission of essential working will result in loss of marks.

The intended marks for questions or parts of questions are given in brackets [ ]

Mathematical tables and graph papers are to be provided by the school.

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) For an Intra-state sale, the CGST paid by a dealer to the Central government is ` **120**. If the marked price of the article is ` **2000**, the rate of **GST** is:

(a) 6%

(b) 10%

(c) 12%

(d) 16.67%

(ii) What must be subtracted from the polynomial $x^3 + x^2 - 2x + 1$, so that the result is exactly divisible by $(x - 3)$?

(a) – 31

(b) – 30

(c) 30

(d) 31

(iii) The roots of the quadratic equation $px^2 - qx + r = 0$ are real and equal if:

(a) $p^2 = 4qr$

(b) $q^2 = 4pr$

(c) $-q^2 = 4pr$

(d) $p^2 > 4qr$

(iv) If matrix $A = \begin{bmatrix} 2 & 2 \\ 0 & 2 \end{bmatrix}$ and $A^2 = \begin{bmatrix} 4 & x \\ 0 & 4 \end{bmatrix}$, then the value of x is:

(a) 2

(b) 4

(c) 8

(d) 10

(v) The median of the following observations arranged in ascending order is **64**. Find the value of x:

27, 31, 46, 52, x, $x + 4$, 71, 79, 85, 90

(a) 60

(b) 61

(c) 62

(d) 66

(vi) Points **A** (x, y), **B** $(3, -2)$ and **C** $(4, -5)$ are collinear. The value of y in terms of x is:

(a) $3x - 11$

(b) $11 - 3x$

(c) $3x - 7$

(d) $7 - 3x$

(vii) The given table shows the distance covered and the time taken by a train moving at a uniform speed along a straight track.

Distance (in m)	60	90	y
Time (in sec)	2	x	5

The values of x and y are:

(a) $x = 4, y = 150$

(b) $x = 3, y = 100$

(c) $x = 4, y = 100$

(d) $x = 3, y = 150$

(viii) The 7th term of the given Arithmetic Progression (A.P.):

$$\frac{1}{a}, \left(\frac{1}{a} + 1\right), \left(\frac{1}{a} + 2\right) \text{ ... is:}$$

(a) $\left(\frac{1}{a} + 6\right)$

(b) $\left(\frac{1}{a} + 7\right)$

(c) $\left(\frac{1}{a} + 8\right)$

(d) $\left(\frac{1}{a} + 7^7\right)$

(ix) The sum invested to purchase **15** shares of a company of nominal value ` **75** available at a discount of **20%** is:

(a) ` 60

(b) ` 90

(c) ` 1350

(d) ` 900

(x) The circumcentre of a triangle is the point which is:

(a) at equal distance from the three sides of the triangle.

(b) at equal distance from the three vertices of the triangle.

(c) the point of intersection of the three medians.

(d) the point of intersection of the three altitudes of the triangle.

(xi) Statement 1: $\sin^2\theta + \cos^2\theta = 1$

Statement 2: $\text{cosec}^2\theta + \cot^2\theta = 1$

Which of the following is valid?

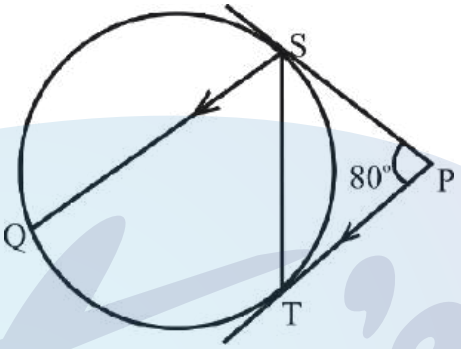
(a) only 1

(b) only 2

(c) both 1 and 2

(d) neither 1 nor 2

(xii) In the given diagram, PS and PT are the tangents to the circle. SQ || PT and **∠SPT = 80°**. The value of ∠QST is:



(a) 140°

(b) 90°

(c) 80°

(d) 50°

(xiii) **Assertion (A):** A die is thrown once and the probability of getting an even number is $\frac{2}{3}$.

Reason (R): The sample space for even numbers on a die is **{2, 4, 6}**

(a) A is true, R is false.

(b) A is false, R is true.

(c) Both A and R are true.

(d) Both A and R and false.

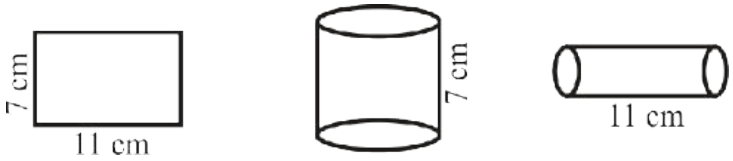
(xiv) A rectangular sheet of paper of size 11 cm x 7 cm is first rotated about the side **11 cm** and then about the side **7 cm** to form a cylinder, as shown in the diagram. The ratio of their curved surface areas is:

(a) 1 : 1

(b) 7 : 11

(c) 11 : 7

(d) $\frac{11\pi}{7} : \frac{7\pi}{11}$



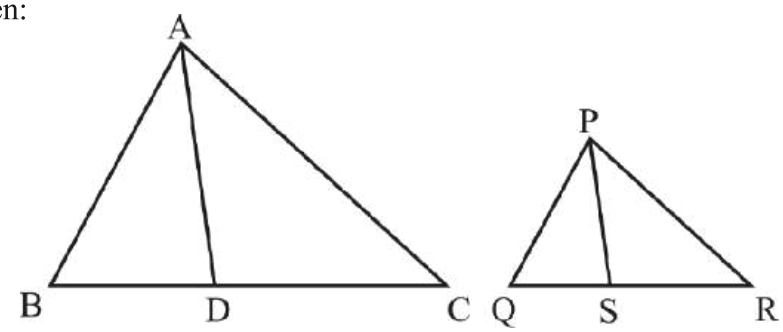
(xv) In the given diagram, **ΔABC ~ ΔPQR**. If AD and PS are bisectors of **∠BAC** and **∠QPR** respectively then:

(a) ΔABC ~ ΔPQS

(b) ΔABD ~ ΔPQS

(c) ΔABD ~ ΔPSR

(d) ΔABC ~ ΔPSR



Question 2

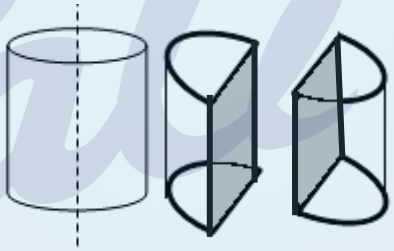
(i) $A = \begin{bmatrix} x & 0 \\ 1 & 1 \end{bmatrix}, B = \begin{bmatrix} 4 & 0 \\ y & 1 \end{bmatrix}$ *and* $C = \begin{bmatrix} 4 & 0 \\ x & 1 \end{bmatrix}$ [4]

Find the values of ***x*** and ***y***, if **AB = C**.

(ii) A solid metallic cylinder is cut into two identical halves along its height (as shown in the diagram). The diameter of the cylinder is **7 cm** and the height is **10 cm**. Find: [4]

(a) The total surface area (both the halves).

(b) The total cost of painting the two halves at the rate of **30** per cm^2 $\left(\boldsymbol{Use\ \pi = \frac{22}{7}}\right)$



(iii) 15, 30, 60, 120… are in **G.P.** (Geometric Progression). [4]

(a) Find the **n^{th}** term of this **G.P.** in terms of ***n***.

(b) How many terms of the above **G.P.** will give the sum **945**?

Question 3

(i) Factorize: $sin^3\theta + cos^3\theta$ [4]

Hence, prove the following identity:

$$\frac{sin^3\theta + \cos^3\theta}{\sin\theta + \cos\theta} + \sin\theta cos\theta = 1$$

(ii) In the given diagram, O is the centre of the circle. PR and PT are two tangents drawn from the external point P and touching the circle at Q and S respectively. MN is a diameter of the circle. Given ∠PQM = 42° and ∠PSM = 25°. [4]

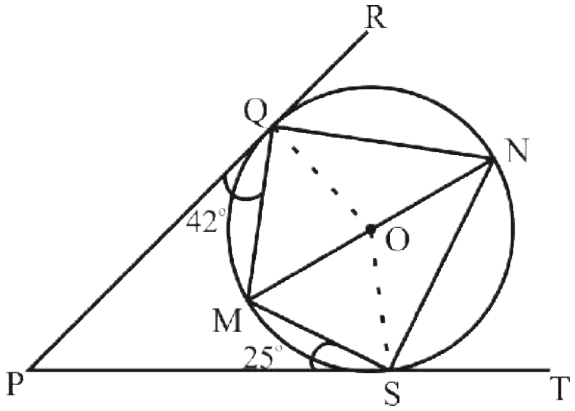
Find:

(a) ∠OQM

(b) ∠QNS

(c) ∠QOS

(d) ∠QMS



(iii) Use graph sheet for this question. Take 2 cm = 1 unit along the axes. [5]

(a) Plot A(0, 3), B(2, 1) and C(4, -1).

(b) Reflect point B and its image C in ***y*-axis** and name their images as B' and C' respectively. Plot and write coordinates of the points B' and C'.

(c) Reflect point A in the line BB' and name its images as A'.

(d) Plot and write coordinates of point A'.

(e) Join the points ABA'B' and give the geometrical name of the closed figure so formed.

SECTION B (40 Marks)

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

Question 4

(i) Suresh has a recurring deposit account in a bank. He deposits ` 2000 per month and the bank pays interest at the rate of 8% per annum. If he gets` 1040 as interest at the time of maturity, find in years total time for which the account was held. [3]

(ii) The following table gives the duration of movies in minutes. [3]

Duration (in minutes)	100 – 110	110 – 120	120 – 130	130 – 140	140 – 150	150 – 160
No. of movies	5	10	17	8	6	4

Using step – deviation method, find the mean duration of the movies.

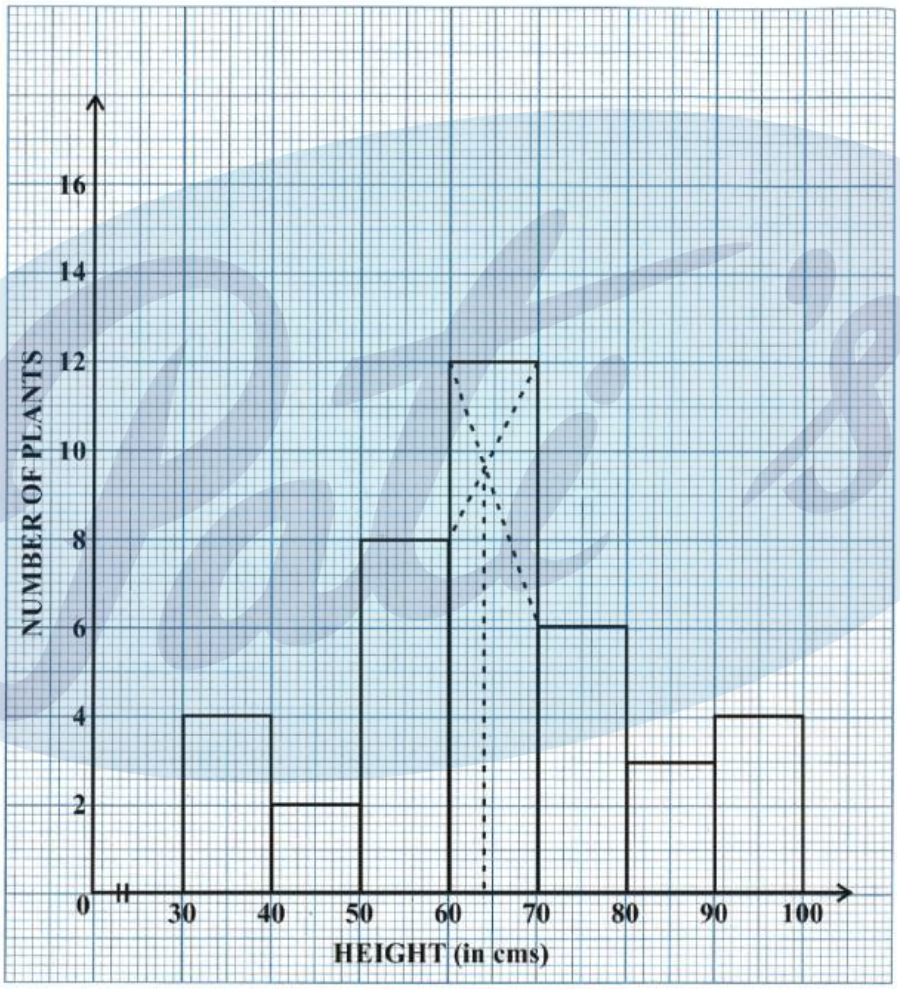
(iii) If $\frac{(a+b)^3}{(a-b)^3} = \frac{64}{27}$ [4]

(a) Find $\frac{a+b}{a-b}$

(b) Hence using properties of proportion, find $a : b$.

Question 5

(i) The given graph with a histogram represents the number of plants of different heights grown in a school campus. Study the graph carefully and answer the following questions: [5]



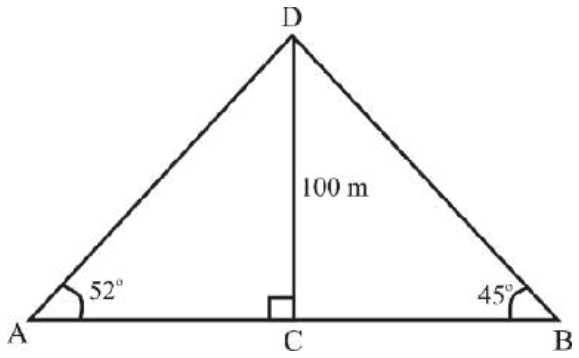
(a) Make a frequency table with respect to the class boundaries and their corresponding frequencies.

(b) State the modal class.

(c) Identify and note down the mode of the distribution.

(d) Find the number of plants whose height range is between 80 cm to 90 cm.

(ii) The angle of elevation of the top of a 100 m high tree from two points A and B on the opposite side of the tree are 52° and 45° respectively. Find the distance AB, to the nearest metre. [5]



Question 6

(i) Solve the following quadratic equation for x and give your answer correct to three significant figures: $2x^2 - 10x + 5 = 0$ [3]

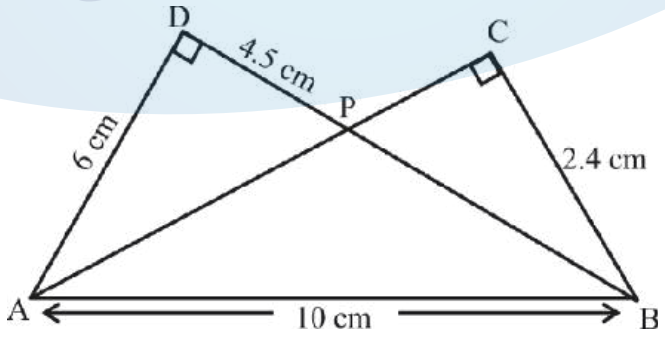
(Use mathematical tables if necessary)

(ii) The n^{th} term of an Arithmetic Progression **(A.P.)** is given by the relation $T_n = 6(7 - n)$. Find: [3]

(a) its first term and common difference

(b) sum of its first **25** terms

(iii) In the given diagram ΔADB and ΔACB are two right angled triangles with ∠ADB = ∠BCA = 90°. If AB = 10 cm, AD = 6 cm, BC = 2.4 cm and DP = 4.5 cm [4]



(a) Prove that ΔAPD ~ ΔBPC

(b) Find the length of BD and PB

(c) Hence, find the length of PA

(d) Find area ΔAPD : area ΔBPC

Question 7

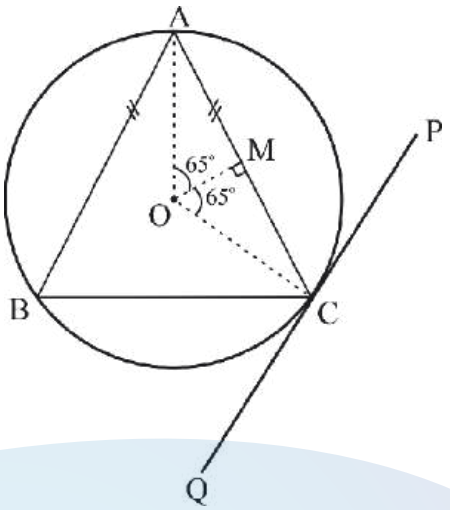
(i) In the given diagram, an isosceles ΔABC is inscribed in a circle with centre O. PQ is a tangent to the circle at C. OM is perpendicular to chord AC and ∠COM = 65°. [3]

Find:

(a) ∠ABC

(b) ∠BAC

(c) ∠BCQ



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

$$-3 + x \leq \frac{7x}{2} + 2 < 8 + 2x, x \in I$$

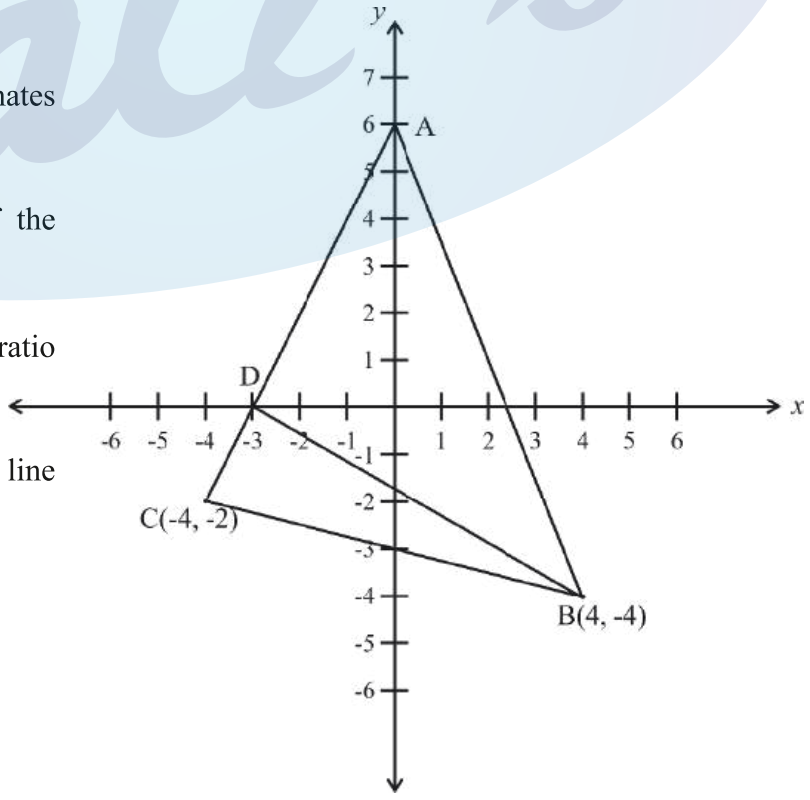
(iii) In the given diagram, ABC is a triangle, where B(4,– 4) and C(– 4, – 2). D is a point on AC. [4]

(a) Write down the coordinates of A and D.

(b) Find the coordinates of the centroid of ΔABC.

(c) If D divides AC in the ratio ***k* : 1**, find the value of ***k***.

(d) Find the equation of the line BD.



Question 8

(i) The polynomial $3x^3 + 8x^2 - 15x + k$ has $(x - 1)$ as a factor. Find the value of k. Hence factorize the resulting polynomial completely. [3]

(ii) The following letters **A, D, M, N, O, S, U, Y** of the English alphabet are written on separate cards and put in a box. The cards are well shuffled and one card is drawn at random. What is the probability that the card drawn is a letter of the word, [3]

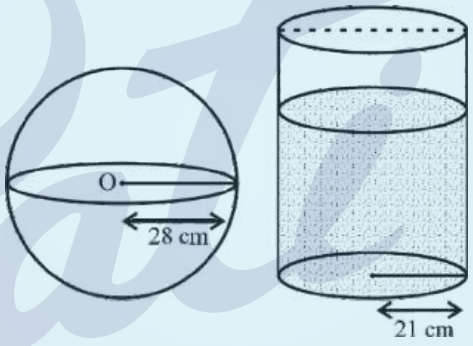
(a) MONDAY?

(b) which does not appear in MONDAY?

(c) which appears both in SUNDAY and MONDAY?

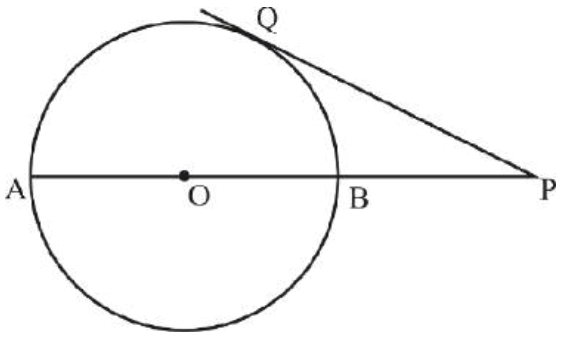
(iii) Oil is stored in a spherical vessel occupying **3/4** of its full capacity. Radius of this spherical vessel is **28 cm**. This oil is then poured into a cylindrical vessel with a radius of **21 cm**. Find the height of the oil in the cylindrical vessel **(correct to the nearest cm).** [4]

$\boldsymbol{Take\ \pi = \frac{22}{7}}$



Question 9

(i) The figure shows a circle of radius 9 cm with O as the centre. The diameter AB produced meets the tangent PQ at P. If PA = 24 cm, find the length of tangent PQ. [3]



(ii) Mr. Gupta invested ` 33000 in buying ` 100 shares of a company at 10% premium. The dividend declared by the company is 12%. Find: [3]

(a) the number of shares purchased by him.

(b) his annual dividend.

(iii) A life insurance agent found the following data for distribution of ages of 100 policy holders: [4]

Age in years	Policy Holders (frequency)	Cumulative frequency
20 – 25	2	2
25 – 30	4	6
30 – 35	12	18
35 – 40	20	38
40 – 45	28	66
45 – 50	22	88
50 – 55	8	96
55 – 60	4	100

On a graph sheet draw an ogive using the given data. Take 2 cm = 5 years along one axis and 2 cm = 10 policy holders along the other axis. Use your graph to find:

(a) The median age.

(b) Number of policy holders whose age is above 52 years.

Question 10

(i) Rohan bought the following eatables for his friends : [3]

Soham Sweet Mart : Bill				
S. No.	**Item**	**Price**	**Quantity**	**Rate of GST**
1	Laddu	` 500 per kg	2 kg	5%
2	Pastries	` 100 per piece	12 pieces	18%

Calculate :

(a) Total GST paid.

(b) Total bill amount including GST.

(ii) (a) If the lines $kx - y + 4 = 0$ and $2y = 6x + 7$ are perpendicular to each other, find the value of k. [3]

(b) Find the equation of a line parallel to $2y = 6x + 7$ and passing through $(-1, 1)$

(iii) Use ruler and compass to answer this question. Construct $\angle ABC = 90^{o}$, where AB = 6 cm, BC = 8 cm. [4]

(a) Construct the locus of points equidistant from B and C.

(b) Construct the locus of points equidistant from A and B.

(c) Mark the point which satisfies both the conditions (a) and (b) as O. Construct the locus of points keeping a fixed distance OA from the fixed point O.

(d) Construct the locus of points which are equidistant from BA and BC.

MATHEMATICS

Maximum Marks: 80

Time allowed: Two and half hours

Answers to this Paper must be written on the paper provided separately.

*You will **not** be allowed to write during first **15** minutes.*

This time is to be spent in reading the question paper.

The time given at the head of this Paper is the time allowed for writing the answers.

*Attempt **all** questions from **Section A** and **any four** questions from **Section B**.*

All working, including rough work, must be clearly shown, and must be done on the same sheet as the rest of the answer.

Omission of essential working will result in loss of marks.

The intended marks for questions or parts of questions are given in brackets [ ]

Mathematical tables and graph papers are provided.

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) If $\begin{bmatrix} 2 & 0 \\ 0 & 4 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 2 \\ -8 \end{bmatrix}$, the value of x and y respectively are:

(a) 1, –2

(b) –2, 1

(c) 1, 2

(d) –2, –1

(ii) If $x - 2$ is a factor of $x^3 - kx - 12$, then the value of k is:

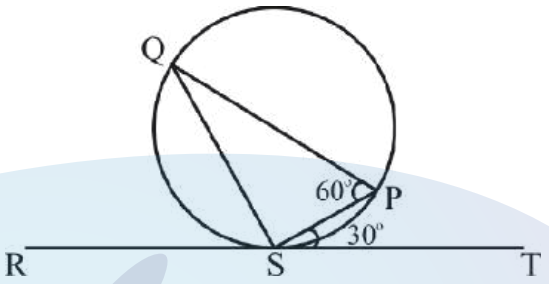
(a) 3

(b) 2

(c) –2

(d) – 3

(iii) In the given diagram RT is a tangent touching the circle at S. If ∠PST = 30° and ∠SPQ = 60° then ∠PSQ is equal to:



(a) 40°

(b) 30°

(c) 60°

(d) 90°

(iv) A letter is chosen at random from all the letters of the English alphabets. The probability that the letter chosen is a vowel, is:

(a) $\frac{4}{26}$

(b) $\frac{5}{26}$

(c) $\frac{21}{26}$

(d) $\frac{5}{24}$

(v) If 3 is a root of the quadratic equation $x^2 - px + 3 = 0$ then p is equal to:

(a) 4

(b) 3

(c) 5

(d) 2

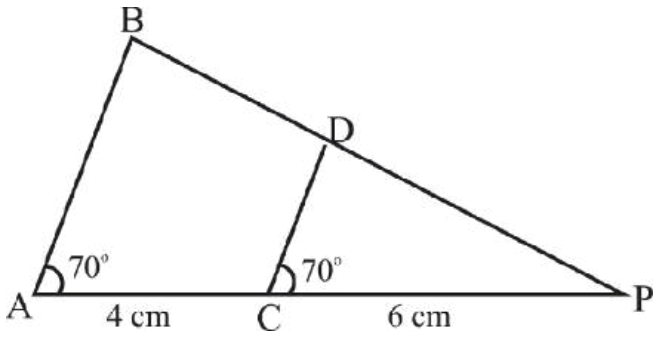
(vi) In the given figure $\angle BAP = \angle DCP = 70^{\circ}$, PC = 6 cm and CA = 4 cm, then PD : DB is:

(a) 5 : 3

(b) 3 : 5

(c) 3 : 2

(d) 2 : 3



(vii) The printed price of an article is ` 3080. If the rate of GST is 10% then the GST charged is:

(a) ` 154

(b) ` 308

(c) ` 30.80

(d) ` 15.40

(viii) $(1 + \sin A)(1 - \sin A)$ is equal to:

(a) $\text{cosec}^2 A$

(b) $\sin^2 A$

(c) $\sec^2 A$

(d) $\cos^2 A$

(ix) The coordinates of the vertices of ΔABC are respectively (–4, –2), (6, 2) and (4, 6). The centroid G of ΔABC is:

(a) (2, 2)

(b) (2, 3)

(c) (3, 3)

(d) (0, –1)

(x) The n^{th} term of an Arithmetic Progression (A.P.) is $2n + 5$. The 10^{th} term is:

(a) 7

(b) 15

(c) 25

(d) 45

(xi) The mean proportional between 4 and 9 is:

(a) 4

(b) 6

(c) 9

(d) 36

(xii) Which of the following cannot be determined graphically for a grouped frequency distribution?

(a) Median

(b) Mode

(c) Quartiles

(d) Mean

(xiii) Volume of a cylinder of height 3 cm is 48π. Radius of the cylinder is:

(a) 48 cm

(b) 16 cm

(c) 4 cm

(d) 24 cm

(xiv) Naveen deposits ` 800 every month in a recurring deposit account for 6 months. If he receives ` 4884 at the time of maturity, then the interest he earns is:

(a) ` 84

(b) ` 42

(c) ` 24

(d) ` 284

(xv) The solution set for the inequation $2x + 4 \leq 14$, $x \in W$ is:

(a) {1, 2, 3, 4, 5}

(b) {0, 1, 2, 3, 4, 5}

(c) {1, 2, 3, 4}

(d) {0, 1, 2, 3, 4}

Question 2

(i) Find the value of '*a*' if $x - a$ is a factor of the polynomial $3x^3 + x^2 - ax - 81$. [4]

(ii) Salman deposits ` 1000 every month in a recurring deposit account for 2 years. If he receives ` 26000 on maturity, find: [4]

(a) the total interest Salman earns.

(b) the rate of interest.

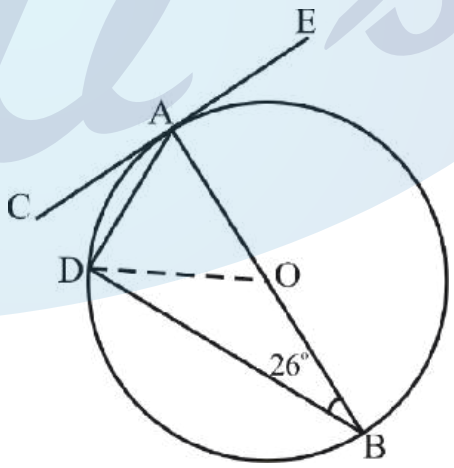
(iii) In the given figure O, is the centre of the circle. CE is a tangent to the circle at A. If $\angle ABD = 26^\circ$, then find: [4]

(a) $\angle BDA$

(b) $\angle BAD$

(c) $\angle CAD$

(d) $\angle ODB$



Question 3

(i) Solve the following quadratic equation: [4]

$x^2 + 4x - 8 = 0$

Give your answer correct to one decimal place.

(Use mathematical tables if necessary.)

(ii) Prove the following identity: [4]

$(\sin^2\theta - 1)(\tan^2\theta + 1) + 1 = 0$

(iii) Use **graph sheet** to answer this question. Take 2 cm = 1 unit along both the axes. [5]

(a) Plot A, B, C where A(0, 4), B(1, 1) and C(4, 0)

(b) Reflect A and B on the *x*-axis and name them as E and D respectively.

(c) Reflect B through the origin and name it F. Write down the coordinates of F.

(d) Reflect B and C on the *y*-axis and name them as H and G respectively.

(e) Join points A, B, C, D, E, F, G, H and A in order and name the closed figure formed.

SECTION B (40 Marks)

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

Question 4

(i) [3]

$If\ A = \begin{bmatrix} 1 & 3 \\ 2 & 4 \end{bmatrix}, B = \begin{bmatrix} 1 & 2 \\ 2 & 4 \end{bmatrix}, C = \begin{bmatrix} 4 & 1 \\ 1 & 5 \end{bmatrix}\ and\ I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}.$

$Find\ A(B + C) - 14I$

(ii) ABC is a triangle whose vertices are A(1, –1), B(0, 4) and C(–6, 4). [3]

D is the midpoint of BC. Find the:

(a) coordinates of D.

(b) equation of the median AD.

(iii) In the given figure, O is the centre of the circle. PQ is a tangent to the circle at T. [4]

Chord AB produced meets the tangent at P.

$AB = 9\text{ cm}, BP = 16\text{ cm}, \angle PTB = 50°$

$\angle OBA = 45°$

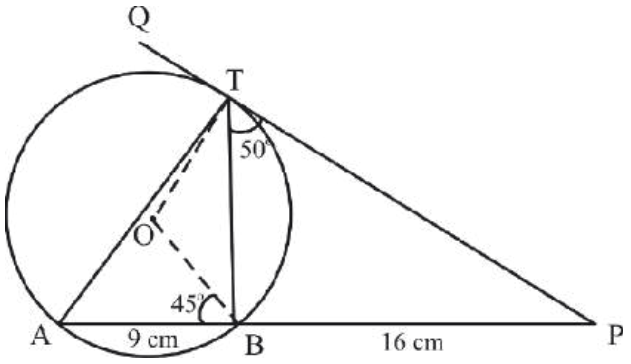
Find:

(a) length of PT

(b) $\angle BAT$

(c) $\angle BOT$

(d) $\angle ABT$



Question 5

(i) Mrs. Arora bought the following articles from a departmental store: [3]

S. No.	Item	Price	Rate of GST	Discount
1.	Hair oil	₹ 1200	18%	₹ 100
2.	Cashew nuts	₹ 600	12%	–

Find the:

(a) Total GST paid.

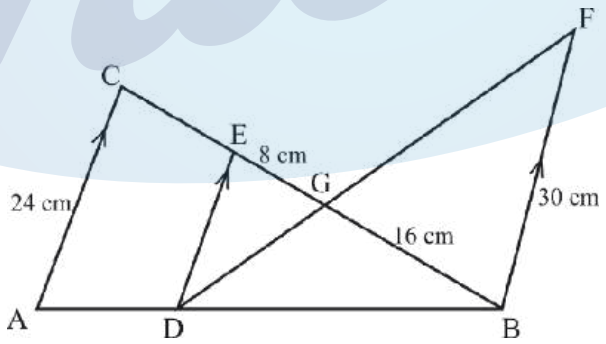
(b) Total bill amount including GST.

(ii) Solve the following inequation. Write down the solution set and represent it on the real number line. [3]

$-5(x-9) \geq 17-9x > x+2, x \epsilon R$

(iii) In the given figure, AC // DE // BF. [4]

If AC = 24 cm, EG=8 cm, GB=16 cm, BF=30 cm.



(a) Prove ΔGED ~ ΔGBF

(b) Find DE

(c) DB : AB

Question 6

(i) The following distribution gives the daily wages of 60 workers of a factory. [3]

Daily income in `	Number of workers (*f*)
200 – 300	6
300 – 400	10
400 – 500	14
500 – 600	16
600 – 700	10
700 – 800	4

Use graph paper to answer this question.

Take 2 cm = ` 100 along one axis and 2 cm = 2 workers along the other axis.

Draw a histogram and hence find the mode of the given distribution.

(ii) The 5^{th} term and the 9^{th} term of an Arithmetic Progression are 4 and –12 respectively. [3]

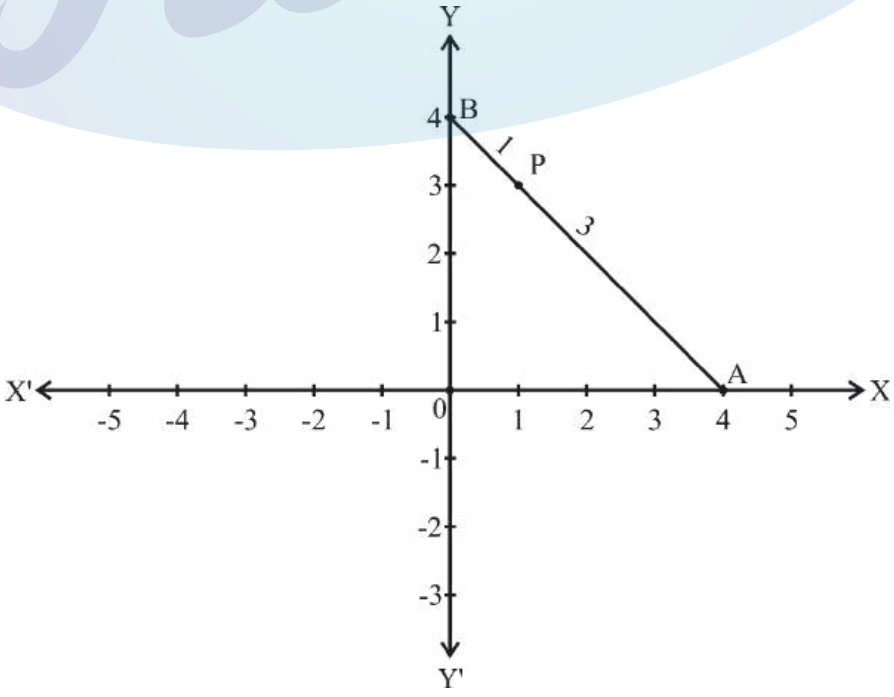
Find:

(a) the first term

(b) common difference

(c) sum of 16 terms of the AP.

(iii) A and B are two points on the *x*-axis and *y*-axis respectively. [4]



(a) Write down the coordinates of A and B.

(b) P is a point on AB such that AP : PB = 3 : 1. Using **section formula** find the coordinates of point P.

(c) Find the equation of a line passing through P and perpendicular to AB.

Question 7

(i) A bag contains 25 cards, numbered through 1 to 25. A card is drawn at random. What is the probability that the number on the card drawn is: [3]

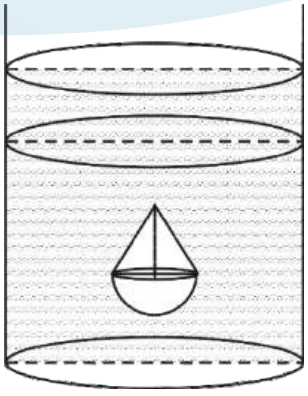
(a) multiple of 5

(b) a perfect square

(c) a prime number?

(ii) A man covers a distance of 100 km, travelling with a uniform speed of x km/hr. Had the speed been 5 km/hr more it would have taken $\frac{1}{2}$ hour less. Find x the original speed. [3]

(iii) A solid is in the shape of a hemisphere of radius 7 cm, surmounted by a cone of height 4 cm. The solid is immersed completely in a cylindrical container filled with water to a certain height. If the radius of the cylinder is 14 cm, find the rise in the water level. [4]



Question 8

(i) The following table gives the marks scored by a set of students in an examination. Calculate the mean of the distribution by using the short cut method. [3]

Marks	Number of Students (f)
0 – 10	3
10 – 20	8
20 – 30	14
30 – 40	9
40 – 50	4
50 – 60	2

(ii) What number must be added to each of the numbers 4, 6, 8, 11 in order to get the four numbers in proportion? [3]

(iii) Using ruler and compass construct a triangle ABC in which AB = 6 cm, ∠BAC =120° and AC = 5 cm. Construct a circle passing through A, B and C. Measure and write down the radius of the circle. [4]

Question 9

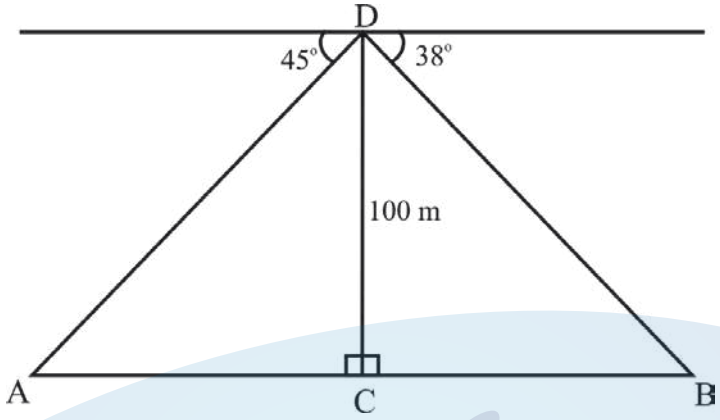
(i) Using Componendo and Dividendo solve for x: [3]

$$\frac{\sqrt{2x+2}+\sqrt{2x-1}}{\sqrt{2x+2}-\sqrt{2x-1}}=3$$

(ii) Which term of the Arithmetic Progression (A.P.) 15, 30, 45, 60… is 300? Hence find the sum of all the terms of the Arithmetic Progression (A.P.) [3]

(iii) From the top of a tower 100 m high a man observes the angles of depression of two ships **A** and **B**, on opposite sides of the tower as 45° and 38° respectively. If the foot of the tower and the ships are in the same horizontal line find the distance between the two ships **A** and **B** to the nearest metre. [4]

(Use Mathematical Tables for this question.)



Question 10

(i) Factorize completely using factor theorem: [4]

$2x^3 - x^2 - 13x - 6$

(ii) Use **graph paper** to answer this question. [6]

During a medical checkup of 60 students in a school, weights were recorded as follows:

Weight (in kg)	Number of Students
28 – 30	2
30 – 32	4
32 – 34	10
34 – 36	13
36 – 38	15
38 – 40	9
40 – 42	5
42 – 44	2

Taking 2 cm = 2 kg along one axis and 2 cm = 10 students along the other axis draw an ogive. Use your graph to find the:

(a) median

(b) upper Quartile

(c) number of students whose weight is above 37 kg

MATHEMATICS

(Two hours and a half)

Answers to this Paper must be written on the paper provided separately.

*You will **not** be allowed to write during the first **15** minutes.*

This time is to be spent in reading the question paper.

The time given at the head of this Paper is the time allowed for writing the answers.

---

*Attempt **all** questions from **Section A** and **any four** questions from **Section B**.*

All working, including rough work, must be clearly shown and must be done on the same sheet as the rest of the answer.

Omission of essential working will result in loss of marks.

The intended marks for questions or parts of questions are given in brackets [ ].

Mathematical tables are provided.

SECTION A (40 Marks)

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

Question 1

(a) Solve the following Quadratic Equation: [3]

$x^2 - 7x + 3 = 0$

Give your answer correct to two decimal places.

(b) Given $A = \begin{bmatrix} x & 3 \\ y & 3 \end{bmatrix}$ [3]

If $A^2 = 3I$, where I is the identity matrix of order 2, find x and y.

(c) Using ruler and compass construct a triangle ABC where AB = 3 cm, BC = 4 cm and ∠ABC = 90°. Hence construct a circle circumscribing the triangle ABC. Measure and write down the radius of the circle. [4]

Question 2

(a) Use factor theorem to factorise $6x^3 + 17x^2 + 4x - 12$ completely. [3]

(b) Solve the following inequation and represent the solution set on the number line. [3]

$$\frac{3x}{5} + 2 < x + 4 \leq \frac{x}{2} + 5, \quad x \in R$$

(c) Draw a Histogram for the given data, using a graph paper: [4]

Weekly Wages (in ₹)	No. of People
3000 – 4000	4
4000 – 5000	9
5000 – 6000	18
6000 – 7000	6
7000 – 8000	7
8000 – 9000	2
9000 – 10000	4

Estimate the mode from the graph.

Question 3

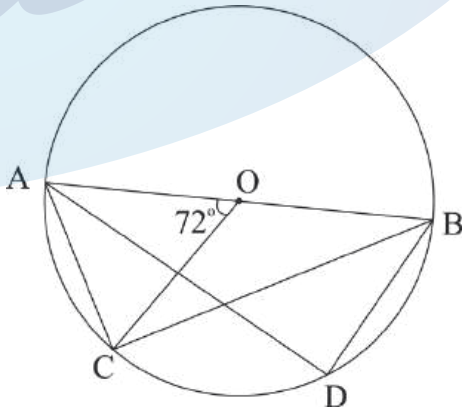
(a) In the figure given below, O is the centre of the circle and AB is a diameter. [3]

If AC = BD and ∠AOC = 72°. Find:

(i) ∠ABC

(ii) ∠BAD

(iii) ∠ABD



(b) Prove that: [3]

$$\frac{\sin A}{1 + \cot A} - \frac{\cos A}{1 + \tan A} = \sin A - \cos A$$

(c) In what ratio is the line joining P(5, 3) and Q(–5, 3) divided by the y-axis? Also find the coordinates of the point of intersection. [4]

Question 4

(a) A solid spherical ball of radius 6 cm is melted and recast into 64 identical spherical marbles. Find the radius of each marble. [3]

(b) Each of the letters of the word 'AUTHORIZES' is written on identical circular discs and put in a bag. They are well shuffled. If a disc is drawn at random from the bag, what is the probability that the letter is: [3]

(i) a vowel

(ii) one of the first 9 letters of the English alphabet which appears in the given word

(iii) one of the last 9 letters of the English alphabet which appears in the given word?

(c) Mr. Bedi visits the market and buys the following articles: [4]

Medicines costing ₹ 950, GST @ 5%

A pair of shoes costing ₹ 3000, GST @ 18%

A Laptop bag costing ₹ 1000 with a discount of 30%, GST @ 18%.

(i) Calculate the total amount of GST paid.

(ii) The total bill amount including GST paid by Mr. Bedi.

SECTION B (40 Marks)

*Attempt any **four** questions from this Section*

Question 5

(a) A company with 500 shares of nominal value ₹ 120 declares an annual dividend of 15%. Calculate: [3]

(i) the toal amount of dividend paid by the company.

(ii) annual income of Mr. Sharma who holds 80 shares of the company.

If the return percent of Mr. Sharma from his shares is 10%, find the market value of each share.

(b) The mean of the following data is 16. Calculate the value of *f*. [3]

Marks	5	10	15	20	25
No. of Students	3	7	*f*	9	6

(c) The 4^{th}, 6^{th} and the last term of a geometric progression are 10, 40 and 640 respectively. If the common ratio is positive, find the first term, common ratio and the number of terms of the series. [4]

Question 6

(a) If $A = \begin{bmatrix} 3 & 0 \\ 5 & 1 \end{bmatrix}$ *and* $B = \begin{bmatrix} -4 & 2 \\ 1 & 0 \end{bmatrix}$ [3]

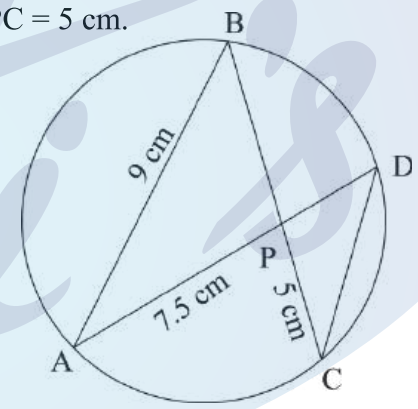
Find $A^2 - 2AB + B^2$

(b) In the given figure AB = 9 cm, PA = 7.5 cm and PC = 5 cm. [3]
Chords AD and BC intersect at P.

(i) Prove that ΔPAB ~ ΔPCD

(ii) Find the length of CD.

(iii) Find area of ΔPAB : area of ΔPCD



(c) From the top of a cliff, the angle of depression of the top and bottom of a tower are observed to be 45° and 60° respectively. If the height of the tower is 20 m. [4]
Find:

(i) the height of the cliff

(ii) the distance between the cliff and the tower.

Question 7

(a) Find the value of '*p*' if the lines, $5x - 3y + 2 = 0$ and $6x - py + 7 = 0$ are perpendicular to each other. Hence find the equation of a line passing through (–2, –1) and parallel to $6x - py + 7 = 0$. [3]

(b) Using properties of proportion find $x : y$, given: [3]

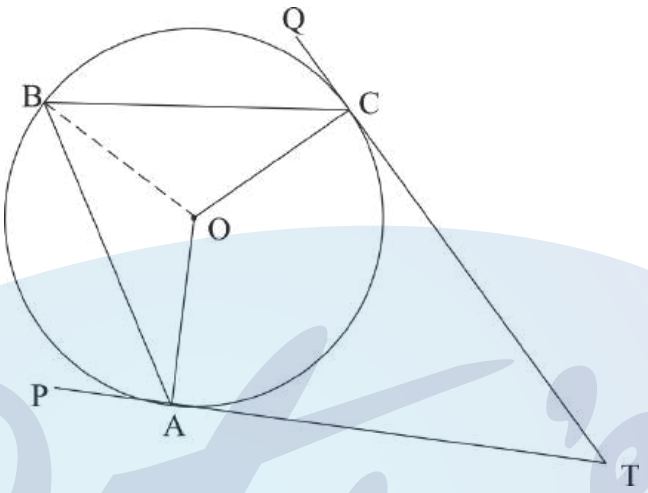
$$\frac{x^2 + 2x}{2x + 4} = \frac{y^2 + 3y}{3y + 9}$$

(c) In the given figure TP and TQ are two tangents to the circle with centre O, touching at A and C respectively. If ∠BCQ = 55° and ∠BAP = 60°, find: [4]

(i) ∠OBA and ∠OBC

(ii) ∠AOC

(iii) ∠ATC



Question 8

(a) What must be added to the polynomial $2x^3 - 3x^2 - 8x$, so that it leaves a remainder 10 when divided by $2x + 1$? [3]

(b) Mr.Sonu has a recurring deposit account and deposits ₹ 750 per month for 2 years. If he gets ₹ 19125 at the time of maturity, find the rate of interest. [3]

(c) Use graph paper for this question. [4]

Take 1 cm = 1 unit on both *x* and *y* axes.

(i) Plot the following points on your graph sheets:

A(–4, 0), B(–3, 2), C(0, 4), D(4, 1) and E(7, 3)

(ii) Reflect the points B, C, D and E on the *x*-axis and name them as B', C', D' and E' respectively.

(iii) Join the points A, B, C, D, E, E', D', C', B' and A in order.

(iv) Name the closed figure formed.

Question 9

(a) 40 students enter for a game of shot-put competition. The distance thrown (in metres) is recorded below: [6]

Distance in m	12 – 13	13 – 14	14 – 15	15 – 16	16 – 17	17 – 18	18 – 19
Number of Students	3	9	12	9	4	2	1

Use a graph paper to draw an ogive for the above distribution.

Use a scale of 2 cm = 1 m on one axis and 2 cm = 5 students on the other axis.

Hence using your graph find:

(i) the median

(ii) Upper Quartile

(iii) Number of students who cover a distance which is above $16\frac{1}{2}$ m.

(b) If $x = \frac{\sqrt{2a+1}+\sqrt{2a-1}}{\sqrt{2a+1}-\sqrt{2a-1}}$, prove that $x^2 - 4ax + 1 = 0$ [4]

Question 10

(a) If the 6^{th} term of an A.P. is equal to four times its first term and the sum of first six terms is 75, find the first term and the common difference. [3]

(b) The difference of two natural numbers is 7 and their product is 450. [3]
Find the numbers.

(c) Use ruler and compass for this question. Construct a circle of radius 4.5 cm. [4]
Draw a chord. AB = 6 cm.

(i) Find the locus of points equidistant from A and B.
Mark the point where it meets the circle as D.

(ii) Join AD and find the locus of points which are equidistant from AD and AB.
Mark the point where it meets the circle as C.

(iii) Join BC and CD. Measure and write down the length of side CD of the quadrilateral ABCD.

Question 11

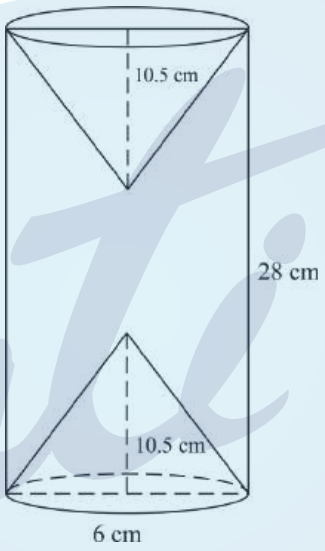
(a) A model of a high rise building is made to a scale of 1 : 50. [3]

(i) If the height of the model is 0.8 m, find the height of the actual building.

(ii) If the floor area of a flat in the building is 20 m^2, find the floor area of that in the model.

(b) From a solid wooden cylinder of height 28 cm and diameter 6 cm, two conical cavities are hollowed out. The diameters of the cones are also of 6 cm and height 10.5 cm. [3]

Taking $\pi = \frac{22}{7}$ find the volume of the remaining solid.



(c) Prove the identity [4]

$$\left(\frac{1-\tan\theta}{1-\cot\theta}\right)^2 = \tan^2\theta$$

MATHEMATICS

(Two hours and a half)

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---

*Attempt **all** questions from **Section A** and **any four** questions from **Section B**.*

All working, including rough work, must be clearly shown and must be done on the same sheet as the rest of the answer.

Omission of essential working will result in loss of marks.

The intended marks for questions or parts of questions are given in brackets [ ].

Mathematical tables are provided.

SECTION A (40 Marks)

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

Question 1

(a) Solve the following inequation and write down the solution set: [3]

$$11x - 4 < 15x + 4 \leq 13x + 14, x \epsilon W$$

Represent the solution on a real number line.

(b) A man invests ₹ 4500 in shares of a company which is paying 7.5% dividend. [3]

If ₹ 100 shares are available at a discount of 10%.

Find:

(i) Number of shares he purchases.

(ii) His annual income.

(c) In a class of 40 students, marks obtained by the students in a class test (out of 10) are given below: [4]

Marks	1	2	3	4	5	6	7	8	9	10
Number of students	1	2	3	3	6	10	5	4	3	3

Calculate the following for the given distribution:

(i) Median

(ii) Mode

Question 2

(a) Using the factor theorem, show that $(x - 2)$ is a factor of $x^3 + x^2 - 4x - 4$. Hence factorise the polynomial completely. [3]

(b) Prove that: [3]

$$(\operatorname{cosec}\theta - \sin\theta)(\sec\theta - \cos\theta)(\tan\theta + \cot\theta) = 1$$

(c) In an Arithmetic Progression (A.P.) the fourth and sixth terms are 8 and 14 respectively. Find the: [4]

(i) first term

(ii) common difference

(iii) sum of the first 20 terms.

Question 3

(a) Simplify [3]

$$\sin A \begin{bmatrix} \sin A & -\cos A \\ \cos A & \sin A \end{bmatrix} + \cos A \begin{bmatrix} \cos A & \sin A \\ -\sin A & \cos A \end{bmatrix}$$

(b) M and N are two points on the X axis and Y axis respectively. [3]

P (3, 2) divides the line segment MN in the ratio 2 : 3.

Find:

(i) the coordinates of M and N

(ii) slope of the line MN.

(c) A solid metallic sphere of radius 6 cm is melted and made into a solid cylinder of height 32 cm. Find the: [4]

(i) radius of the cylinder

(ii) curved surface area of the cylinder

Take $\pi = 3.1$

Question 4

(a) The following numbers, K + 3, K + 2, 3K – 7 and 2K – 3 are in proportion. Find K. [3]

(b) Solve for x the quadratic equation $x^2 - 4x - 8 = 0$. [3]
Give your answer correct to three significant figures.

(c) Use ruler and compass only for answering this question. [4]
Draw a circle of radius 4 cm. Mark the centre as O. Mark a point P outside the circle at a distance of 7 cm from the centre. Construct two tangents to the circle from the external point P.
Measure and write down the length of any one tangent.

SECTION B (40 Marks)

*Attempt any **four** questions from this Section*

Question 5

(a) There are 25 discs numbered 1 to 25. They are put in a closed box and shaken thoroughly. A disc is drawn at random from the box. [3]
Find the probability that the number on the disc is:

(i) an odd number

(ii) divisible by 2 and 3 both.

(iii) a number less than 16.

(b) Rekha opened a recurring deposit account for 20 months. The rate of interest is 9% per annum and Rekha receives ₹ 441 as interest at the time of maturity. [3]

Find the amount Rekha deposited each month.

(c) Use a graph sheet for this question. [4]

Take 1 cm = 1 unit along both ***x*** and ***y*** axis.

(i) Plot the following points:

A(0,5), B(3,0), C(1,0) and D(1,–5)

(ii) Reflect the points B, C and D on the ***y*** axis and name them as B', C' and D' respectively.

(iii) Write down the coordinates of B', C' and D'.

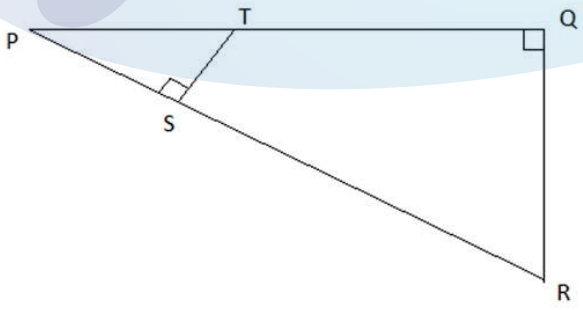
(iv) Join the points A, B, C, D, D', C', B', A in order and give a name to the closed figure ABCDD'C'B'.

Question 6

(a) In the given figure, $\angle PQR = \angle PST = 90^{\circ}$, PQ = 5 cm and PS = 2 cm. [3]

(i) Prove that $\Delta PQR \sim \Delta PST$.

(ii) Find Area of ΔPQR : Area of quadrilateral SRQT.



(b) The first and last term of a Geometrical Progression (G.P.) are 3 and 96 respectively. If the common ratio is 2, find: [3]

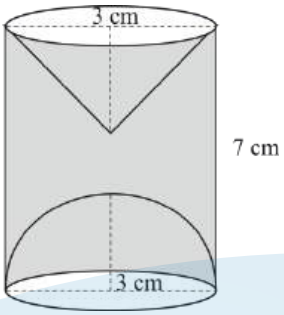
(i) '***n***' the number of terms of the G.P.

(ii) Sum of the **n** terms.

(c) A hemispherical and a conical hole is scooped out of a solid wooden cylinder. [4]
Find the volume of the remaining solid where the measurements are as follows:

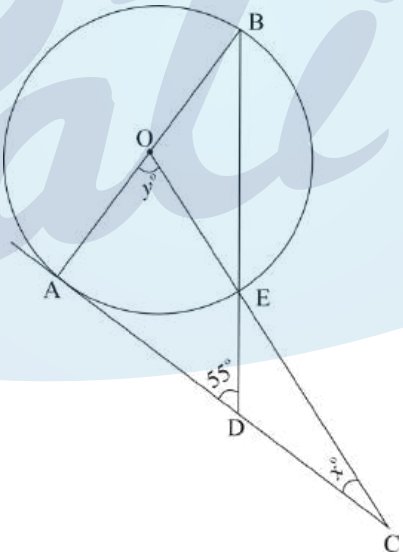
The height of the solid cylinder is 7 cm, radius of each of hemisphere, cone and cylinder is 3 cm. Height of cone is 3 cm.

Give your answer correct to the nearest whole number. Take $\pi = \frac{22}{7}$.



Question 7

(a) In the given figure AC is a tangent to the circle with centre O. [3]
If $\angle ADB = 55^o$, find x and y. Give reasons for your answers.



(b) The model of a building is constructed with the scale factor 1 : 30. [3]

(i) If the height of the model is 80 cm, find the actual height of the building in meters.

(ii) If the actual volume of a tank at the top of the building is 27 m^3, find the volume of the tank on the top of the model.

(c) Given $\begin{bmatrix} 4 & 2 \\ -1 & 1 \end{bmatrix} M = 6\,I$, where M is a matrix and I is unit matrix of order 2x2. [4]

(i) State the order of matrix M.

(ii) Find the matrix M.

Question 8

(a) The sum of the first three terms of an Arithmetic Progression (A.P.) is 42 and the product of the first and third term is 52. Find the first term and the common difference. [3]

(b) The vertices of a ΔABC are A(3, 8), B(–1, 2) and C(6, –6). Find: [3]

(i) Slope of BC.

(ii) Equation of a line perpendicular to BC and passing through A.

(c) Using ruler and a compass only construct a semi-circle with diameter BC = 7cm. Locate a point A on the circumference of the semicircle such that A is equidistant from B and C. Complete the cyclic quadrilateral ABCD, such that D is equidistant from AB and BC. Measure ∠ADC and write it down. [4]

Question 9

(a) The data on the number of patients attending a hospital in a month are given below. Find the average (mean) number of patients attending the hospital in a month by using the shortcut method. [3]

Take the assumed mean as 45. Give your answer correct to 2 decimal places.

Number of patients	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60	60 – 70
Number of Days	5	2	7	9	2	5

(b) Using properties of proportion solve for x, given [3]

$$\frac{\sqrt{5x}+\sqrt{2x-6}}{\sqrt{5x}-\sqrt{2x-6}}=4$$

(c) Sachin invests ₹ 8500 in 10%, ₹100 shares at ₹170. He sells the shares when the price of each share rises by ₹ 30. He invests the proceeds in 12% ₹ 100 shares at ₹125. Find: [4]

(i) the sale proceeds.

(ii) the number of ₹ 125 shares he buys.

(iii) the change in his annual income.

Question 10

(a) Use graph paper for this question. [6]

The marks obtained by 120 students in an English test are given below:

Marks	0–10	10–20	20–30	30–40	40–50	50–60	60–70	70–80	80–90	90–100
No. of students	5	9	16	22	26	18	11	6	4	3

Draw the ogive and hence, estimate:

(i) the median marks.

(ii) the number of students who did not pass the test if the pass percentage was 50.

(iii) the upper quartile marks.

(b) A man observes the angle of elevation of the top of the tower to be 45°. He walks towards it in a horizontal line through its base. On covering 20 m the angle of elevation changes to 60°. Find the height of the tower correct to 2 significant figures. [4]

Question 11

(a) Using the Remainder Theorem find the remainders obtained when $x^3 + (kx + 8)x + k$ is divided by $x + 1$ and $x - 2$. [3]

Hence find ***k*** if the sum of the two remainders is 1.

(b) The product of two consecutive natural numbers which are multiples of 3 is equal to 810. Find the two numbers. [3]

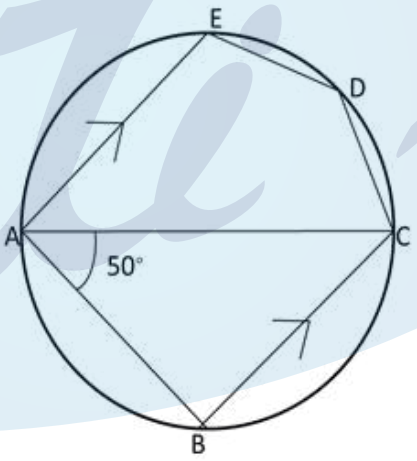
(c) In the given figure, ABCDE is a pentagon inscribed in a circle such that AC is a diameter and side BC//AE. If ∠BAC = 50°, find giving reasons: [4]

(i) ∠ACB

(ii) ∠EDC

(iii) ∠BEC

Hence prove that BE is also a diameter



MATHEMATICS

(Two hours and a half)

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*Attempt **all** questions from **Section A** and **any four** questions from **Section B**.*

All working, including rough work, must be clearly shown and must be done on the same sheet as the rest of the answer.

Omission of essential working will result in loss of marks.

The intended marks for questions or parts of questions are given in brackets [ ].

Mathematical tables are provided.

SECTION A (40 Marks)

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

Question 1

(a) Find the value of 'x' and 'y' if: [3]

$$2\begin{bmatrix} x & 7 \\ 9 & y-5 \end{bmatrix} + \begin{bmatrix} 6 & -7 \\ 4 & 5 \end{bmatrix} = \begin{bmatrix} 10 & 7 \\ 22 & 15 \end{bmatrix}$$

(b) Sonia had a recurring deposit account in a bank and deposited ₹600 per month for 2½ years. If the rate of interest was 10% p.a., find the maturity value of this account. [3]

(c) Cards bearing numbers 2, 4, 6, 8, 10, 12, 14, 16, 18 and 20 are kept in a bag. A card is drawn at random from the bag. Find the probability of getting a card which is: [4]

(i) a prime number.

(ii) a number divisible by 4.

(iii) a number that is a multiple of 6.

(iv) an odd number.

Question 2

(a) The circumference of the base of a cylindrical vessel is 132 cm and its height is 25 cm. Find the [3]

(i) radius of the cylinder

(ii) volume of cylinder. (use $\pi = \frac{22}{7}$)

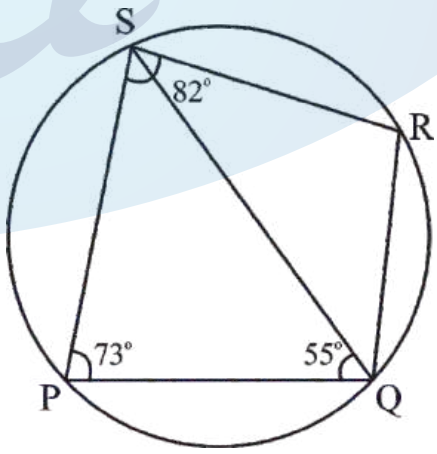
(b) If $(k-3)$, $(2k+1)$ and $(4k+3)$ are three consecutive terms of an A.P., find the value of k. [3]

(c) PQRS is a cyclic quadrilateral. Given $\angle QPS = 73^\circ$, $\angle PQS = 55^\circ$ and $\angle PSR = 82^\circ$, calculate: [4]

(i) $\angle QRS$

(ii) $\angle RQS$

(iii) $\angle PRQ$



Question 3

(a) If $(x+2)$ and $(x+3)$ are factors of $x^3 + ax + b$, find the values of 'a' and 'b'. [3]

(b) Prove that $\sqrt{sec^2\theta + cosec^2\theta} = tan\theta + cot\theta$ [3]

(c) Using a graph paper draw a histogram for the given distribution showing the number of runs scored by 50 batsmen. Estimate the mode of the data: [4]

Runs scored	3000-4000	4000-5000	5000-6000	6000-7000	7000-8000	8000-9000	9000-10000
No. of batsmen	4	18	9	6	7	2	4

Question 4

(a) Solve the following inequation, write down the solution set and represent it on the real number line: [3]

$-2 + 10x \leq 13x + 10 < 24 + 10x, x \in Z$

(b) If the straight lines $3x - 5y = 7$ and $4x + ay + 9 = 0$ are perpendicular to one another, find the value of *a*. [3]

(c) Solve $x^2 + 7x = 7$ and give your answer correct to two decimal places. [4]

SECTION B (40 Marks)

*Attempt any **four** questions from this Section*

Question 5

(a) The 4^{th} term of a G.P. is 16 and the 7^{th} term is 128. Find the first term and common ratio of the series. [3]

(b) A man invests ₹22,500 in ₹50 shares available at 10% discount. If the dividend paid by the company is 12%, calculate: [3]

(i) The number of shares purchased

(ii) The annual dividend received.

(iii) The rate of return he gets on his investment. Give your answer correct to the nearest whole number.

(c) Use graph paper for this question (Take 2cm = 1unit along both x and y axis). [4]
ABCD is a quadrilateral whose vertices are A(2,2), B(2,–2), C(0,–1) and D(0,1).

(i) Reflect quadrilateral ABCD on the y-axis and name it as A'B'CD.

(ii) Write down the coordinates of A' and B'.

(iii) Name two points which are invariant under the above reflection.

(iv) Name the polygon A'B'CD.

Question 6

(a) Using properties of proportion, solve for x. Given that x is positive: [3]

$$\frac{2x + \sqrt{4x^2 - 1}}{2x - \sqrt{4x^2 - 1}} = 4$$

(b) $If\ A = \begin{bmatrix} 2 & 3 \\ 5 & 7 \end{bmatrix}, B = \begin{bmatrix} 0 & 4 \\ -1 & 7 \end{bmatrix}\ and\ C = \begin{bmatrix} 1 & 0 \\ -1 & 4 \end{bmatrix}$, find $AC + B^2 - 10C$. [3]

(c) Prove that $(1 + \cot\theta - cosec\theta)(1 + tan\theta + sec\theta) = 2$ [4]

Question 7

(a) Find the value of k for which the following equation has equal roots. [3]

$$x^2 + 4kx + (k^2 - k + 2) = 0$$

(b) On a map drawn to a scale of 1 : 50,000, a rectangular plot of land ABCD has the following dimensions. AB = 6cm; BC = 8cm and all angles are right angles. Find: [3]

(i) the actual length of the diagonal distance AC of the plot in km.

(ii) the actual area of the plot in sq km.

(c) A(2, 5), B(–1, 2) and C(5, 8) are the vertices of a triangle ABC, 'M' is a point on AB such that AM : MB = 1 : 2. Find the co-ordinates of 'M'. Hence find the equation of the line passing through the points C and M. [4]

Question 8

(a) ₹7500 were divided equally among a certain number of children. Had there been 20 less children, each would have received ₹100 more. Find the original number of children. [3]

(b) If the mean of the following distribution is 24, find the value of *'a'*. [3]

Marks	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50
Number of students	7	*a*	8	10	5

(c) Using ruler and compass only, construct a ΔABC such that BC = 5 cm and AB = 6.5 cm and ∠ABC = 120° [4]

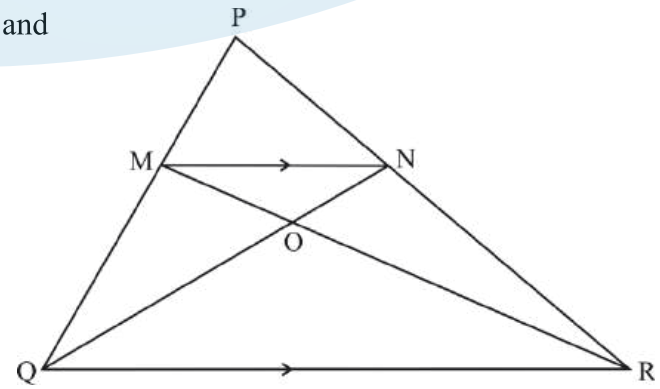
(i) Construct a circum-circle of ΔABC

(ii) Construct a cyclic quadrilateral ABCD, such that D is equidistant from AB and BC.

Question 9

(a) Priyanka has a recurring deposit account of ₹1000 per month at 10% per annum. If she gets ₹5550 as interest at the time of maturity, find the total time for which the account was held. [3]

(b) In Δ*PQR*, *MN* is parrallel to *QR* and $\frac{PM}{MQ} = \frac{2}{3}$ [3]

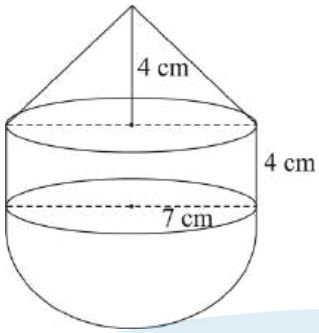


(i) Find $\frac{MN}{QR}$

(ii) Prove that Δ*OMN* and Δ*ORQ* are similar.

(iii) Find, Area of Δ*OMN* : Area of Δ*ORQ*

(c) The following figure represents a solid consisting of a right circular cylinder with a hemisphere at one end and a cone at the other. Their common radius is 7 cm. The height of the cylinder and cone are each of 4 cm. Find the volume of the solid. [4]

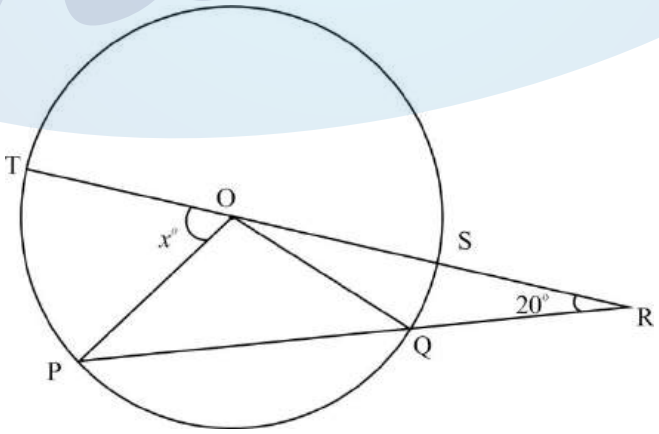


Question 10

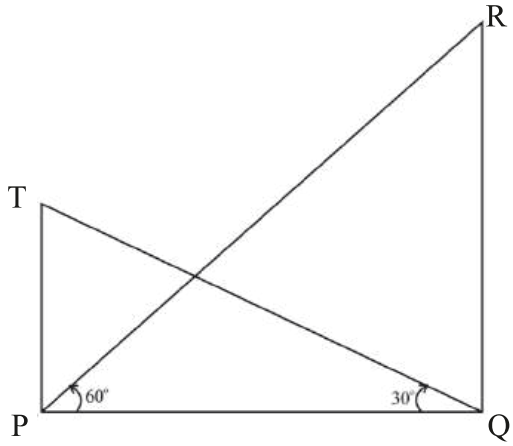
(a) Use Remainder theorem to factorize the following polynomial: [3]

$2x^3 + 3x^2 - 9x - 10$.

(b) In the figure given below 'O' is the centre of the circle. If QR = OP and ∠ORP = 20°. Find the value of 'x' giving reasons. [3]



(c) The angle of elevation from a point P of the top of a tower QR, 50m high is 60° and that of the tower PT from a point Q is 30°. Find the height of the tower PT, correct to the nearest metre. [4]



Question 11

(a) The 4^{th} term of an A.P. is 22 and 15^{th} term is 66. Find the first term and the common difference. Hence find the sum of the series to 8 terms. [4]

(b) Use Graph paper for this question. [6]

A survey regarding height (in cm) of 60 boys belonging to Class 10 of a school was conducted. The following data was recorded:

Height in cm	135 – 140	140 – 145	145 – 150	150 – 155	155 – 160	160 – 165	165 – 170
No. of boys	4	8	20	14	7	6	1

Taking 2cm = height of 10 cm along one axis and 2 cm = 10 boys along the other axis draw an ogive of the above distribution. Use the graph to estimate the following:

(i) the median

(ii) lower Quartile

(iii) if above 158 cm is considered as the tall boys of the class. Find the number of boys in the class who are tall.

MATHEMATICS

(Two hours and a half)

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The intended marks for questions or parts of questions are given in brackets [ ].

Mathematical tables are provided.

SECTION A (40 Marks)

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

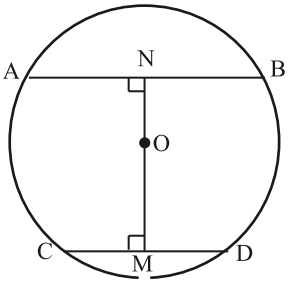
Question 1

(a) If b is the mean proportion between a and c, show that: [3]

$$\frac{a^4 + a^2b^2 + b^4}{b^4 + b^2c^2 + c^4} = \frac{a^2}{c^2}$$

(b) Solve the equation $4x^2 - 5x - 3 = 0$ and give your answer correct to two decimal places. [4]

(c) AB and CD are two parallel chords of a circle such that AB = 24 cm and CD = 10 cm. If the radius of the circle is 13 cm, find the distance between the two chords. [3]



Question 2

(a) Evaluate without using trigonometric tables, [3]

$$\sin^2 28° + \sin^2 62° + \tan^2 38° - \cot^2 52° + \frac{1}{4}\sec^2 30°$$

(b) If $A = \begin{bmatrix} 1 & 3 \\ 3 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} -2 & 1 \\ -3 & 2 \end{bmatrix}$ and $A^2 - 5B^2 = 5C$. Find matrix C where C is a 2 by 2 matrix. [4]

(c) Jaya borrowed ₹ 50,000 for 2 years. The rates of interest for two successive years are 12% and 15% respectively. She repays ₹33,000 at the end of the first year. Find the amount she must pay at the end of the second year to clear her debt. [3]

Question 3

(a) The catalogue price of a computer set is ₹ 42000. The shopkeeper gives a discount of 10% on the listed price. He further gives an off-season discount of 5% on the discounted price. However, sales tax at 8% is charged on the remaining price after the two successive discounts. Find: [3]

(i) the amount of sales tax a customer has to pay

(ii) the total price to be paid by the customer for the computer set.

(b) P(1,–2) is a point on the line segment A(3,–6) and B(x, y) such that AP : PB is equal to 2 : 3. Find the coordinates of B. [4]

(c) The marks of 10 students of a class in an examination arranged in ascending order is as follows: [3]

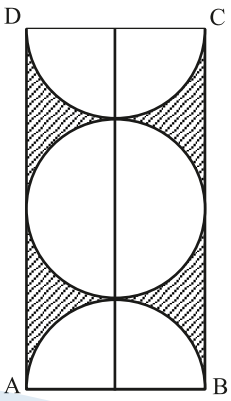
13, 35, 43, 46, x, x+4, 55, 61, 71, 80

If the median marks is 48, find the value of x. Hence find the mode of the given data.

Question 4

(a) What must be subtracted from $16x^3 - 8x^2 + 4x + 7$ so that the resulting expression has $2x + 1$ as a factor? [3]

(b) In the given figure ABCD is a rectangle. It consists of a circle and two semi circles each of which are of radius 5 cm. Find the area of the shaded region. Give your answer correct to three significant figures. [4]



(c) Solve the following inequation and represent the solution set on a number line. [3]

$$-8\frac{1}{2} < -\frac{1}{2} - 4x \leq 7\frac{1}{2}, x \in I$$

SECTION B (40 Marks)

*Attempt any **four** questions from this Section*

Question 5

(a) Given matrix $B = \begin{bmatrix} 1 & 1 \\ 8 & 3 \end{bmatrix}$. Find the matrix X if, $X = B^2 - 4B$. [4]

Hence solve for a and b given $X \begin{bmatrix} a \\ b \end{bmatrix} = \begin{bmatrix} 5 \\ 50 \end{bmatrix}$

(b) How much should a man invest in ₹ 50 shares selling at ₹60 to obtain an income of ₹ 450, if the rate of dividend declared is 10%. Also find his yield percent, to the nearest whole number. [3]

(c) Sixteen cards are labelled as ***a,b,c…….m,n,o,p.*** They are put in a box and shuffled. A boy is asked to draw a card from the box. What is the probability that the card drawn is: [3]

(i) a vowel.

(ii) a consonant.

(iii) none of the letters of the word ***median***.

Question 6

(a) Using a ruler and a compass construct a triangle ABC in which AB = 7cm, ∠CAB=60° and AC = 5cm. Construct the locus of: [4]

(i) points equidistance from AB and AC.

(ii) points equidistant from BA and BC.

Hence construct a circle touching the three sides of the triangle internally.

(b) A conical tent is to accommodate 77 persons. Each person must have $16m^3$ of air to breathe. Given the radius of the tent as $7m$ find the height of the tent and also its curved surface area. [3]

(c) If $\frac{7m + 2n}{7m - 2n} = \frac{5}{3}$, use properties of proportion to find [3]

(i) $m : n$

(ii) $\frac{m^2 + n^2}{m^2 - n^2}$

Question 7

(a) A page from a saving bank account passbook is given below: [5]

Date	Particulars	Amount Withdrawn (₹)	Amount Deposited (₹)	Balance (₹)
Jan. 7, 2016	B/F			3000.00
Jan 10, 2016	By Cheque		2600.00	5600.00
Feb. 8, 2016	To Self	1500.00		4100.00
Apr. 6, 2016	By Cheque	2100.00		2000.00
May 4, 2016	By cash		6500.00	8500.00
May 27, 2016	By Cheque		1500.00	10000.00

(i) Calculate the interest for the 6 months from January to June 2016, at 6% per annum.

(ii) If the account is closed on 1st July 2016, find the amount received by the account holder.

(b) Use a graph paper for this question (Take 2 cms = 1 unit on both x and y axis) [5]

(i) Plot the following points:

A(0,4), B(2,3), C(1,1) and D(2,0).

(ii) Reflect points B, C, D on the y-axis and write down their coordinates. Name the images as B', C', D' respectively.

(iii) Join the points A, B, C, D, D', C', B' and A in order, so as to form a closed figure. Write down the equation of the line of symmetry of the figure formed.

Question 8

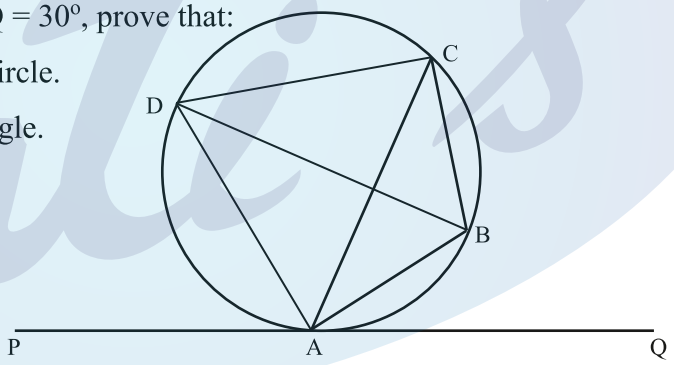
(a) Calculate the mean of the following distribution using step deviation method. [4]

Marks	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60
Number of Students	10	9	25	30	16	10

(b) In the given figure PQ is a tangent to the circle at A. AB and AD are bisectors of ∠CAQ and ∠PAC. IF ∠BAQ = 30°, prove that: [3]

(i) BD is a diameter of the circle.

(ii) ABC is an isosceles triangle.



(c) The printed price of an air conditioner is ₹ 45,000/-. The wholesaler allows a discount of 10% to the shopkeeper. The shopkeeper sells the article to the customer at a discount of 5% of the marked price. Sales tax (under VAT) is charged at the rate of 12% at every stage. Find: [3]

(i) VAT paid by the shopkeeper to the government.

(ii) The total amount paid by the customer inclusive of tax.

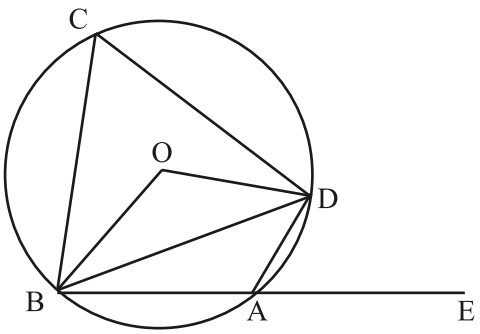
Question 9

(a) In the figure given, O is the centre of the circle. ∠DAE = 70°. Find giving suitable reasons, the measure of: [4]

(i) ∠BCD

(ii) ∠BOD

(iii) ∠OBD



(b) A(-1, 3) , B(4, 2) and C(3, -2) are the vertices of a triangle. [3]

(i) Find the coordinates of the centroid G of the triangle.

(ii) Find the equation of the line through G and parallel to AC.

(c) Prove that [3]

$$\frac{\sin\theta - 2sin^3\theta}{2cos^3\theta - cos\theta} = tan\theta$$

Question 10

(a) The sum of the ages of Vivek and his younger brother Amit is 47 years. The product of their ages in years is 550. Find their ages. [4]

(b) The daily wages of 80 workers in a project are given below. [6]

Wages (in ₹)	400-450	450-500	500-550	550-600	600-650	650-700	700-750
No. of workers	2	6	12	18	24	13	5

Use a graph paper to draw an ogive for the above distribution. (Use a scale of 2 cm = ₹ 50 on *x*-axis and 2 cm = 10 workers on *y*-axis). Use your ogive to estimate:

(i) the median wage of the workers.

(ii) the lower quartile wage of workers.

(iii) the number of workers who earn more than ₹ 625 daily.

Question 11

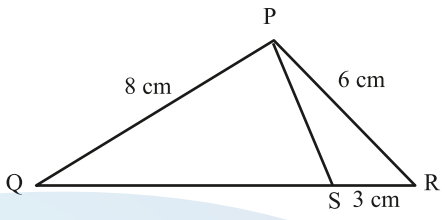
(a) The angles of depression of two ships A and B as observed from the top of a light house 60 m high are 60^o and 45^o respectively. If the two ships are on the opposite sides of the light house, find the distance between the two ships. Give your answer correct to the nearest whole number. [4]

(b) PQR is a triangle. S is a point on the side QR of ΔPQR such that ∠PSR = ∠QPR. Given QP = 8 cm, PR = 6 cm and SR = 3 cm [3]

(i) Prove ΔPQR ~ ΔSPR

(ii) Find the length of QR and PS

(iii) $\frac{area\ of\ \Delta PQR}{area\ of\ \Delta SPR}$



(c) Mr. Richard has a recurring deposit account in a bank for 3 years at 7.5% p. a. simple interest. If he gets ₹ 8325 as interest at the time of maturity, find: [3]

(i) The monthly deposit

(ii) The maturity value.

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