

**ICSE 2024 EXAMINATION**  
**SPECIMEN QUESTION PAPER**  
**MATHEMATICS**

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*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.*

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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.***

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**SECTION A**

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

**Question 1**

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

[15]

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

(i) If  $A = \begin{bmatrix} -1 & 2 \end{bmatrix}$  and  $B = \begin{bmatrix} 1 & -2 \\ 0 & 3 \end{bmatrix}$

Which of the following operation is possible?

- (a)  $A - B$
- (b)  $A + B$
- (c)  $AB$
- (d)  $BA$

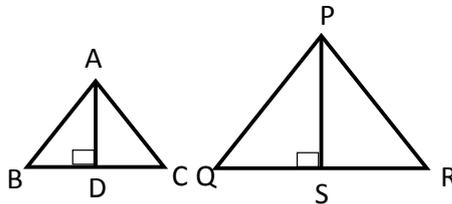
- (ii) If  $x^2 + kx + 6 = (x - 2)(x - 3)$  for all values of  $x$ , then the value of  $k$  is:
- (a)  $-5$
  - (b)  $-3$
  - (c)  $-2$
  - (d)  $5$
- (iii) A retailer purchased an item for ₹1500 from a wholesaler and sells it to a customer at 10% profit. The sales are intra-state and the rate of GST is 10%. The amount of GST paid by the customer:
- (a) ₹15
  - (b) ₹30
  - (c) ₹150
  - (d) ₹165
- (iv) If the roots of equation  $x^2 - 6x + k = 0$  are real and distinct, then value of  $k$  is:
- (a)  $> -9$
  - (b)  $> -6$
  - (c)  $< 6$
  - (d)  $< 9$
- (v) Which of the following is/are an Arithmetic Progression (A.P.)?
1.  $1, 4, 9, 16, \dots$
  2.  $\sqrt{3}, 2\sqrt{3}, 3\sqrt{3}, 4\sqrt{3}, \dots$
  3.  $8, 6, 4, 2, \dots$
- (a) only 1.
  - (b) only 2.
  - (c) only 2. and 3.
  - (d) all 1., 2. and 3.

- (vi) The table shows the values of  $x$  and  $y$ , where  $x$  is proportional to  $y$ .

$x$	6	12	N
$y$	M	18	6

What are the values of M and N?

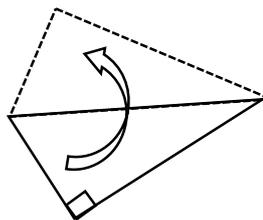
- (a)  $M = 4, N = 9$   
 (b)  $M = 9, N = 3$   
 (c)  $M = 9, N = 4$   
 (d)  $M = 12, N = 0$
- (vii) In the given diagram,  $\triangle ABC \sim \triangle PQR$  and  $\frac{AD}{PS} = \frac{3}{8}$ . The value of  $AB : PQ$  is:



- (a)  $8 : 3$   
 (b)  $3 : 5$   
 (c)  $3 : 8$   
 (d)  $5 : 8$
- (viii) A right angle triangle shaped piece of hard board is rotated completely about its hypotenuse, as shown in the diagram. The solid so formed is always:

1. a single cone
2. a double cone

Which of the statement is valid?



- (a) only 1.  
 (b) only 2.  
 (c) both 1. and 2.  
 (d) neither 1. nor 2.

(ix) Event A: The sun will rise from east tomorrow.

Event B: It will rain on Monday.

Event C: February month has 29 days in a leap year.

Which of the above event(s) has probability equal to 1?

- (a) all events A, B and C
- (b) both events A and B
- (c) both events B and C
- (d) both events A and C

(x) The three vertices of a scalene triangle are always equidistant from a fixed point.

The point is:

- (a) Orthocentre of the triangle.
- (b) Incentre of the triangle.
- (c) Circumcentre of the triangle.
- (d) Centroid of the triangle.

(xi) In a circle with radius  $R$ , the shortest distance between two parallel tangents is equal to:

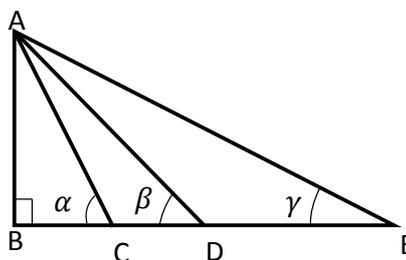
- (a)  $R$
- (b)  $2R$
- (c)  $2\pi R$
- (d)  $\pi R$

(xii) An observer at point E, which is at a certain distance from the lamp post AB, finds the angle of elevation of top of lamp post from positions C, D and E as  $\alpha$ ,  $\beta$  and  $\gamma$ .

It is given that B, C, D and E are along a straight line.

Which of the following condition is satisfied?

- (a)  $\tan \alpha > \tan \beta$
- (b)  $\tan \beta < \tan \gamma$
- (c)  $\tan \gamma > \tan \alpha$
- (d)  $\tan \alpha < \tan \beta$



- (xiii) 1. Shares of company A, paying 12%, ₹100 shares are at ₹80.  
 2. Shares of company B, paying 12%, ₹100 shares at ₹100.  
 3. Shares of company C, paying 12%, ₹100 shares are at ₹120.

Shares of which company are at premium?

- (a) Company A  
 (b) Company B  
 (c) Company C  
 (d) Company A and C
- (xiv) Which of the following equation represent a line passing through origin?  
 (a)  $3x - 2y + 5 = 0$   
 (b)  $2x - 3y = 0$   
 (c)  $x = 5$   
 (d)  $y = -6$
- (xv) For the given 25 variables:  $x_1, x_2, x_3 \dots \dots \dots x_{25}$

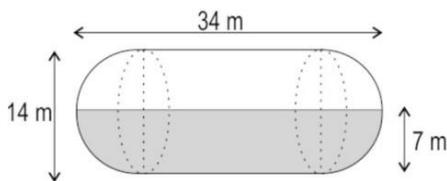
**Assertion (A):** To find median of the given data, the variate needs to be arranged in ascending or descending order.

**Reason (R):** The median is the central most term of the arranged data.

- (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 are false

**Question 2**

- (i) Shown below is a horizontal water tank composed of a cylinder and two hemispheres. The tank is filled up to a height of 7 m. Find the surface area of the tank in contact with water. Use  $\pi = \frac{22}{7}$ . [4]



(ii) In a recurring deposit account for 2 years, the total amount deposited by a person is ₹ 9600. If the interest earned by him is one-twelfth of his total deposit, then find: [4]

- (a) the interest he earns.
- (b) his monthly deposit.
- (c) the rate of interest.

(iii) Find: [4]

- (a)  $(\sin \theta + \operatorname{cosec} \theta)^2$
- (b)  $(\cos \theta + \sec \theta)^2$

Using the above results prove the following trigonometry identity.

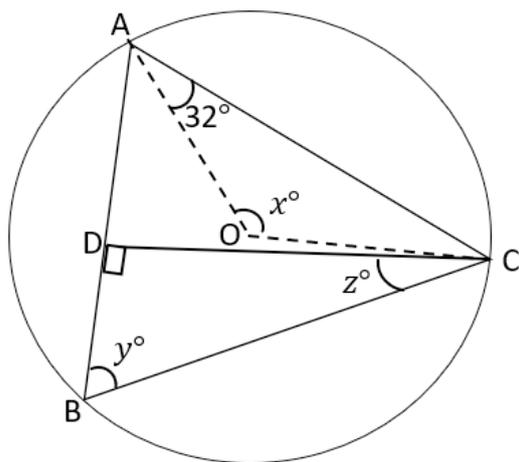
$$(\sin \theta + \operatorname{cosec} \theta)^2 + (\cos \theta + \sec \theta)^2 = 7 + \tan^2 \theta + \cot^2 \theta$$

### Question 3

(i) If  $a$ ,  $b$  and  $c$  are in continued proportion, then prove that: [4]

$$\frac{3a^2 + 5ab + 7b^2}{3b^2 + 5bc + 7c^2} = \frac{a}{c}$$

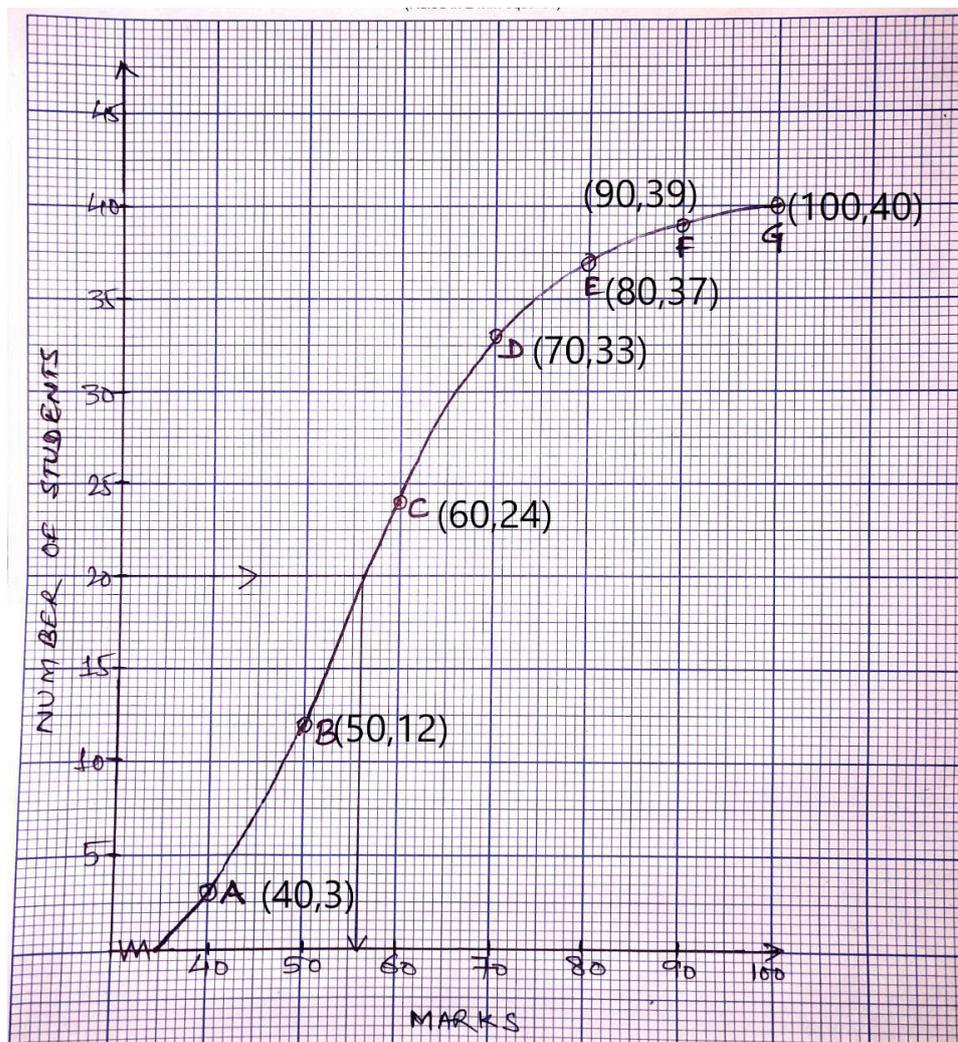
(ii) In the given diagram,  $O$  is the centre of circle circumscribing the  $\triangle ABC$ .  $CD$  is perpendicular to chord  $AB$ .  $\angle OAC = 32^\circ$ . Find each of the unknown angles  $x$ ,  $y$  and  $z$ . [4]



(iii) Study the graph and answer each of the following:

[5]

- (a) Name the curve plotted
- (b) Total number of students
- (c) The median marks
- (d) Number of students scoring between 50 and 80 marks



## SECTION B

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

### Question 4

(i) If  $A = \begin{bmatrix} 4 & -4 \\ -4 & 4 \end{bmatrix}$ , find  $A^2$ . If  $A^2 = pA$ , then find the value of  $p$ . [3]

(ii) Solve the given equation  $x^2 - 4x - 2 = 0$  and express your answer correct to two places of decimal. [3]

(You may use mathematical tables for this question).

(iii) In the given diagram,  $\triangle ABC$  is right angled at B. BDFE is a rectangle. [4]

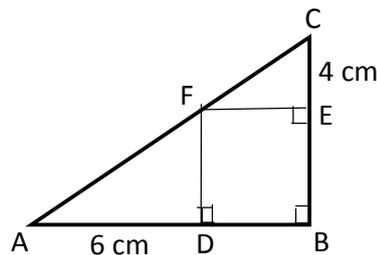
AD = 6 cm, CE = 4 cm and BC = 12 cm

(a) prove that  $\triangle ADF \sim \triangle FEC$

(b) prove that  $\triangle ADF \sim \triangle ABC$

(c) find the length of FE

(d) find area  $\triangle ADF$  : area  $\triangle ABC$



### Question 5

(i) Shown below is a table illustrating the monthly income distribution of a company with 100 employees. [3]

Monthly Income (in ₹10, 000)	0 - 4	4 - 8	8 - 12	12 - 16	16 - 20	20 - 24
Number of employees	55	15	06	08	12	4

Using step- deviation method, find the mean monthly income of an employee.

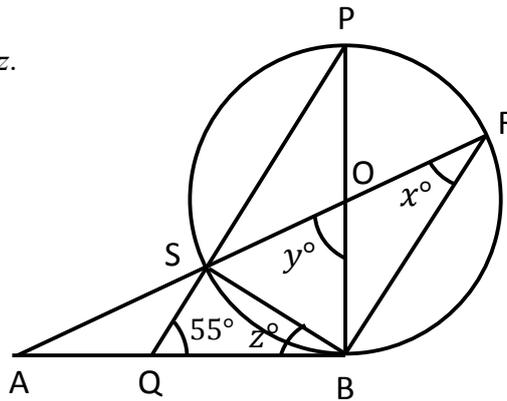
(ii) The following bill shows the GST rate and the marked price of articles: [3]

Vidhyut Electronics				
S. No.	Item	Marked Price	Quantity	Rate of GST
(a)	LED TV set	₹ 12000	01	28%
(b)	MP4 player	₹ 5000	01	18%

Find the total amount to be paid (including GST) for the above bill.

- (iii) In the given figure, O is the centre of the circle and AB is a tangent to the circle at B. [4]  
 If  $\angle PQB = 55^\circ$ .

- (a) find the value of the angles  $x$ ,  $y$  and  $z$ .  
 (b) prove that RB is parallel to PQ.



**Question 6**

- (i) There are three positive numbers in a Geometric Progression (G.P.) such that: [3]  
 (a) their product is 3375  
 (b) the result of the product of first and second number added to the product of second and third number is 750.

Find the numbers.

- (ii) The table given below shows the ages of members of a society. [3]

Age (in years)	Number of Members of the Society
25 – 35	05
35 – 45	32
45 – 55	69
55 - 65	80
65 – 75	61
75 - 85	13

Use graph sheet for this question.

Take 2cm = 10 years along one axis and 2cm=10 members along the other axis.

- (a) Draw a histogram representing the above distribution.  
 (b) Hence find the modal age of the members.

(iii) A tent is in the shape of a cylinder surmounted by a conical top. If the height and radius of the cylindrical part are 7 m each and the total height of the tent is 14 m. Find the: [4]

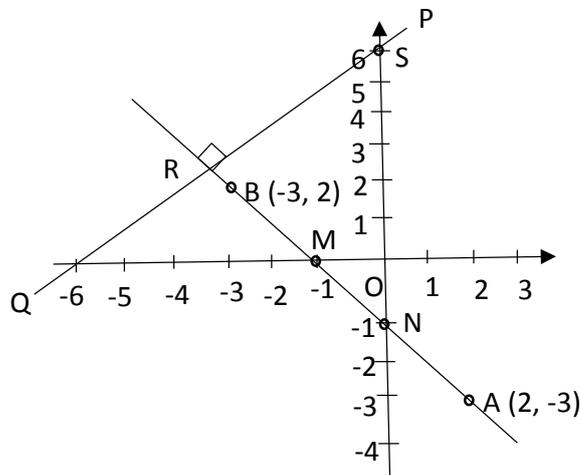
- (a) quantity of air contained inside the tent.
- (b) radius of a sphere whose volume is equal to the quantity of air inside the tent.

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

**Question 7**

(i) The line segment joining A(2,-3) and B(-3, 2) is intercepted by the x-axis at the point M [5] and the y axis at the point N. PQ is perpendicular to AB produced at R and meets the y- axis at a distance of 6 units from the origin O, as shown in the diagram, at S. Find the:

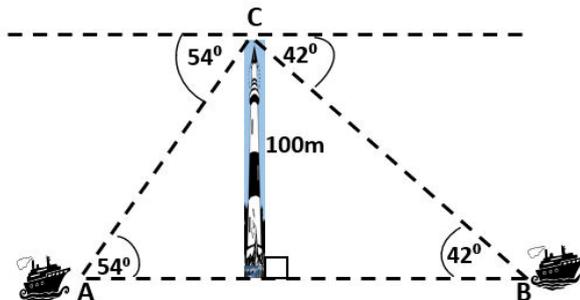
- (a) coordinates of M and N
- (b) coordinates of S
- (c) slope of AB.
- (d) equation of line PQ.



(ii) The angle of depression of two ships A and B on opposite sides of a light house of height 100m are respectively  $42^\circ$  and  $54^\circ$ . The line joining the two ships passes through the foot of the lighthouse. [5]

- (a) Find the distance between the two ships A and B.
- (b) Give your final answer correct to the nearest whole number.

(Use mathematical tables for this question)



### Question 8

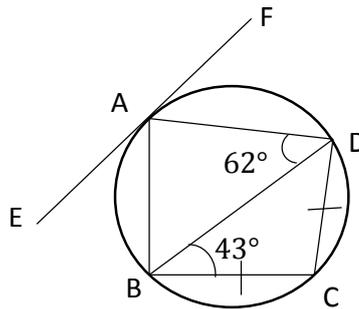
- (i) Solve the following inequation write the solution set and represent it on the real number line. [3]

$$3 - 2x \geq x + \frac{1-x}{3} > \frac{2x}{5}, x \in R$$

- (ii) ABCD is a cyclic quadrilateral in which BC = CD and EF is a tangent at A. [3]

$\angle CBD = 43^\circ$  and  $\angle ADB = 62^\circ$ . Find:

- (a)  $\angle ADC$   
(b)  $\angle ABD$   
(c)  $\angle FAD$



- (iii) A (a, b), B(-4, 3) and C(8,-6) are the vertices of a  $\triangle ABC$ . Point D is on BC such that  $BD : DC$  is 2 : 1 and M (6, 0) is mid point of AD. Find: [4]

- (a) coordinates of point D.  
(b) coordinates of point A.  
(c) equation of a line passing through M and parallel to line BC.

### Question 9

- (i) Using componendo and dividendo, find the value of x, when: [3]

$$\frac{x^3 + 3x}{3x^2 + 1} = \frac{14}{13}$$

- (ii) The total expense of a trip for certain number of people is ₹18000. If three more people join them, then the share of each reduces by ₹3000. Taking x to be the original number of people, form a quadratic equation in x and solve it to find the value of x. [3]

- (iii) Using ruler and compass only construct  $\angle ABC = 60^\circ$ ,  $AB = 6$  cm and  $BC = 5$  cm. [4]
- (a) construct the locus of points equidistant from AB and BC.
  - (b) construct the locus of points equidistant from A and B.
  - (c) Mark the point which satisfies both the conditions (a) and (b) as P.

Hence, construct a circle with centre P and passing through A and B.

### Question 10

- (i) Using remainder and factor theorem, factorize completely, the given polynomial: [3]

$$2x^3 - 9x^2 + 7x + 6$$

- (ii) Each of the letter of the word "HOUSEWARMING" is written on cards and put in a bag. [3]

If a card is drawn at random from the bag after shuffling, what is the probability that the letter on the card is:

- (a) a vowel
  - (b) one of the letters of the word SEWING.
  - (c) not a letter from the word WEAR.
- (iii) Use graph sheet for this question. Take 2 cm = 1 unit along the axes. [4]
- (a) Plot A (1, 2), B(1, 1) and C (2, 1)
  - (b) Reflect A, B and C about y-axis and name them as A', B' and C'.
  - (c) Reflect A, B, C, A', B' and C' about x-axis and name them as A'', B'', C'', A''', B''' and C''' respectively.
  - (d) Join A, B, C, C'', B'', A'', A''', B''', C''', C', B', A' and A to form a closed figure.