ICSE EXAMINATION PAPER - 2025
MATHEMATICS
Class-10th
(Solved)

Maximum Marks: 80 *Time Allotted: Three Hours*

Instructions to Candidates:

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

SECTION-A (40 MARKS)

(Attempt all questions from this Section.)

Question 1 **[15]**

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

(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) ₹ $(500 \times 18 + 570)$

(b) ₹ $(500 \times 19 + 570)$

(c) ₹ $(500 \times 18 \times 19 + 570)$

(d) ₹ $(500 \times 9 \times 19 + 570)$

(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 $3x + 4y + 7 = 0$ is

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

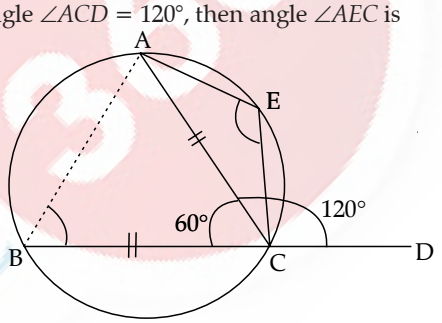
(c) $4x - 3y = 0$ **(d)** $3x + 4y = 0$

(v) If $A = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$, then 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 $\angle ACD = 120°$, then angle $\angle AEC$ 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)** $(x - 2)$

(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 $\sin^2 A + \sin A = 1$ then $\cos^4 A + \cos^2 A = 1$

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

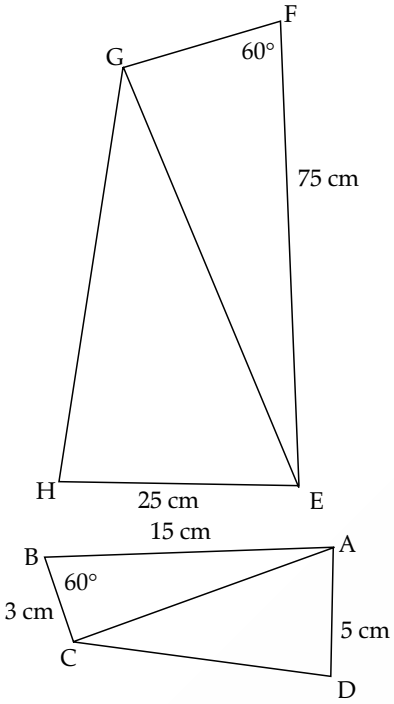
(a) (A) is true, (R) is false.

(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 $\Delta ABC \sim \Delta EFG$. If $\angle ABC = \angle EFG = 60°$, 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 $0 < -\frac{x}{3} < 2, x \in z$ 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): $\text{Mean} = \frac{\text{Sum of all the observations}}{\text{Total number of observations}}$

(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

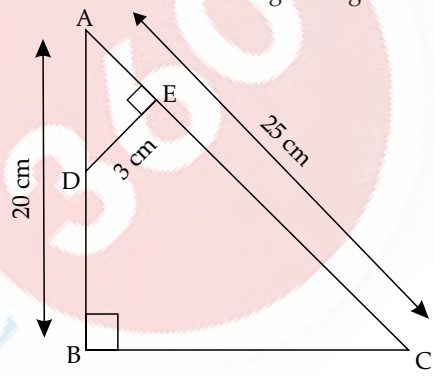
(i) Solve the following quadratic equation $2x^2 - 5x - 4 = 0$ Give your answer correct to **three significant figures**. (*Use mathematical tables for this question*) **[4]**

(ii) Mrs. Rao deposited ₹ 50 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 ₹ 250 more per month at the same rate of interest and for the same time.

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



(a) Prove that $\Delta ABC \sim \Delta AED$.

(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 m^2, 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 $\angle BAC = 120°$. Construct a circle circumscribing the ΔABC. Measure and write down the length of the radius of the circle. **[4]**

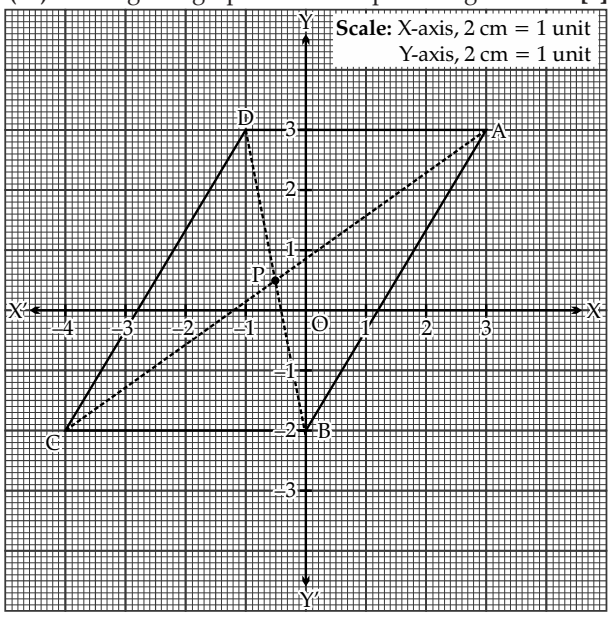
(ii) If $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$, $B = \begin{bmatrix} 2 & 1 \\ 4 & 2 \end{bmatrix}$ and $C = \begin{bmatrix} -5 & 1 \\ 7 & -4 \end{bmatrix}$ **[4]**

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 they represent 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]**

$$\frac{(\cot A + \tan A - 1)(\sin A + \cos A)}{\sin^3 A + \cos^3 A} = \sec A.\ \text{cosec}\, A$$

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.

Find the sum of total surface area of the three parts as shown in Figure 2. Given, the radius of the capsule is 3.5 cm and the length of the cylindrical block is 14 cm. **[4]**

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

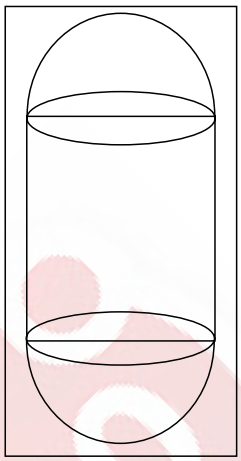


Figure 1

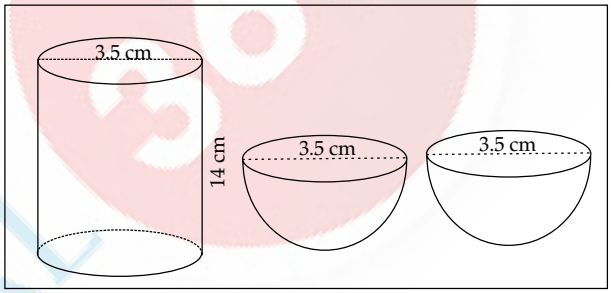


Figure 2

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.

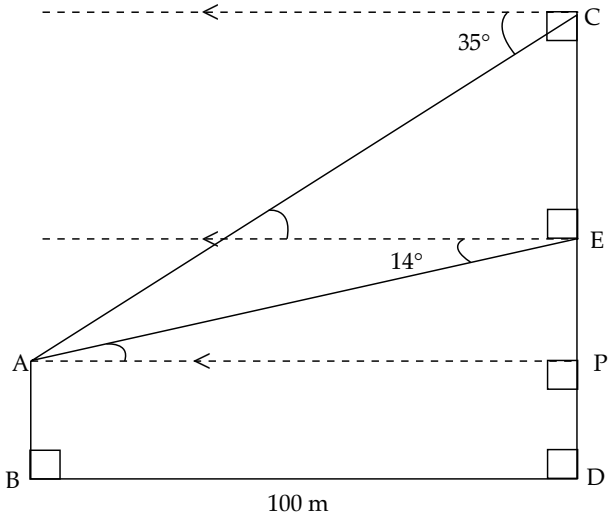
(d) Reflect *A, B* and *C* on the *y*-axis and name their images as *J, I* and *H* respectively.

(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).

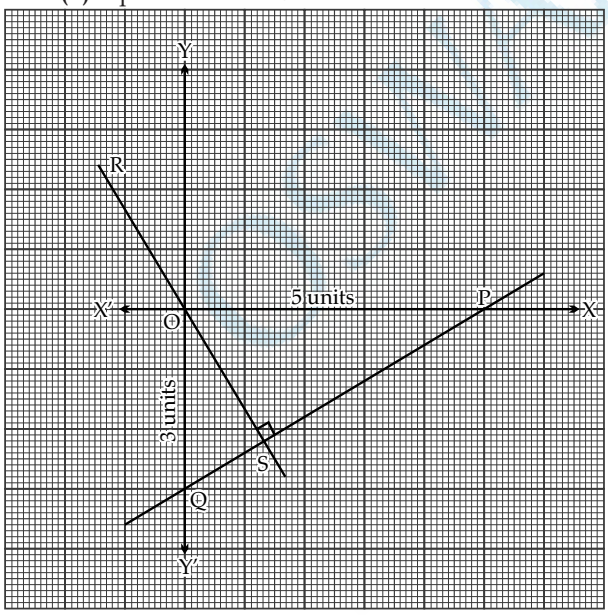
Draw a Histogram for the following distribution which gives the marks obtained by 164 students in a particular class and hence find the Mode.

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
y	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 speed of the car was reduced by 20 km/h and time of the journey increased by 2 hours. Find: **[4]**

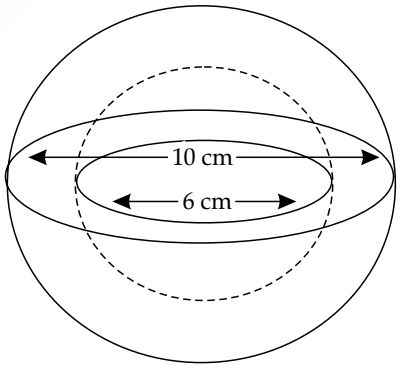
(a) the original speed of the car.

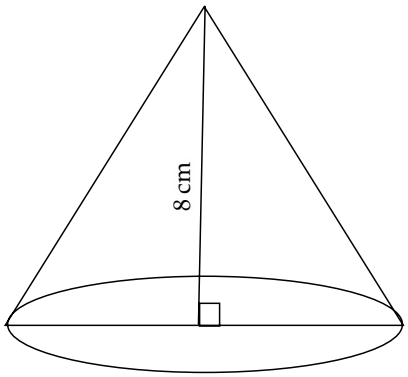
(b) with the reduced speed, the number of hours they took to reach their destination.

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

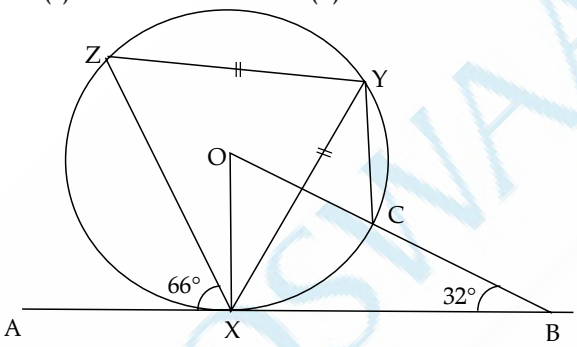
(b) Water Bottle

(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 $\angle OBX = 32°$ and $\angle AXZ = 66°$. Find: **[4]**

(a) $\angle BOX$ **(b)** $\angle CYX$

(c) $\angle ZYX$ **(d)** $\angle OXY$



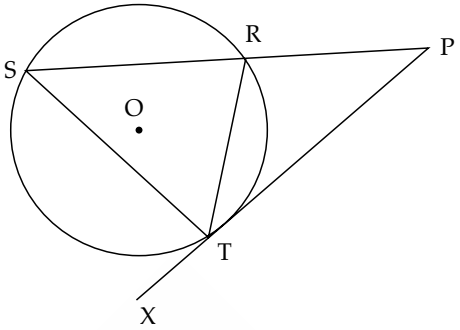
Question 10

(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]**

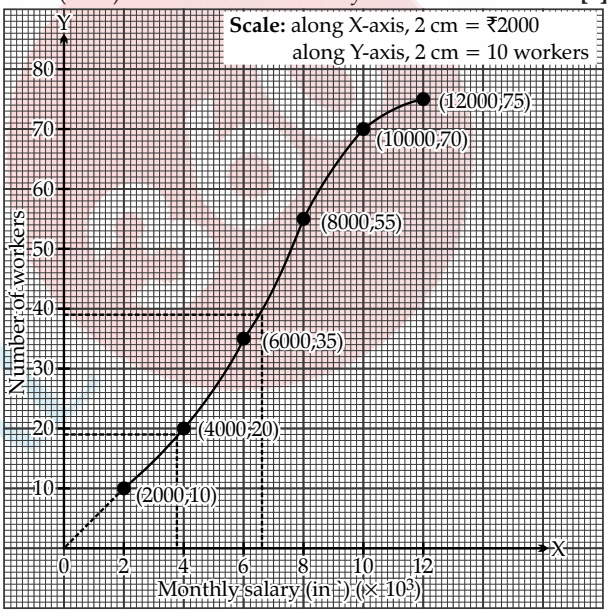


(a) Prove that $\Delta PTR \sim \Delta PST$

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

(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.

■■

ANSWERS

SECTION-A (65 MARKS)

(Attempt all questions from this Section.)

Answer 1

(i) Option (d) is correct.

Explanation: Given: $3x^2 + \sqrt{7}x + 2 = 0$

On comparing with $ax^2+bx+c=0$ we get,

$a = 3$, $b=\sqrt{7}$ and $c = 2$

Using the discriminant formula $D = b^2 - 4ac$

$D = \left(\sqrt{7}\right)^2 - 4 \times 3 \times 2$

$D = 7 - 24$

$D = -17$

$D < 0$

So, the given quadratic equation has no real roots

(ii) Option (a) is correct.

Explanation: Given $P = ₹\ 500$ per month

$n = 18$ $I = 570$

M.V. =?

Using the formula

$$M.V. = P \times n + I$$
$$= ₹\ (500 \times 18 + 570)$$

(iii) Option(a) is correct.

Explanation: Probability of any event is always between 0 to 1

As, $\frac{5}{4} = 1.25$ which is greater than 1.

So, option (a) cannot be the probability of any event.

(iv) Option(d) is correct

Explanation: Given line $3x+4y+7=0$

$$\Rightarrow \quad 4y = -3x-7$$
$$y = \frac{-3}{4}x - \frac{7}{4}$$

On comparing with $y = mx + c$

$$m = \frac{-3}{4}$$

For the parallel line slope is same.

Equation of line passing through the origin with slope $\frac{-3}{4}$.

$y-0 = \frac{-3}{4}x - 0 \Rightarrow 3x+4y = 0$

(v) Option (c) is correct.

Explanation: Since, $A = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$

$$A \times A = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix} \times \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix} = \begin{bmatrix} 0\times0+1\times1 & 0\times1+1\times0 \\ 1\times0+0\times1 & 1\times1+0\times0 \end{bmatrix}$$
$$= \begin{bmatrix} 0+1 & 0+0 \\ 0+0 & 1+0 \end{bmatrix}$$
$$= \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

(vi) Option (d) is correct

Explanation: Given $AC = BC$

then $\angle CAB = \angle ABC$ (angles opposite to equal sides are equal)

$\angle CAB + \angle ABC = \angle ACD$ (exterior angle property)

So, $2\angle CAB = \angle ACD$

Thus, $2\angle CAB = 120°$

Therefore, $\angle CAB = 60°$

$\angle AEC + \angle ABC = 180°$

(As, opposite angles of a cyclic quadrilateral is 180°)

$\angle AEC + 60° = 180°$

$\angle AEC = 120°$

(vii) Option (c & d) is correct.

Explanation:

$$P(x) = x^2 - 4$$
$$Q(x) = x^3 - x^2 - 4x + 4$$

Factorise

$$P(x) = (x+2)(x-2)$$
$$Q(x) = x^3 - x^2 - 4x + 4$$
$$= x^2(x-1) - 4(x-1)$$
$$= (x^2-4)(x-1)$$
$$= (x+2)(x-1)(x-2)$$

Common Factor $= (x+2)(x-2)$

(viii) Option (c) is correct

Explanation: Given dividend = 12% of face value

Let Face value be ₹ 100 then dividend ₹ 12

Return on investment = 10%

Let market price be x

Using the yield Formula

$$\text{Return} = \frac{\text{Dividend}}{\text{M.V}} \times 100$$
$$10 = \frac{12}{x} \times 100$$
$$x = ₹\ 120$$

As, Market Price > Face Value

So, shares are above per.

(ix) Option (a) is correct.

(x) Option (c) is correct.

Explanation: Assertion :

$$\sin^2 A + \sin A = 1$$
$$1 - \cos^2 A + \sin A = 1$$
$$\sin A = \cos^2 A \quad \text{....(i)}$$

Now, $\sin^2 A + \cos^2 A = 1$

$(\cos^2 A)^2 + \cos^2 A$

$= (\sin A)^2 + \cos^2 A$

$= \sin^2 A + \cos^2 A = 1$ (using the given reason)

Thus, $\cos^4 A + \cos^2 A = 1$

Hence, both Assertion and reason are true and reason is the correct explanation of assertion.

(xi) Option (a) is correct.

Explanation: Given $\Delta ABC \sim \Delta EFG$, $EF = 75$ cm, $AB = 15$ cm, BC = 3 cm

$\angle B = \angle F = 60°$

Now, using the Basic proportionality theorem.

$$\frac{AB}{EF}=\frac{BC}{FG}$$
$$\frac{15}{75}=\frac{3}{FG}$$
$$FG=\frac{3\times75}{15}=15\,cm$$

(xii) Option (a) is correct.

Explanation: Given $\frac{V_1}{V_2}=\frac{27}{64}$

$$\Rightarrow \quad \frac{\frac{4}{3}\pi r_1^3}{\frac{4}{3}\pi r_2^3}=\frac{27}{64}$$

$$\Rightarrow \quad \frac{r_1}{r_2}=\frac{3}{4}$$

(xiii) Option (d) is correct.

Explanation: Marked Price = ₹ 1375

CGST = 4%

Since GST is divided into CGST and SGST , SGST is also 4%.

$$GST = \frac{8}{100}\times1375$$
$$= \frac{8\times1375}{100}=110$$

Final Price = ₹ 1375 + ₹ 110 = ₹ 1485

(xiv) Option (a) is correct.

Explanation: Given $0<\frac{-x}{3}<2$

$\Rightarrow \quad 0 < -x < 6$

$\Rightarrow \quad 0 > x > -6$

$\Rightarrow \quad -6 < x < 0$

The solution set is {–5 , –4, –3, –2, –1}

(xv) Option (b) is correct.

Explanation: Assertion

$$\text{Mean} = \frac{1+2+3+4+5+6+7+8+9}{9}$$
$$= \frac{45}{9}=5$$

Assertion is false.

and Reason is true.

Answer 2

(i) Since , $2x^2-5x-4=0$

On comparing with $ax^2+bx+c=0$, $a=2$, $b=-5$, $c=-4$

Now, using Formula $x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$

$$x=\frac{-(-5)\pm\sqrt{(-5)^2-4\times2\times-4}}{2\times2}$$

$$x=\frac{5\pm\sqrt{25+32}}{4}=\frac{5\pm\sqrt{57}}{4}$$

$$x=\frac{5\pm7.549}{4}$$

$x = 3.137$, -0.637

(ii) (a) Given Maturity Value (M.V) = ₹ 10,110

Principle (P) = ₹ 250

Period $n = 3\times12 = 36$ month

Now M.V. $= P\times n+I$

$10{,}110 = 250\times36+I$

$I = 10{,}110-9{,}000$

$I = 1{,}110$

$$I = P\times n\times\frac{(n+1)}{2\times12}\times\frac{R}{100}$$

$$I=\frac{250\times36\times37\times R}{2{,}400}$$

$$R=\frac{1{,}110\times2{,}400}{250\times36\times37}$$

$R = 8\%$

(b) Principle = 300, $R = 8\%$, $n = 36$

$$I = P\times\frac{n(n+1)}{12\times2}\times\frac{R}{100}$$

$$I=\frac{300\times36\times37\times8}{2400}$$

$I =$ ₹ 1332

More interest received by Mrs. Rao = 1332 – 1110

= ₹ 222

(iii) Given: $\angle ABC = 90°$, $\angle DEA = 90°$

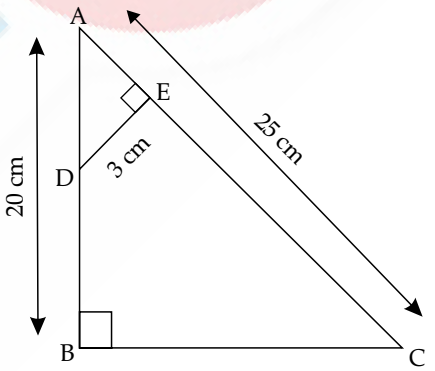
$AB = 20$ cm , $AC = 25$ cm, $DE = 3$ cm

(a) In Δ AED and Δ ABC

$\angle AED = \angle ABC = 90°$

$\angle EAD = \angle CAB$ = common angle

$\Delta AED \sim ABC$ (AA Similarity)



(b) Now, In right angled triangle ABC, ∠B = 90°

By using pythagoras theorem

$AC^2 = AB^2 + BC^2$

$25^2 = 20^2 + BC^2$

$625 = 400 + BC^2$

$BC^2 = 625 - 400$

$BC = \sqrt{225}$

$BC = 15$ cm

$AC^2 = 25^2 - 20^2$

$BC^2 = 625 - 400$

$$BC = \sqrt{225}$$
$$= 15$$

By using BPT theorem

$$\frac{AB}{AE}=\frac{BC}{ED}=\frac{CA}{DA}$$

(using pythagoras theorem)

$$\frac{AB}{AE}=\frac{BC}{ED} \Rightarrow \frac{20}{AE}=\frac{15}{3}$$
$$AE = 4 \text{ cm}$$
$$\frac{BC}{ED}=\frac{CA}{DA} \Rightarrow \frac{15}{3}=\frac{25}{AD}$$
$$AD = 5 \text{ cm}$$

(c) Scale factor of map $k^2 = \dfrac{\text{Area of BCED}}{\text{Actual area of ground}}$

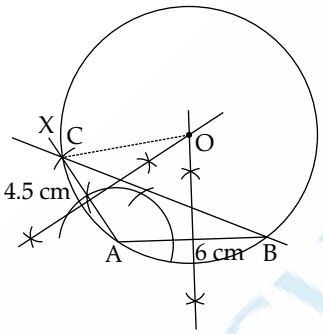
$$= \frac{ar(\Delta ABC - \Delta AED)}{576\,m^2}$$
$$= \frac{\frac{1}{2}\times 20\times 15 - \frac{1}{2}\times 3\times 4}{576\,m^2}$$
$$= \frac{(150-6)\,cm^2}{576\,m^2}$$
$$= \frac{144}{576\times 100\times 100} = \frac{1}{40000}$$

Thus, $k = \sqrt{\dfrac{1}{40000}}$

$$= \frac{1}{200}$$

Answer 3

(i)



Step to construction:

1. Draw line segment AB = 6 cm.
2. At point A, construct an angle BAX of 120°
3. With A as centre and radius 4.5cm draw an arc cutting AX at point C.
4. Join B and C, thus ABC is a required triangle.
5. Draw perpendicular bisectors of AB & AC which intersect at O.
6. With O as centre and OC as radius, draw a circle touching points A,B and C of triangle ABC.
7. Thus, the length of radius is approx 5.2 cm.

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

(a) $A + C = \begin{bmatrix}1 & 2\\ 3 & 4\end{bmatrix} + \begin{bmatrix}-5 & 1\\ 7 & -4\end{bmatrix}$

$$= \begin{bmatrix}1-5 & 1+2\\ 3+7 & 4-4\end{bmatrix}$$
$$= \begin{bmatrix}-4 & 3\\ 10 & 0\end{bmatrix}$$

(b) $B(A + C) = \begin{bmatrix}2 & 1\\ 4 & 2\end{bmatrix} \times \begin{bmatrix}-4 & 3\\ 10 & 0\end{bmatrix}$

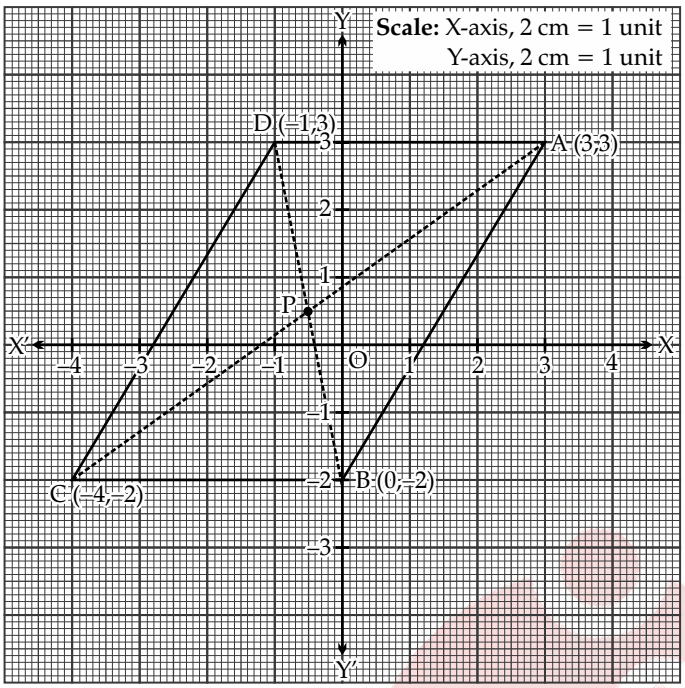
$$= \begin{bmatrix}2\times -4 + 1\times 10 & 2\times 3 + 1\times 0\\ 4\times -4 + 2\times 10 & 4\times 3 + 2\times 0\end{bmatrix}$$
$$= \begin{bmatrix}-8+10 & 6\\ -16+20 & 12\end{bmatrix} = \begin{bmatrix}2 & 6\\ 4 & 12\end{bmatrix}$$

(c) $5B = 5\begin{bmatrix}2 & 1\\ 4 & 2\end{bmatrix} = \begin{bmatrix}10 & 5\\ 20 & 10\end{bmatrix}$

(d) $B(A+C) - 5B = \begin{bmatrix}2 & 6\\ 4 & 12\end{bmatrix} - \begin{bmatrix}10 & 5\\ 20 & 10\end{bmatrix}$

$$= \begin{bmatrix}2-10 & 6-5\\ 4-20 & 12-10\end{bmatrix}$$
$$= \begin{bmatrix}-8 & 1\\ -16 & 2\end{bmatrix}$$

(iii) (a) Coordinate $A = (3, 3)$
$B = (0, -2)$
$C = (-4, -2)$
$D = (-1, 3)$



(b) Coordinate of P = Mid point of BD

$$=\left(\frac{-1+0}{2},\frac{3-2}{2}\right)$$

$$=\left(-\frac{1}{2},\frac{1}{2}\right)$$

(c) Slope of CB $=\frac{y_2-y_1}{x_2-x_1}=\frac{-2-(-2)}{0-(-4)}=\frac{0}{4}=0$

Slope of DA $=\frac{y_2-y_1}{x_2-x_1}=\frac{3-3}{3-(-1)}=\frac{0}{4}=0$

Slope of CB = DA then they are parallel line

(d) Eq of AC $=y-y_1=\frac{y_2-y_1}{x_2-x_1}(x-x_1)$

When $x_1 = -4$

$\Rightarrow \quad y-(-2)=\frac{3-(-2)}{3-(-4)} \quad \{x-(-4)\}$

$\Rightarrow \quad y+2=\frac{5}{7}(x+4)$

$\Rightarrow \quad 7y+14=5x+20$

$7y-5x-6=0$

$5x-7y+6=0$

SECTION-B

Answer 4

(i) Since, $2x-\frac{5}{3}<\frac{3x}{5}+10\le\frac{4x}{5}+11; x\in R$

$$2x-\frac{5}{3}<\frac{3x}{5}+10$$

$\Rightarrow 30x-25<9x+150$

$\Rightarrow 21x<175$

$x<\frac{175}{21}$

$x<8\frac{1}{3}$ ....(i)

$\frac{3x}{5}+10\le\frac{4x}{5}+11$

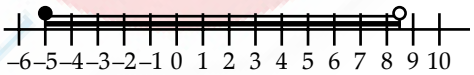
$\Rightarrow 3x+50\le 4x+55$

$-5\le x$ ....(ii)

From (i) and (ii) we get,

$-5\le x<8\frac{1}{3}$

Solution set $=\left\{-5\le x<8\frac{1}{3}, x\in R\right\}$



(ii) **(a)** Given $a = 5$

last term = 50

Sum $S_n = 440$

Now $S_n=\frac{n}{2}(a+l)$

$440=\frac{n}{2}(5+50)$

$n=\frac{440\times 2}{55}=16$

(b) $l = a + (n-1)d$

$50 = 5 + (16-1)d$

$\frac{45}{15}=d$

$d = 3$

(iii) Prove that

$$\frac{(\cot A+\tan A-1)(\sin A+\cos A)}{\sin^3 A+\cos^3 A}=\sec A.\operatorname{cosec} A$$

L.H.S. $\frac{\left(\frac{\cos A}{\sin A}+\frac{\sin A}{\cos A}-1\right)(\sin A+\cos A)}{(\sin^2 A+\cos^2 A-\sin A.\cos A)(\sin A+\cos A)}$

$$\Rightarrow \frac{\left(\frac{\cos^2 A+\sin^2 A-\sin A.\cos A}{\sin A+\cos A}\right)}{\sin^2 A+\cos^2 A-\sin A.\cos A}$$

$$=\frac{1}{\sin A.\cos A}$$

= sec A.cosec A = R.H.S

Answer 5

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

Using componendo and dividendo

$$\frac{6x^2+6x-10}{6x^2}=\frac{9x^2+4x+10}{9x^2}$$

$$\Rightarrow \quad \frac{6x^2+6x-10}{2}=\frac{9x^2+4x+10}{3}$$

$$\Rightarrow \quad 18x^2+18x-30 = 18x^2+8x+20$$

$$10x = 50$$

$$x = 5$$

(ii) (a) $P(x) = 2x^3 - 7x^2 + kx - 2$

Since $(x-2)$ is a factor ; Put $x = 2$ in the polynomial

$P(2) = 2(2)^3 - 7(2)^2 + k(2) - 2$

$0 = 16 - 28 + 2k - 2$

$k = 7$

(b) The Polynomial is $2x^3 - 7x^2 + 7x - 2$

The factor of polynomial = $(x-2)(2x-1)(x-1)$

By Long Division method

$2x^2 - 3x + 1$

$x - 2$) $2x^3 - 7x^2 + 7x - 2$

$2x^3 - 4x^2$

$-\quad +$

$0 \quad -3x^2 + 7x - 2$

$-3x^2 + 6x$

$+ \quad -$

$0 \quad x - 2$

$x - 2$

$- \quad +$

0

Alternate Method: Factorisation of the given polynomial is,

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

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

$= 2x^2(x-2) - 3x(x-2) + 1(x-2)$

$= (x-2)(2x^2 - 3x + 1)$

$= (x-2)(2x^2 - 2x - x + 1)$

$= (x-2)[2x(x-1) - 1(x-1)]$

$= (x-2)(x-1)(2x-1)$

(iii) Given: Height of Cylinder = 14 cm

Radius of Cylinder = 3.5 cm

Radius of hemisphere = 3.5 cm

Total Surface of Area of three Part = total Surface area of Cylinder + 2 × total Surface area of hemisphere

$$= 2\pi r(r+h) + 2 \times 3\pi r^2$$

$$= 2\pi r(r+h+3r)$$

$$= 2 \times \pi \times r(4r+h)$$

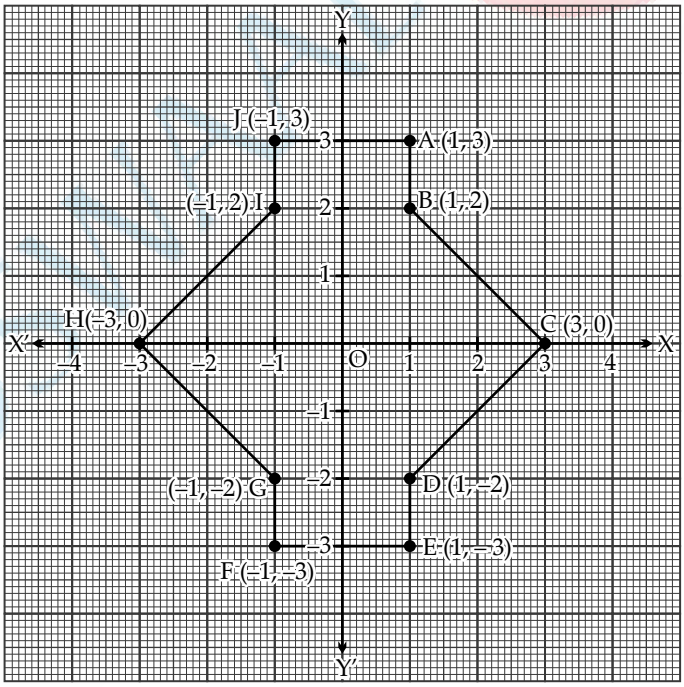
$$= 2 \times \frac{22}{7} \times 3.5\,(4 \times 3.5 + 14)$$

$$= 2 \times \frac{22}{7} \times 3.5 \times 28$$

$$= 616 \text{ cm}^2$$

Answer 6

(i)(a)



(b) Reflection of A and B on the x–axis

A(1,3) → E(1,–3)

B(1,2) → D(1,–2)

(c) Reflection of A and B through the origin

A(1,3) → F(–1,–3)

B(1,2) → G(–1,–2)

(d) Reflection of A , B and C on the y–axis

A(1,3) → J(–1,3)

B(1,2)→ I(–1,2)

C(3,0) → H(–3,0)

(e) Joint the Point A → B → C → D → E → F → G → H → I → J → A

The figure obtained is Decagon

(ii) Given, BD = 100 m = AP

As, angle of depression = angle of elevation.

Thus, ∠EAP =14°

and ∠CAP = 35°

In right angle ΔAEP, ∠P = 90°

$$\tan 14° = \frac{EP}{AP}$$

$$0.25 = \frac{EP}{100}$$

$$25 = EP$$

$$EP = 25 \text{ m}$$

In ∠APC, ∠P = 90°

$$\tan 35° = \frac{CP}{AP}$$

$$0.70 = \frac{CP}{AP}$$

$$CP = 70 \text{ cm}$$

Now, $CE = CP - EP$

$= 70 - 25$

$= 45$ m

E is the mid-point of CD (given)

Therefore, $CD = 2CE$

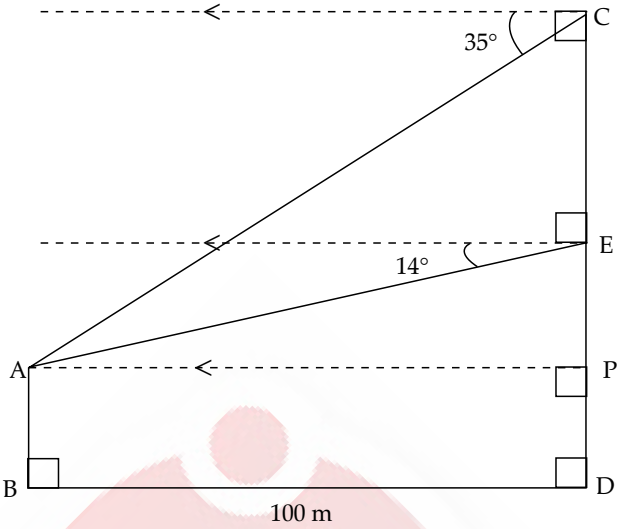
$= 2 \times 45$

$= 90$ m

$AB = CD - CP$

$= 90 - 70$

$= 20$ m



Answer 7

To find mode.

(a) Firstly identify the rectangle with highest frequency (Modal class) which is 60-70.

(b) Join the top corners of the modal rectangle with immediate next corners of the adjacent rectangles.

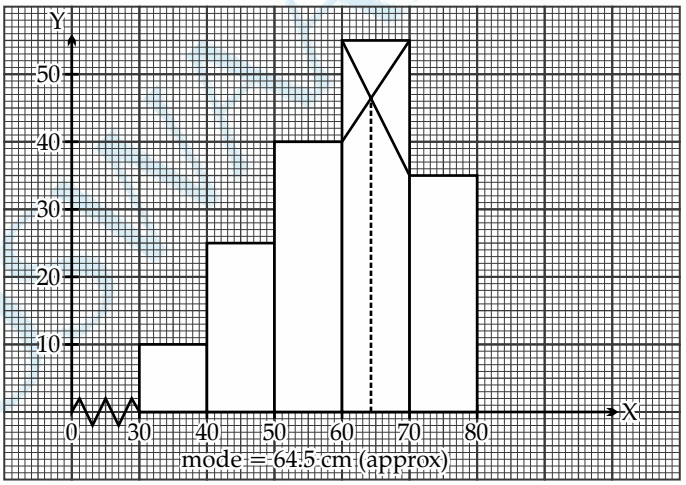
(c) Let the point where the joining lines cut each other as P.

(d) Draw a perpendicular from A to x -axis.

(e) The point 'A', where the perpendicular meet the X-axis will give the mode.

Scale: On Y-axis: 2cm = 10 Marks

On X-axis: 2cm = 10 students



(ii)(a) Coordinate of P = (5,0)

Coordinate of Q = (0,–3)

(b) Slope of PQ $= \frac{y_2 - y_1}{x_2 - x_1} = \frac{0-(-3)}{5-0}$

$$m_1 = \frac{3}{5}$$

Now, RS is perpendicular PQ and Slope of RS be m_2

$m_1 \times m_2 = -1$

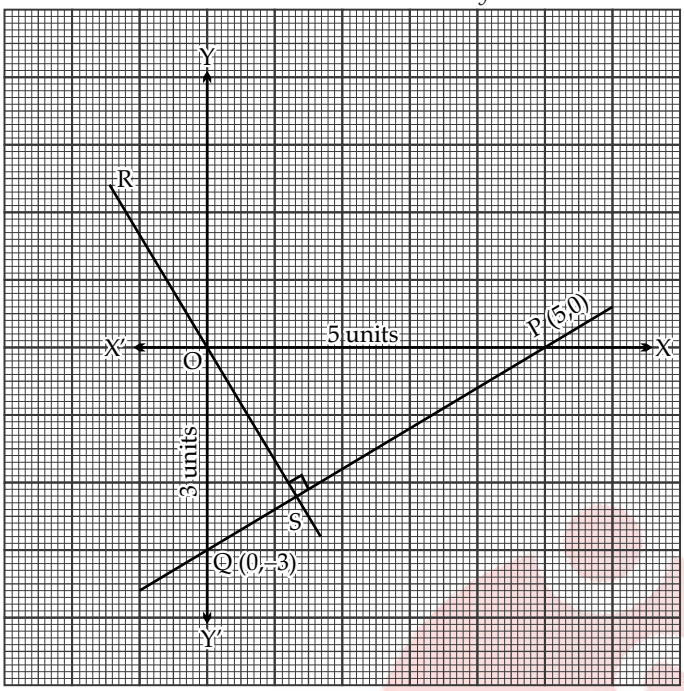
$$m_2 = \frac{-5}{3}$$

Equation of line RS passing (0,0)

$$y - y_1 = \frac{-5}{3}(x - x_1)$$

$$y - 0 = \frac{-5}{3}(x - 0)$$

$3y = -5x$ $5x + 3y = 0$



(iii) Total cost of Article A = 190 × 6
= 1140

$$GST = 1140 \times \frac{12}{100} = 136.8$$

Total cost with GST = ₹ 1276.80

Total Cost of Article B = 50 ×12 = ₹ 600

5% discount is applicable $= 600 \times \frac{5}{100} = 30$

Total Cost = 600 – 30 = ₹ 570

$$GST = 570 \times \frac{18}{100} = ₹\ 102.6$$

Total Cost with GST = ₹ 672.60

Total Bill = ₹ 1276.80 + 672.60
=₹ 1949.40 = ₹ 1950

The customer paid ₹ 2000 but actual bill ₹ 1950
So the amount paid by the customer is wrong as total amount is not ₹ 2000.

Answer 8

(i) Given face value of each Share = ₹ 200
Premium = 25%
Return = 5%
Annual dividend received =₹ 1000

(a) Market value = Face value + Premium

$$= 200 + 200 \times \frac{25}{100}$$

= 200 + 50 = ₹ 250

(b) $$Return\% = \frac{(r\% \times N.V)}{M.V} \times 100$$

$$5 = \frac{(r \times 200 \times 100)}{250} \times 100$$

$$5 \times 250 \times \frac{100}{200} \times 100 = r$$

r = 6.25% p.a

(c) Total dividend = Number of Share × Dividend per Share
1000 = N ×12.5

$$\text{Number of Share (N)} = \frac{1000}{12.5} = 80$$

(ii)

C.I	*x*	*f*	*x.f*	*c.f*
9.5–10.5	10	3	30	3
10.5–11.5	11	2	22	5
11.5–12.5	12	2	24	7
12.5–13.5	13	6	78	13
13.5–14.5	14	3	42	16
14.5–15.5	15	5	75	21
15.5–16.5	16	3	48	24
	Total	24	319	

(a) $$\text{Mean } \bar{x} = \frac{\sum x.f}{\sum f} = \frac{319}{24} = 13.29 = 13$$

$$M = 12.5 + \frac{\left(\frac{24}{2} - 7\right)}{6} \times 1$$

$$= 12.5 + \frac{5}{6}$$

= 12.5 + 0.83
=13.33 = 13

(b) Where l = 12.5
n =24
c.f. =7
f =6
h =1

$$\text{Median} = l + \left(\frac{\frac{n}{2} - c.f.}{f}\right) \times h$$

(iii)(a) Let the original speed of car be x km/h
The original time taken to travel 350 km

$$t_1 = \frac{d}{s} = \frac{350}{x}$$

New time be t_2 when speed reduce by 20 km/h

Average time speed $t_2 - t_1 = 2$

$$\Rightarrow \quad t_2 = \frac{350}{x-2}$$

Now, $\quad \frac{350}{x-2} - \frac{350}{x} = 2$

$$\Rightarrow \quad \frac{350x - 350x - 7000}{x(x-20)} = 2$$

$$\Rightarrow \quad \frac{350(x - x + 20)}{x^2 - 20x} = 2$$

$$\Rightarrow \quad 3500 = x^2 - 20x$$
$$\Rightarrow \quad x^2 - (70 - 50)x - 3500 = 0$$
$$\Rightarrow \quad x^2 - 70x + 50x - 3500 = 0$$
$$(x - 70)(x + 50) = 0$$
$$x = 70$$
$$x = -50 \quad \text{(Not Possible)}$$

As, speed cannot be negative.
so original speed = 70km/h

(b) New time $t_2 = \frac{350}{70-20} = 7\ h$

Answer 9

(i) Given Internal Radius of sphere = 3 cm
External Radius of sphere= 5 cm
Height af cone = 8 cm
Now, Volume af Hollow Sphere = Volume of Cone

$$\frac{4}{3}\pi r_1^3 - \frac{4}{3}\pi r_2^3 = \frac{1}{3}\pi r^2 h$$

$$\Rightarrow \quad \frac{4}{3}\pi r\left(5^3 - 3^3\right) = \frac{1}{3}\pi R^2 h$$

$$\Rightarrow \quad 4(125 - 27) = R^2 \times 8$$

$$\Rightarrow \quad \frac{98}{2} = R^2$$

$$\Rightarrow \quad R = 7 \text{ cm}$$

(ii)(a) Perfect square between 1 to 30 $P(E) = 1, 4, 9, 16\ 25$

$$P(E) = 5$$

$$P(\text{Wall Clock}) = \frac{P(E)}{P(S)} = \frac{5}{30} = \frac{1}{6}$$

(b) Multiple of 3 = 3, 6, 9, 12, 15, 18, 21, 24, 27, 30
Even among them = 6, 12, 18, 24, 30

$$P(\text{Water Bottle}) = \frac{5}{30} = \frac{1}{6}$$

(c) Prime Number = 2, 3, 5, 7, 11, 13, 17, 19, 23, 29

$$P(\text{Purse}) = \frac{10}{30} = \frac{1}{3}$$

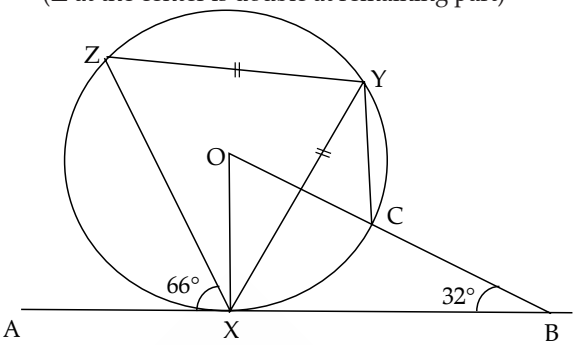
(iii) (a) In ΔBOX

$\angle OXB = 90°$ (point of contact)
$\angle OXB + \angle OBX + \angle BOX = 180°$
$\Rightarrow \quad 90° + 32° + \angle BOX = 180°$
$\angle BOX = 58°$

(b) $\angle CYX = \frac{1}{2} \times \angle COX = 29°$

$$= \frac{1}{2} \times 58°$$

($\angle$ at the center is double at remaining part)



(c) Since $ZY = XY$, then $\angle YXZ = \angle XZY$
$\angle AXZ = \angle ZYX$ $\therefore$ (alternate segment theorem)
$\angle ZYX = 66^\circ$
In ΔXYZ
$\angle XYZ + \angle YZX + \angle ZXY = 180°$
$66° + x + x = 180°$
$2x = 114°$
$x = 57°$
So $\angle YZX = \angle ZXY = 57°$

(d) $\angle AXZ + \angle ZXY + \angle YXB = 180°$ (straight line property)

$$66° + 57° + \angle YXB = 180°$$
$$\angle YXB = 180 - 123°$$
$$\angle YXB = 57°$$

Now, $\quad \angle OXY = \angle OXB - \angle YXB$
$= 90° - 57°$
Thus, $\quad \angle OXY = 33°$

Answer 10

(i) Given $T_n = 1701$
$a = 7$

$$r = \frac{T_2}{T_1} = \frac{21}{7} = 3$$

(a) Using the formula $T_n = ar^{n-1}$

$$1701 = 7(3)^{n-1}$$
$$3^{n-1} = 243$$
$$3^{n-1} = 3^5$$
$$n = 6$$

(b) Using the formula

$$S_n = \frac{a\left(r^n - 1\right)}{r - 1}$$

$$S_6 = \frac{7\left(3^6 - 1\right)}{3 - 1}$$

$$S_6 = \frac{7(729 - 1)}{2}$$

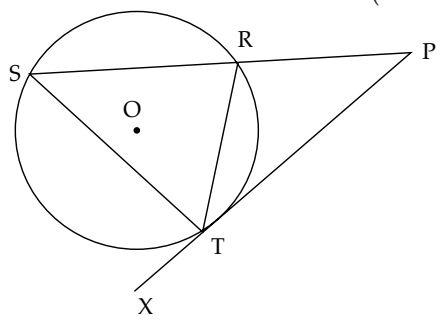
$$S_6 = \frac{7 \times 728}{2}$$

$$S_6 = 2548$$

(ii) **(a)** In Δ PTR and PST
$\angle TPR = \angle TPS$ (Common)

$\angle PTR = \angle PST$ ($\because$ Alternate Segment Theorem)

$\Delta PTR \sim \Delta PST$ (AA Similarity)



(b) Using basic proportionality theorem

$$\frac{PT}{PS} = \frac{PR}{PT}$$

$PT^2 = PR \cdot PS$ **Hence Proved.**

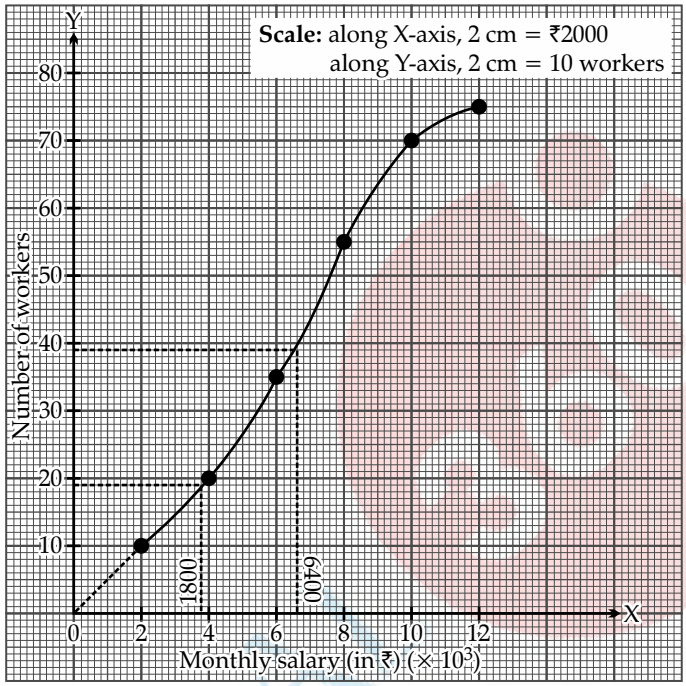
(c) Put PR = 4 and PS = 16 in $PT^2 = PR \times PS$

$PT^2 = 4 \times 16$

$PT^2 = 64$

$PT = 8$ cm

(iii)



(a) Total Number of Workers = 75

(b) Median $= \frac{n+1}{2} = \frac{75+1}{2} = 38$ workers

Median = 6400

Median Class = 6000 – 8000

(c) Lower Quartile Class

$= \frac{n+1}{4} = \frac{75+1}{4} = \frac{76}{4} = 19$ workers

Lower Quartile Class = 2000 – 4000

(d) Number of workers having monthly salary more than or equal 6000 = 35 workers

Number of workers having salary less than 10000 = 70

So, Number of workers = 70 – 35

more than equal 6000 and less than 10000 = 35

■■