SAMPLE QUESTION PAPER (BASIC) - 09

Class 10 - Mathematics

Time Allowed: 3 hours **Maximum Marks: 80**

General Instructions:

1. This Question Paper has 5 Sections A-E.
2. Section A has 20 MCQs carrying 1 mark each.
3. Section B has 5 questions carrying 02 marks each.
4. Section C has 6 questions carrying 03 marks each.
5. Section D has 4 questions carrying 05 marks each.
6. Section E has 3 case based integrated units of assessment (04 marks each) with subparts of the values of 1, 1 and 2 marks each respectively.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided. An internal choice has been provided in the 2marks questions of Section E.
8. Draw neat figures wherever required. Take π =22/7 wherever required if not stated.

Section A

1. If the bisector of an angle of a triangle bisects the opposite side then the triangle is **[1]**

   a) scalene b) isosceles

   c) equilateral d) right-angled

2. Which of the following expressions is not a polynomial? **[1]**

   a) $5x^3 - 3x^2 - \sqrt{x} + 2$ b) $5x^3 - 3x^2 - x + \sqrt{2}$

   c) $5x^2 - \frac{2}{3}x + 2\sqrt{5}$ d) $\sqrt{5}x^3 - \frac{3}{5}x + \frac{1}{7}$

3. The area of the triangle formed by the line $\frac{x}{a} + \frac{y}{b} = 1$ with the co – ordinate axis is **[1]**

   a) $2ab$ ab sq. units b) $\frac{1}{4}ab$ sq. units

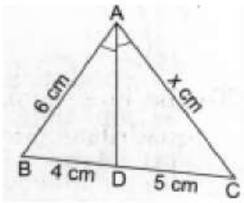
   c) ab ab sq. units d) $\frac{1}{2}ab$ sq. units

4. One equation of a pair of dependent linear equations is – 5x + 7y = 2, then the second equation can be **[1]**

   a) – 10x + 14y + 4 = 0 b) – 10x – 14y + 4 = 0

   c) 10x – 14y +4 = 0 d) 10x + 14y + 4 = 0

5. In a △ ABC it is given that AD is the internal bisector of ∠A. If BD = 4 cm, DC = 5 cm and AB = 6 cm, then AC = ? **[1]**



a) 9 cm
b) 7.5 cm
c) 4.5 cm
d) 8 cm

6. Two dice are rolled simultaneously. The probability that the sum of the numbers on the faces is 9 is **[1]**

a) $\frac{5}{9}$
b) $\frac{1}{9}$
c) $\frac{4}{9}$
d) $\frac{2}{9}$

7. If $\sin\theta = \frac{\sqrt{3}}{2}$ then $(\operatorname{cosec}\theta + \cot\theta) = ?$ **[1]**

a) $\sqrt{2}$
b) $(2+\sqrt{3})$
c) $2\sqrt{3}$
d) $\sqrt{3}$

8. The mean of the first 10 composite numbers is **[1]**

a) 11.2
b) 11.4
c) 112
d) 12.2

9. XY is drawn parallel to the base BC of a $\triangle$ABC cutting AB at X and AC at Y. If AB = 4 BX and YC = 2cm, then AY = **[1]**

a) 8 cm
b) 4 cm
c) 6 cm
d) 2 cm

10. What is the largest number that divides each one of 1152 and 1664 exactly? **[1]**

a) 64
b) 256
c) 128
d) 32

11. The hypotenuse of a right triangle is 6m more than twice the shortest side. The third side is 2m less than the hypotenuse. The representation of the above situation in the form of a quadratic equation is **[1]**

a) $(2x + 6)^2 = x^2 + (2x + 4)^2$
b) $(2x + 6)^2 + x^2 = (2x + 4)^2$
c) $(2x + 6)^2 = x^2 - (2x + 4)^2$
d) None of these

12. ABCD is a rectangle whose three vertices are B (4,0), C (4,3) and D (0,3). The length of one of its diagonals is **[1]**

a) 5
b) 3
c) 4
d) 25

13. $\frac{\text{Upper class limit} + \text{Lower class limit}}{2} =$ **[1]**

a) frequency
b) class mark
c) None of these
d) class size

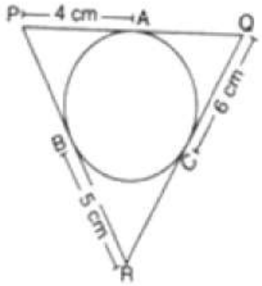
14. If $\frac{x\csc^2 30^\circ \sec^2 45^\circ}{8\cos^2 45^\circ \sin^2 60^\circ} = \tan^2 60^\circ - \tan^2 30^\circ$, then x = **[1]**

a) 0
b) 2
c) -1
d) 1

15. A kite is flying at a height of 30 m from the ground. The length of string from the kite to the ground is 60 m. Assuming that there is no slack in the string, the angle of elevation of the kite at the ground is **[1]**

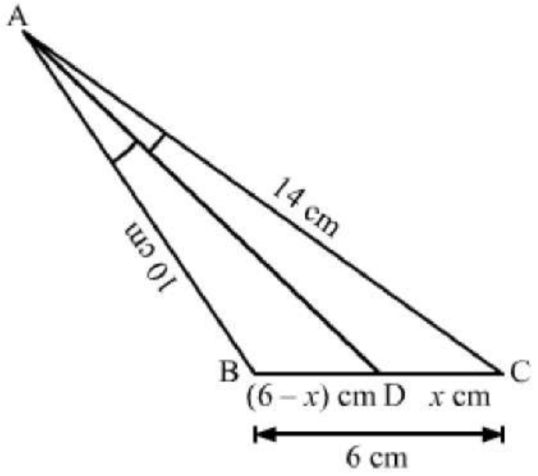
a) 30°
b) 45°
c) 90°
d) 60°

16. The perimeter of $\triangle PQR$ in the given figure is **[1]**



a) 15 cm
b) 60 cm
c) 45 cm
d) 30 cm.

17. In a $\triangle$ABC, it is given that AD is the internal bisector of $\angle$A. If AB = 10 cm, AC = 14 cm and BC = 6 cm, the CD = ? **[1]**



a) 3.5 cm
b) 7 cm
c) 4.8 cm
d) 10.5 cm

18. Which of the following equations has 2 as a root? **[1]**

a) $2x^2 - 7x + 6 = 0$
b) $3x^2 - 6x - 2 = 0$
c) $x^2 + 3x - 12 = 0$
d) $x^2 - 4x + 5 = 0$

19. **Assertion (A):** A constant polynomial always cuts the x-axis at only one point. **[1]**

Reason (R): Constant polynomial does not have any zero.

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

20. **Assertion (A):** Two identical solid cubes of side 5 cm are joined end to end. The total surface area of the resulting cuboid is 350 cm^2. **[1]**

Reason (R): Total surface area of a cuboid is 2(lb + bh + hl)

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

Section B

21. Solve the following quadratic equation : $x : 4\sqrt{3}x^2 + 5x - 2\sqrt{3} = 0$ **[2]**

22. Find the distance of C(-4, -6) points from the origin. **[2]**

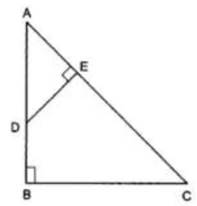
OR

Find the perimeter of a triangle with vertices (0,0),(1,0) and (0,1).

23. Find the largest positive integer that will divide 122,150 and 115 leaving remainders 5, 7, 11 respectively. **[2]**

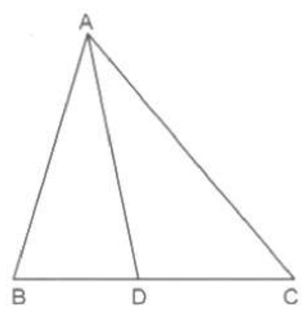
24. If cotθ = $\frac{9}{40}$, find the values of cosecθ and secθ. **[2]**

25. In Fig. if $AB \perp BC$ and $DE \perp AC$. Prove that △ABC ~ △AED. **[2]**



OR

In Fig. check whether AD is the bisector of $\angle A$ of ΔABC if AB = 5 cm, AC = 10 cm, BD = 1.5 cm and CD = 3.5 cm

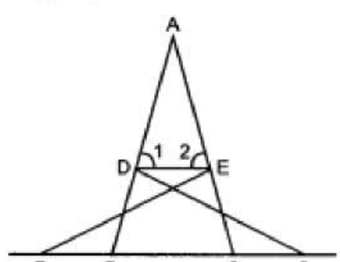


Section C

26. Solve the quadratic equation by factorization: **[3]**

$\frac{1}{2a+b+2x} = \frac{1}{2a} + \frac{1}{b} + \frac{1}{2x}$

27. In figure, △FEC ≅ △GBD and ∠1 = ∠2. Prove that $\triangle ADE \sim \triangle ABC$. **[3]**



28. If the point C (-1, 2) divides the line segment AB in the ratio 3 : 4, where the coordinates of A are (2, 5), find the coordinates of B **[3]**

OR

If the point P (2, 2) is equidistant from the points A (-2, k) and B (-2k, -3), find k. Also, find the length of AP.

29. In a seminar, the number of participants in Hindi, English and Mathematics are 60, 84 and 108, respectively. Find the minimum number of rooms required if in each room the same number of participants are to be seated and all of them being in the same subject. **[3]**

30. If at some time of the day the ratio of the height of a vertically standing pole to the length of its shadow on the **[3]**

ground is $\sqrt{3}:1$, then find the angle of elevation of the sun at that time.

OR

The length of a string between a kite and a point on the ground is 85 m. If the string makes an angle θ with the ground level such that tan $\theta = 15/8$ then find the height of the kite from the ground. Assume that there is no slack in the string.

31. Find the arithmetic mean of the following frequency distribution using step-deviation method: **[3]**

Age(in years)	18 - 24	24 - 30	30 - 36	36 - 42	42 - 48	48 - 54
Number of workers	6	8	12	8	4	2

Section D

32. Akhila went to a fair in her village. She wanted to enjoy rides on the Giant Wheel and play Hoopla (a game in which you throw a ring on the items kept in the stall, and if the ring covers any object completely, you get it). The number of times she played Hoopla is half the number of rides she had on the Giant Wheel. Each ride costs Rs.3, and a game of Hoopla costs Rs.4, how would you find out the number of rides she had and how many times she played Hoopla if she spent Rs. 20 in the fair. Represent the situation algebraically and graphically. **[5]**

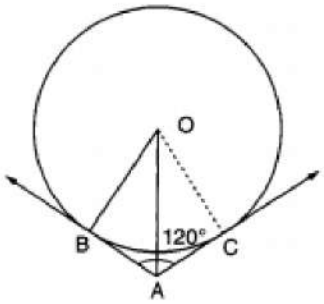
OR

Solve for x and y :

2x - y + 3 = 0

3x - 5y + 1 = 0

33. In fig., two tangents AB and AC are drawn to a circle with centre O such that $\angle BAC = 120^\circ$. Prove that OA = 2AB. **[5]**



34. A semicircular region and a square region have equal perimeters. The area of the square region exceeds that of the semicircular region by 4 cm^2. Find the perimeters and areas of the two regions. **[5]**

OR

Find upto three places of decimal the radius of the circle whose area is the sum of the areas of two triangles whose sides are 35, 53, 66 and 33, 56, 65 measured in centimetres (Use π = 22/7).

35. All the red face cards are removed from a pack of 52 playing cards. A card is drawn at random from the remaining cards, after reshuffling them. Find the probability that the drawn card is: **[5]**

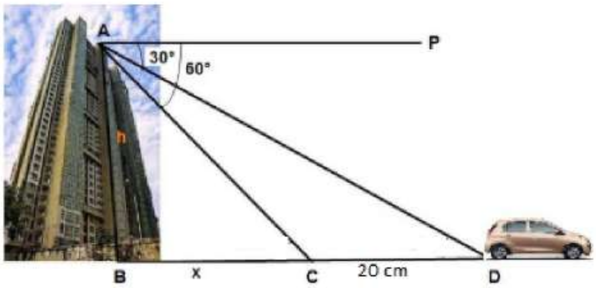
i. of red colour
ii. a queen
iii. an ace
iv. a face card.

Section E

36. **Read the text carefully and answer the questions:** **[4]**

Vijay lives in a flat in a multi-story building. Initially, his driving was rough so his father keeps eye on his driving. Once he drives from his house to Faridabad. His father was standing on the top of the building at point

A as shown in the figure. At point C, the angle of depression of a car from the building was 60°. After accelerating 20 m from point C, Vijay stops at point D to buy ice cream and the angle of depression changed to 30°.



(i) Find the value of x.

(ii) Find the height of the building AB.

(iii) Find the distance between top of the building and a car at position D?

OR

Find the distance between top of the building and a car at position C?

37. **Read the text carefully and answer the questions:** **[4]**

Deepa has to buy a scooty. She can buy scooty either making cashdown payment of ₹ 25,000 or by making 15 monthly instalments as below.

Ist month - ₹ 3425, IInd month - ₹ 3225, IIIrd month - ₹ 3025, IVth month - ₹ 2825 and so on

(i) Find the amount of 6th instalment.

(ii) Total amount paid in 15 instalments.

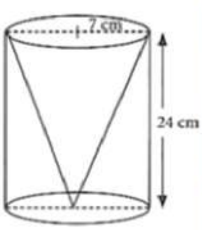
(iii) Deepa paid 10th and 11th instalment together find the amount paid that month.

OR

If Deepa pays ₹2625 then find the number of instalment.

38. **Read the text carefully and answer the questions:** **[4]**

One day Vinod was going home from school, saw a carpenter working on wood. He found that he is carving out a cone of same height and same diameter from a cylinder. The height of the cylinder is 24 cm and base radius is 7 cm. While watching this, some questions came into Vinod's mind.



(i) Find the slant height of the conical cavity so formed?

(ii) Find the curved surface area of the conical cavity so formed?

(iii) Find the external curved surface area of the cylinder?

OR

Find the ratio of curved surface area of cone to curved surface area of cylinder?

Solution

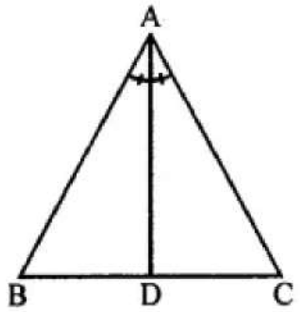
SAMPLE QUESTION PAPER (BASIC) - 09

Class 10 - Mathematics

Section A

1. **(b)** isosceles

Explanation: If the bisector of angle of a triangle bisects the opposite side of a triangle.



$\because$ AD is the angle bisector of $\angle$A

$\therefore \frac{AB}{AC} = \frac{BD}{CD}$ (D bisects BC)

$\therefore$ AB = AC

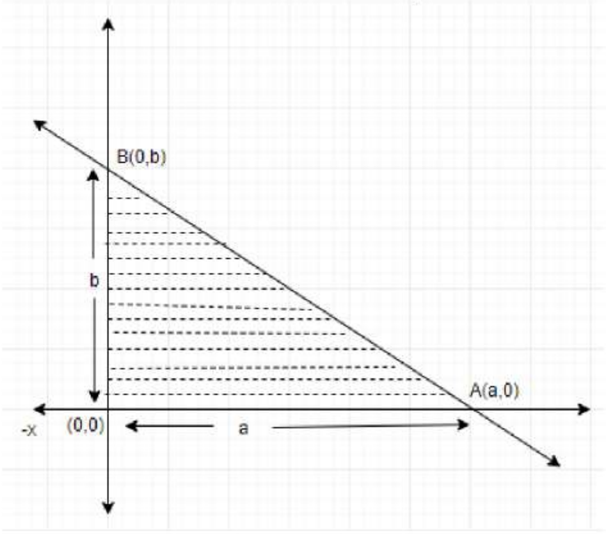
$\therefore \triangle ABC$ is an isosceles triangle.

2. **(a)** $5x^3 - 3x^2 - \sqrt{x} + 2$

Explanation: $5x^3 - 3x^2 - \sqrt{x} + 2$ is not a polynomial because each term of a polynomial should be a product of a constant and one or more variable raised to a positive, zero or integral power. Here $\sqrt{x}$ does not satisfy the condition of being a polynomial.

3. **(d)** $\frac{1}{2}ab$ sq. units

Explanation: Area of triangle OAB = $\frac{1}{2} \times$ OA $\times$ OB = $\frac{1}{2}ab$



4. **(c)** 10x – 14y +4 = 0

Explanation: If the equation of a pair of dependent linear equations, then $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

Given: a_1 = -5, b_1 = -5and c_1 = 2.

For satisfying the condition of dependent linear equations, the values of a_2, b_2 and c_2 should be the multiples of the values of a_1, b_1 and c_1.

$\therefore$ The values would be $a_2 = -5 \times (-2) = 10, b_2 = 7 \times (-2) = -14$ and $c_1 = 2 \times (-2) = -4$

$\therefore$ The second equation can be 10x - 14y = - 4

5. **(b)** 7.5 cm

Explanation: It is given that AD bisects angle A.

Therefore, applying angle bisector theorem, we get:

$\frac{BD}{DC} = \frac{AB}{AC}$

$\Rightarrow \frac{4}{5} = \frac{6}{x}$

$\Rightarrow x = \frac{5\times6}{4} = 7.5$

Hence, AC = 7.5 cm

6. **(b)** $\frac{1}{9}$

Explanation: Number of possible outcomes = {(3, 6), (5, 4), (4, 5), (6, 3)} = 4

Number of Total outcomes = 6 × 6 = 36

∴ Required Probability = $\frac{4}{36} = \frac{1}{9}$

7. **(d)** $\sqrt{3}$

Explanation: Given: $\sin\theta = \frac{\sqrt{3}}{2}$ and $\text{cosec}\,\theta = \frac{2}{\sqrt{3}}$

$\text{cosec}^2\theta - \cot^2\theta = 1$

$\Rightarrow \cot^2\theta = \text{cosec}^2\theta - 1$

$\Rightarrow \cot^2\theta = \frac{4}{3} - 1$ [Given]

$\Rightarrow \cot\theta = \frac{1}{\sqrt{3}}$

$\therefore \text{cosec}\,\theta + \cot\theta = \frac{2}{\sqrt{3}} + \frac{1}{\sqrt{3}}$

$= \frac{3}{\sqrt{3}}$

$= \frac{\sqrt{3}\times\sqrt{3}}{\sqrt{3}}$

$= \sqrt{3}$

8. **(a)** 11.2

Explanation: The first 10 composite numbers are 4, 6, 8, 9, 10, 12, 14, 15, 16, 18

$\therefore$ Mean = $\frac{\text{Sum of first 10 composite numbers}}{10}$

$= \frac{4+6+8+9+10+12+14+15+16+18}{10}$

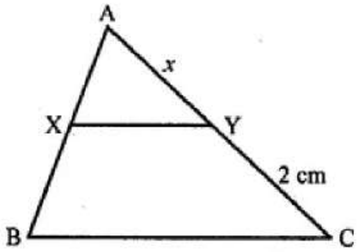
$= \frac{112}{10}$

= 11.2

9. **(c)** 6 cm

Explanation: In ΔABC, XY || BC

AB = 4BX, YC = 2 cm



$\therefore AB = 4BX \Rightarrow AX + BX = 4BX$

$\Rightarrow \text{AX} = 4\text{BX} - \text{BX} = 3\text{BX}$

Let AY = x

$\because$ In ΔABC, XY || BC

$\frac{AX}{BX} = \frac{AY}{CY} \Rightarrow \frac{3BX}{BX} = \frac{x}{2}$

$\Rightarrow \frac{3}{1} = \frac{x}{2} \Rightarrow x = 3\times2 = 6$

$\therefore \text{AY} = 6\text{cm}$

10. **(c)** 128

Explanation: Largest number that divides each one of 1152 and 1664 = HCF (1152, 1664)

We know, 1152 = $2^7 \times 3^2$

1164 = $2^7 \times 13$

∴ HCF = 2^7 = 128

11. **(a)** $(2x + 6)^2 = x^2 + (2x + 4)^2$

Explanation: Let the shortest side of a right angled triangle be x meters.

Then according to question, its hypotenuse will be (2x + 6) meters and, the third side will be (2x + 6 -2) = (2x + 4) meters.

Now, using Pythagoras theorem, $(\text{Hypotenuse})^2 = (\text{Base})^2 + (\text{Perpendicular})^2$

$\Rightarrow (2x + 6)^2 = x^2 + (2x + 4)^2$

12. **(a)** 5

Explanation: Three vertices of a rectangle ABCD are B (4,0), C (4, 3) and D (0, 3) length of one of its diagonals

$BD = \sqrt{(4-0)^2 + (0-3)^2} = \sqrt{4^2 + 3^2}$

$= \sqrt{16+9} = \sqrt{25} = 5$

13. **(b)** class mark

Explanation: In each class interval of grouped data, there are two limits or boundaries (upper limit and lower limit) while the mid-value is equal to $\frac{\text{Upper class limit} + \text{Lower class limit}}{2}$. These mid-values are also known as Classmark.

14. **(d)** 1

Explanation: We have, $\frac{x \csc^2 30^\circ \sec^2 45^\circ}{8 \cos^2 45^\circ \sin^2 60^\circ} = \tan^2 60^\circ - \tan^2 30^\circ$

$\Rightarrow \frac{x(2)^2(\sqrt{2})^2}{8\left(\frac{1}{\sqrt{2}}\right)^2\left(\frac{\sqrt{3}}{2}\right)^2} = (\sqrt{3})^2 - \left(\frac{1}{\sqrt{3}}\right)^2$

$\Rightarrow \frac{x \times 4 \times 2}{8 \times \frac{1}{2} \times \frac{3}{4}} = 3 - \frac{1}{3} \Rightarrow \frac{8x}{3} = \frac{8}{3}$

$\Rightarrow x = \frac{8}{3} \times \frac{3}{8} = 1$

15. **(a)** 30°

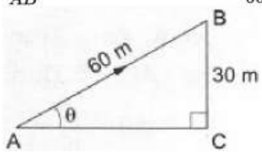
Explanation: Let AB be the tower and B be the kite.

Let AC be the horizontal and let BC $\perp$ AC.

Let $\angle CAB = \theta$.

BC = 30 m and AB = 60 m. Then,

$\frac{BC}{AB} = \sin\theta \Rightarrow \sin\theta = \frac{30}{60} = \frac{1}{2} \Rightarrow \sin\theta = \sin 30^\circ \Rightarrow \theta = 30^\circ$.



16. **(d)** 30 cm.

Explanation: Since Tangents from an external point to a circle are equal.

$\therefore$ PA = PB = 4 cm,

BR = CR = 5 cm

CQ = AQ = 6 cm

Perimeter of $\triangle PQR$ = PQ + QR + RP

= PA + AQ + QC + CR + BR + PB

= 4 + 6 + 6 + 5 + 5 + 4

= 30 cm

17. **(a)** 3.5 cm

Explanation: By using angle bisector theore in $\triangle ABC$, we have

$\frac{AB}{AC} = \frac{BD}{DC}$

$\Rightarrow \frac{10}{14} = \frac{6-x}{x}$

$\Rightarrow 10x = 84 - 14x$

$\Rightarrow 24x = 84$

$\Rightarrow x = 3.5$

Hence, the correct answer is 3.5.

18. **(a)** $2x^2 - 7x + 6 = 0$

Explanation: Given, $2x^2 - 7x + 6 = 0$

If 2 satisfies the above equation then 2 is a root.

Now, $2(2)^2 - 7(2) + 6 = 0$

$\therefore$ 2 is a root of this equation

19. **(d)** A is false but R is true.

Explanation: As constant polynomial is only a real number, it has degree as zero, so it has non-zero, so it will never cut x-axis at any point.

20. **(d)** A is false but R is true.

Explanation: A is false but R is true.

Section B

21. $4\sqrt{3}x^2 + 5x - 2\sqrt{3} = 0$

$4\sqrt{3}x^2 + 8x - 3x - 2\sqrt{3} = 0$

$4x(\sqrt{3}x + 2) - \sqrt{3}(\sqrt{3}x + 2) = 0$

$(4x - \sqrt{3})(\sqrt{3}x + 2) = 0$

$x = \frac{\sqrt{3}}{4}, -\frac{2\sqrt{3}}{3}$

22. The given point is C(-4, -6) and let O(0,0) be the origin

Then, $CO = \sqrt{(-4-0)^2 + (-6-0)^2}$

$= \sqrt{16+36} = \sqrt{52} = 2\sqrt{13}\ units$

OR

A = (x, y) = (0,0),

B = (x_1,y_1) = (1,0) and C = (x_2,y_2) = (0,1)

The perimeter is sum of length of three sides, so first find the length of three sides and add them.

First side= AB= $\sqrt{(x_1 - x)^2 + (y_1 - y)^2} = \sqrt{(1-0)^2 + (0-0)^2} = 1$

Second side = BC = $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} = \sqrt{(0-1)^2 + (1-0)^2} = \sqrt{2}$

Third side = AC = $\sqrt{(x_2 - x)^2 + (y_2 - y)^2} = \sqrt{(0-0)^2 + (1-0)^2} = 1$

Adding lengths of three sides $= 1 + 1 + \sqrt{2} = (2 + \sqrt{2})\ units$

23. First subtracting the remainders

122 - 5 = 117

150 - 7 = 143

115 - 11 = 104

Now prime factors of 117,143 and 104 are

117=$3^2 \times$ 13

143= 11 $\times$ 13

104= $2^3 \times$ 13

The HCF of 104, 117 and 143 is 13

The largest number which divides 122, 150 and 115 leaving 5, 7 and 11 respectively as remainders is 13

24. We have, $\cot\theta = \frac{9}{40}$

$\therefore \quad \operatorname{cosec}\theta = \sqrt{1+\cot^2\theta} \Rightarrow \operatorname{cosec}\theta = \sqrt{1+\left(\frac{9}{40}\right)^2} = \sqrt{1+\frac{81}{1600}} = \sqrt{\frac{1681}{1600}} = \frac{41}{40}$

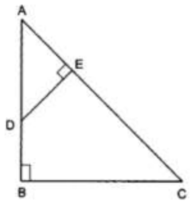
Again, $\cot\theta = \frac{9}{40} \Rightarrow \tan\theta = \frac{1}{\cot\theta} = \frac{40}{9}$

$\therefore \quad \sec\theta = \sqrt{1+\tan^2\theta} \Rightarrow \sec\theta = \sqrt{1+\left(\frac{40}{9}\right)^2} = \sqrt{\frac{1681}{81}} = \frac{41}{9}$

25. Given: A triangle ABC in which $AB \perp BC$ and $DE \perp AC$.

To Prove: $\triangle$ABC ~ $\triangle$AED.

Proof: In $\triangle$'s ABC and AED, we have



$\angle$ABC = $\angle$AED = 90^o

$\angle$BAC = $\angle$EAD (Each equal to $\angle$A]

Therefore, by AA-criterion of similarity, we obtain $\triangle ABC \sim \triangle AED$.

OR

It is given that, AB = 5 cm, AC = 10 cm, BD = 1.5 cm and CD = 3.5 cm

We have to check whether AD is bisector of $\angle A$

First we will check proportional ratio between sides

So,

$\frac{AB}{AC} = \frac{5}{10} = \frac{1}{2}$

$\frac{BD}{CD} = \frac{1.5}{3.5} = \frac{3}{7}$

Since $\frac{AB}{AC} \neq \frac{BD}{CD}$

Hence, AD is not the bisector of $\angle A$

Section C

26. Consider $\frac{1}{2a+b+2x} = \frac{1}{2a} + \frac{1}{b} + \frac{1}{2x}$

$\Rightarrow \frac{1}{2a+b+2x} - \frac{1}{2x} = \frac{1}{2a} + \frac{1}{b}$

$\Rightarrow$ 2ab (2x - 2a – b – 2x) = (2a + b)2x (2a + b + 2x)

$\Rightarrow$ 2ab (-2a - b) = 2(2a+ b) (2ax + bx + $2x^2$)

$\Rightarrow$ -ab = 2ax + bx + $2x^2$

$\Rightarrow$ $2x^2$ + 2ax + bx + ab = 0

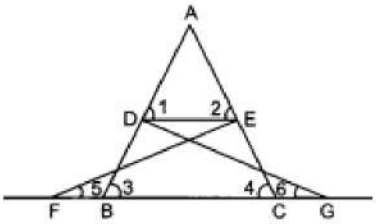
$\Rightarrow$ 2x (x + a) + b (x + a) = 0

$\Rightarrow$ (2x + b) (x + a) = 0

$\Rightarrow x = -a, -\frac{b}{2}$

Hence the roots are $-a, -\frac{b}{2}$.

27. Given: $\triangle FEC \cong \triangle GBD$ and $\angle 1 = \angle 2$



To prove: $\triangle ADE \sim \triangle ABC$

Proof: In ΔADE, $\angle 1 = \angle 2$ (Given)

$\Rightarrow$ AE = AD ....(i) (sides opposite to equal angles are equal)

Also, $\Delta FEC \cong \Delta GBD$ (Given)

$\Rightarrow$ BD = EC (by CPCT) ....(ii)

$\angle 3 = \angle 4$ [By CPCT]

Also AE + EC = AD + BD

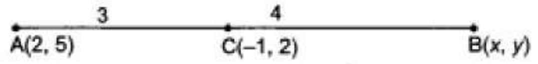
AC = AB ....(iii)

Dividing (i) and (iii), we get

$\frac{AD}{AB} = \frac{AE}{AC}$ and $\angle A = \angle A$ (common)

$\therefore$ $\triangle ADE \sim \triangle ABC$ (SAS similarity)

28. According to the question, A(2, 5) and C(-1, 2).



point C divides the line segment AB in the ratio 3 : 4.

By using section formula,

$(x, y) = \frac{3\times x+4\times 2}{3+4}, \frac{3\times y+4\times 5}{3+4}$

Comparing x , we get

$\Rightarrow \frac{3\times x+4\times 2}{3+4}$ = -1

$\Rightarrow \frac{3x+8}{7} = -1$

$\Rightarrow$3x + 8 = -7

$\Rightarrow$ 3x = -15

$\Rightarrow$x = -5

Comparing y , we get

$\Rightarrow \frac{3\times y+4\times 5}{3+4}$ = 2

$\Rightarrow \frac{3y+20}{7} = 2$

$\Rightarrow 3y + 20 = 14$

$\Rightarrow 3y = 14 - 20$

$\Rightarrow 3y = -6$

$\Rightarrow y = -2$

$\therefore$ Coordinates of B are (-5, -2).

OR

Given: P(2, 2) is equidistant from the points A(-2, k) and B(-2k, -3),

We have, AP = BP

$AP^2 = BP^2$

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

$16 + 4 + k^2 - 4k = 4 + 4k^2 + 8k + 25$

$20 + k^2 - 4k = 29 + 4k^2 + 8k$

$3k^2 + 12k + 9 = 0$

$k^2 + 4k + 3 = 0$

$k^2 + 3k + k + 3 = 0$

$k(k + 3) + 1(k + 3) = 0$

$(k + 1)(k + 3) = 0$

$k = -1, -3$

For k = -1, we have,

AP = $\sqrt{(2+2)^2 + (2-k)^2} = \sqrt{16 + (2+1)^2} = \sqrt{25} = 5$

For k = -3, we have,

AP = $\sqrt{(2+2)^2 + (2+3)^2} = \sqrt{16+25} = \sqrt{41}$

29. The number of participants in each room must be the HCF of 60, 84 and 108.

In order to find the HCF of 60, 84 and 108, we first find the HCF of 60 and 84 by Euclid's division algorithm:

2	60	84	1
	48	60	
	12	24	2
	(HCF)	24	
		0	
		(Remainder)	

Clearly, HCF of 60 and 84 is 12

Now, we find the HCF of 12 and 108

12	108	9
(HCF)	108	
	0	
	(Remainder)	

Clearly, HCF of 12 and 108 is 12. Hence, the HCF of 60,84 and 108 is 12.

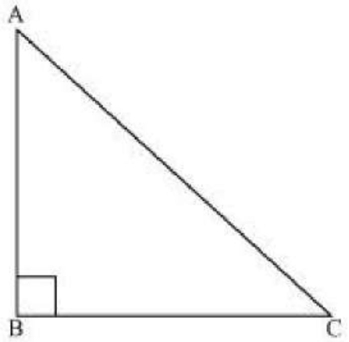
Therefore, in each room maximum 12 participants can be seated.

We have,

Total number of participants = 60 + 84 + 108 = 252

$\therefore$ Number of rooms required $= \frac{252}{12} = 21$.

30.



Let the pole be AB and length of the shadow be BC.

Given, the ratio of height of pole to the length of its shadow on the ground is $\sqrt{3}:1$

So, $\frac{AB}{BC}=\frac{\sqrt{3}}{1}$

Consider the triangle ABC,

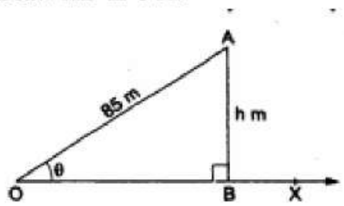
$\tan\angle ACB=\frac{AB}{BC}=\frac{\sqrt{3}}{1}$

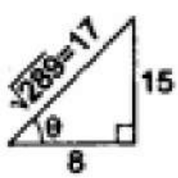
$\angle ACB=60^\circ$

Hence, the angle of elevation of the sun at that time is 60^o

OR

Let OX be the horizontal ground and let A be the position of the kite. Let O be the position of the observer and OA be the string. Draw $AB\perp OX$.





Then, $\angle BOA=\theta$ such that $\tan\theta=\frac{15}{8}$, $OA=85m$ and $\angle OBA=90^\circ$.

Let AB = h m.

From right ΔOBA, we have

$\frac{AB}{OA}=\sin\theta=\frac{15}{17}\ \left[\because\tan\theta=\frac{15}{8}\Rightarrow\sin\theta=\frac{15}{17}\right]$

$\Rightarrow\frac{h}{85}=\frac{15}{17}\Rightarrow h=\frac{15}{17}\times 85=75.$

31.

Class Interval	Frequency(f_i)	Mid value x_i	$u_i=\frac{x_i-A}{h}=\frac{x_i-39}{6}$	$(f_i\times u_i)$
18 - 24	6	21	-3	-18
24 - 30	8	27	-2	-16
30 - 36	12	33	-1	-12
36 - 42	8	39 = A	0	0
42 - 48	4	45	1	4
48 - 54	2	51	2	4
	$\Sigma f_i=40$			$\Sigma(f_i\times u_i)$= -38

Thus, A = 39, h = 6 $\sum f_i=40$ and $\sum f_iu_i=-38$

Mean = $A+\left\{h\times\frac{\sum f_iu_i}{\sum f_i}\right\}$

$=39+\left\{6\times\frac{-38}{40}\right\}$

= 39 - 5.7

= 33.3

Section D

32. Let the number of rides Akhila had on Giant wheel be x and number of times Akhila played Hoopla be y.

Given, number of times she played Hoopla is half the number of rides she had on the Giant Wheel.

$\Rightarrow y = \frac{x}{2}$

$\Rightarrow 2y - x = 0$ ...(i)

For above equation, we have following table

x	0	2
$y = \frac{x}{2}$	0	1

Given, each ride on giant wheel costs Rs 3, and a game of Hoopla costs Rs 4 and she spent total Rs 20 in the fair.

⇒ 3x + 4y = 20

⇒ 3x + 4y - 20 = 0 ...(ii)

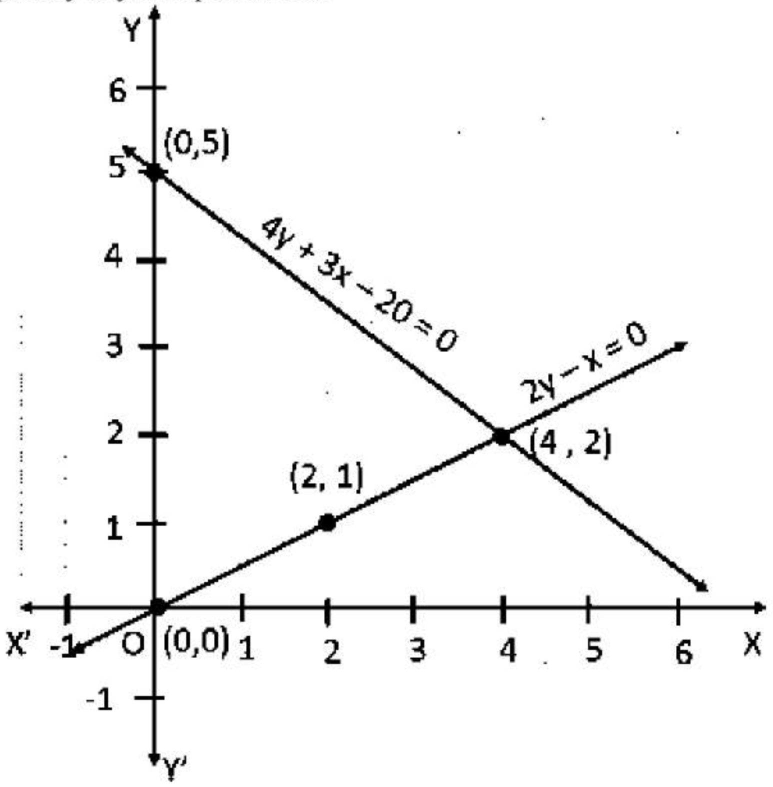
$\Rightarrow y = \frac{20-3x}{4}$

x	0	4
$y = \frac{20-3x}{4}$	5	2

Thus, algebraically the equations are represented as:

2y - x = 0 and 3x + 4y - 20 = 0

Graphically they are represented as:



OR

2x - y + 3 = 0

3x - 5y + 1 = 0

$2x - y = -3 \ldots\ldots\ldots (1)$

$3x - 5y = -1 \ldots\ldots (2)$

Multiplying eqn. (i) by 3 and (ii) by 2, and subtracting (ii)

$6x - 3y = -9$

$6x - 10y = -2$

$(-)\ (+)\ \ (+)$

$7y = 11$

$\Rightarrow y = \frac{11}{7}$

Substituting the value of y in ,eqn. (i)

2x - y = 3

2 x = y + 3

$2x = 3 + \frac{11}{7}$

$2x = \frac{21 + 11}{7} \Rightarrow 2x = 32/7$

$\Rightarrow x = \frac{32}{14}$

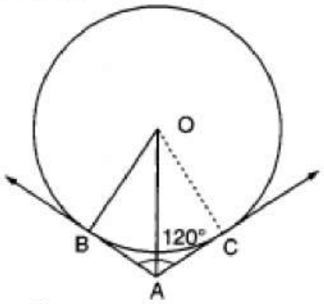
$or\ x = \frac{16}{7}$

- 4 - y + 3 = 0

or, - y - 1 = 0

y = -1

Hence, x=-2

33. 

In Δ's OAB and OAC, we have,

$\angle OBA = \angle OCA = 90^\circ$

OA = OA [Common]

AB = AC [∵ Tangents from an external point are equal in length]

Therefore, by RHS congruence criterion, we have,

$\Delta OBA \cong \Delta OCA$

$\Rightarrow \angle OAB = \angle OAC$ [By c.p.c.t.]

$\therefore \angle OAB = \angle OAC = \frac{1}{2}\angle BAC$

$= \frac{1}{2} \times 120^\circ = 60^\circ$

$\Rightarrow \angle OAB = \angle OAC = 60^\circ$

In ΔOBA, we have,

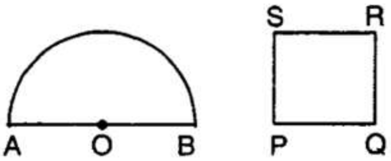
$\cos B = \frac{AB}{OA}$

$\Rightarrow \cos 60^\circ = \frac{AB}{OA}$

$\Rightarrow \frac{1}{2} = \frac{AB}{OA}$

$\Rightarrow$ OA = 2AB

Hence proved.

34. 

Let radius of semicircular region be r units.

Perimeter = 2r + πr

Let side of square be x units

Perimeter = 4x units.

A.T.Q, 4x = 2r + πr $\Rightarrow x = \frac{2r+\pi r}{4}$

Area of semicircle = $\frac{1}{2}\pi r^2$

Area of square = x^2

A.T.Q, $x^2 = \frac{1}{2}\pi r^2 + 4$

$\Rightarrow \left(\frac{2r+\pi r}{4}\right)^2 = \frac{1}{2}\pi r^2 + 4$

$\Rightarrow \frac{1}{16}\left(4r^2 + \pi^2 r^2 + 4\pi r^2\right) = \frac{1}{2}\pi r^2 + 4$

$\Rightarrow 4r^2 + \pi^2 r^2 + 4\pi r^2 = 8\pi r^2 + 64$

$\Rightarrow 4r^2 + \pi^2 r^2 - 4\pi r^2 = 64$

$\Rightarrow r^2\left(4 + \pi^2 - 4\pi\right) = 64$

$\Rightarrow r^2(\pi - 2)^2 = 64$

$\Rightarrow r = \sqrt{\frac{64}{(\pi-2)^2}}$

$\Rightarrow r = \frac{8}{\pi-2} = \frac{8}{\frac{22}{7}-2}$ = 7 cm

Perimeter of semicircle =$2 \times 7 + \frac{22}{7} \times 7$= 36 cm

Perimeter of square = 36 cm

Side of square = $\frac{36}{4}$= 9 cm

Area of square = 9$\times$ 9 = 81 cm^2

Area of semicircle = $\frac{\pi r^2}{2} = \frac{22}{2\times7} \times 7 \times 7$ = 77 cm^2

OR

We have to find upto three places of decimal the radius of the circle whose area is the sum of the areas of two triangles whose sides are 35, 53, 66 and 33, 56, 65 measured in centimetres.

For the first triangle, we have a = 35, b = 53 and c = 66.

$\therefore \quad s = \frac{a+b+c}{2} = \frac{35+53+66}{2} = 77\text{cm}$

Let Δ_1 be the area of the first triangle. Then,

$\Delta_1 = \sqrt{s(s-a)(s-b)(s-c)}$

$\Rightarrow \quad \Delta_1 = \sqrt{77(77-35)(77-53)(77-66)} = \sqrt{77 \times 42 \times 24 \times 11}$

$\Rightarrow \quad \Delta_1 = \sqrt{7 \times 11 \times 7 \times 6 \times 6 \times 4 \times 11}$= $\sqrt{7^2 \times 11^2 \times 6^2 \times 2^2} = 7 \times 11 \times 6 \times 2 = 924\text{cm}^2$ ...(i)

For the second triangle, we have a = 33,b = 56,c = 65

$\therefore \quad s = \frac{a+b+c}{2} = \frac{33+56+65}{2} = 77\text{cm}$

Let Δ_2 be the area of the second triangle. Then,

$\Delta_2 = \sqrt{s(s-a)(s-b)(s-c)}$

$\Rightarrow \quad \Delta_2 = \sqrt{77(77-33)(77-56)(77-65)}$

$\Rightarrow \quad \Delta_2 = \sqrt{77 \times 44 \times 21 \times 12}$= $\sqrt{7 \times 11 \times 4 \times 11 \times 3 \times 7 \times 3 \times 4}$= $\sqrt{7^2 \times 11^2 \times 4^2 \times 3^2}$

$\Rightarrow \quad \Delta_2 = 7 \times 11 \times 4 \times 3 = 924\text{cm}^2$

Let r be the radius of the circle. Then,

Area of the circle = Sum of the areas of two triangles

$\Rightarrow \quad \pi r^2 = \Delta_1 + \Delta_2$

$\Rightarrow \quad \pi r^2$ = 924 + 924

$\Rightarrow \quad \frac{22}{7} \times r^2 = 1848$

$\Rightarrow \quad r^2 = 1848 \times \frac{7}{22} = 3 \times 4 \times 7 \times 7 \Rightarrow r = \sqrt{3 \times 2^2 \times 7^2} = 2 \times 7 \times \sqrt{3} = 14\sqrt{3}\text{cm}$

35. No. of cards removed= 3 face cards of heart +3 face cards of diamond=6

Remaining cards =52-6=46

So total No.of events are n=46

(i) No. of red card left = 13-6=7 so m =7

so P(E)=$\frac{7}{46}$

(ii) No. of queen left = 4 - 2 queens of heart and diamond = 2

So m = 2

P (E) = $\frac{2}{46} = \frac{1}{23}$

(iii) Total No. of aces = 4 so m=4

P(E)=$\frac{4}{46} = \frac{2}{23}$

(iv) No.of face cards left= 12 - total face cards removed =12 - 6 = 6

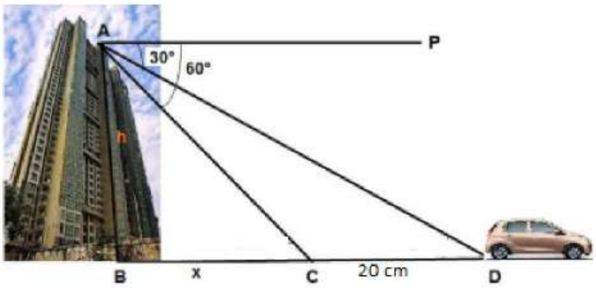
So m = 6

Hence P(E)=$\frac{6}{46} = \frac{3}{23}$

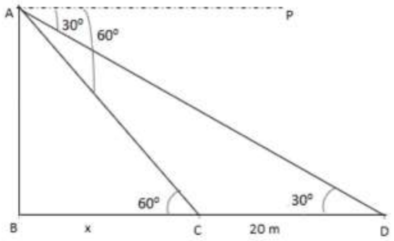
Section E

36. **Read the text carefully and answer the questions:**

Vijay lives in a flat in a multi-story building. Initially, his driving was rough so his father keeps eye on his driving. Once he drives from his house to Faridabad. His father was standing on the top of the building at point A as shown in the figure. At point C, the angle of depression of a car from the building was 60^o. After accelerating 20 m from point C, Vijay stops at point D to buy ice cream and the angle of depression changed to 30^o.



(i) The above figure can be redrawn as shown below:



From the figure,

let AB = h and BC = x

In △ABC,

$\tan 60 = \frac{AB}{BC} = \frac{h}{x}$

$\sqrt{3} = \frac{h}{x}$

$h = \sqrt{3}x$ ...(i)

In △ABD,

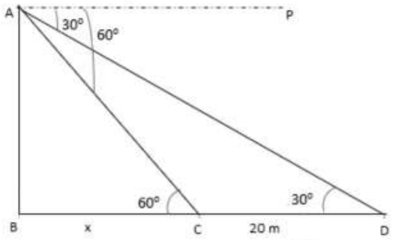
$\tan 30 = \frac{AB}{BD} = \frac{h}{x+20}$

$\frac{1}{\sqrt{3}} = \frac{\sqrt{3}x}{x+20}$ [using (i)]

x + 20 = 3x

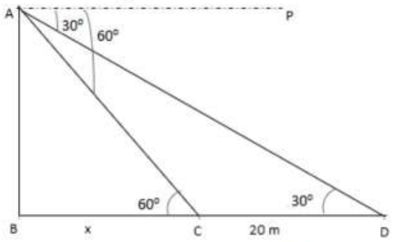
x = 10 m

(ii) The above figure can be redrawn as shown below:



Height of the building, $h = \sqrt{3}x = 10\sqrt{3} = 17.32$ m

(iii)The above figure can be redrawn as shown below:



Distance from top of the building to point D.

In △ABD

$\sin 30^o = \frac{AB}{AD}$

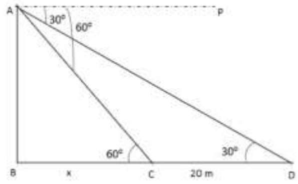
$\Rightarrow AD = \frac{AB}{\sin 30^0}$

$\Rightarrow AD = \frac{10\sqrt{3}}{\frac{1}{2}}$

$\Rightarrow$ AD = $20\sqrt{3}m$

OR

The above figure can be redrawn as shown below:



Distance from top of the building to point C is

In △ABC

$\sin 60^{o} = \frac{AB}{AC}$

$\Rightarrow AC = \frac{AB}{\sin 60^{0}}$

$\Rightarrow AC = \frac{10\sqrt{3}}{\frac{\sqrt{3}}{2}}$

$\Rightarrow$ AD = 20 m

37. **Read the text carefully and answer the questions:**

Deepa has to buy a scooty. She can buy scooty either making cashdown payment of ₹ 25,000 or by making 15 monthly instalments as below.

Ist month - ₹ 3425, IInd month - ₹ 3225, IIIrd month - ₹ 3025, IVth month - ₹ 2825 and so on

(i) 1st installment = ₹3425

2nd installment = ₹3225

3rd installment = ₹3025

and so on

Now, 3425, 3225, 3025, ... are in AP, with

a = 3425, d = 3225 - 3425 = -200

Now 6th installment = a_n = a + 5d = 3425 + 5(-200) = ₹2425

(ii) Total amount paid = $\frac{15}{2}(2a + 14d)$

$= \frac{15}{2}[2(3425) + 14(-200)] = \frac{15}{2}(6850 - 2800)$

$= \frac{15}{2}(4050)$ = ₹30375

(iii) $a_n = a + (n - 1)d$

$\Rightarrow a_{10} = 3425 + 9 \times (-200) = 1625$

$\Rightarrow a_{11} = 3425 + 10 \times (-200) = 1425$

$a_{10} + a_{11} = 1625 + 1425 = 3050$

OR

$a_n = a + (n - 1)d$ given $a_n = 2625$

$2625 = 3425 + (n - 1) \times - 200$

$\Rightarrow - 800 = (n - 1) \times - 200$

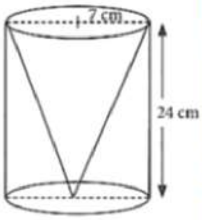
$\Rightarrow 4 = n - 1$

$\Rightarrow n = 5$

So, in 5th installment, she pays ₹2625.

38. **Read the text carefully and answer the questions:**

One day Vinod was going home from school, saw a carpenter working on wood. He found that he is carving out a cone of same height and same diameter from a cylinder. The height of the cylinder is 24 cm and base radius is 7 cm. While watching this, some questions came into Vinod's mind.



(i) Given height of cone = 24cm and radius of base = r = 7cm

Slant height of conical cavity,

$l = \sqrt{h^2 + r^2}$

$= \sqrt{(24)^2 + (7)^2} = \sqrt{576 + 49} = \sqrt{625}$ = 25 cm

(ii) we know that r = 7cm, l = 25 cm

Curved surface area of conical cavity = πrl

$= \frac{22}{7} \times 7 \times 25 = 550\ \text{cm}^2$

(iii) For cylinder height = h = 24cm, radius of base = r = 7cm

External curved surface area of cylinder

$= 2\pi rh = 2 \times \frac{22}{7} \times 7 \times 24 = 1056\ \text{cm}^2$

OR

Curved surface area of conical cavity = πrl

$= \frac{22}{7} \times 7 \times 25 = 550\ \text{cm}^2$

External curved surface area of cylinder

$= 2\pi rh = 2 \times \frac{22}{7} \times 7 \times 24 = 1056\ \text{cm}^2$

$\frac{curved\ surface\ area\ of\ cone}{curved\ surface\ area\ of\ cylinder} = \frac{550}{1056} = \frac{275}{528}$

hence required ratio = 275:528