Ans·1) c)

Ans·2) a)

Ans·3) b)

Ans·4) c)

Ans·5) a)

Ans·6) a)

Ans·7) b)

Ans·8) c)

Ans·9) b)

Ans·10) d)

Ans·11) a) and d)

Ans·12) c)

Ans·13) b)

Ans·14) a)

Ans·15) c)

Ans·16) a)

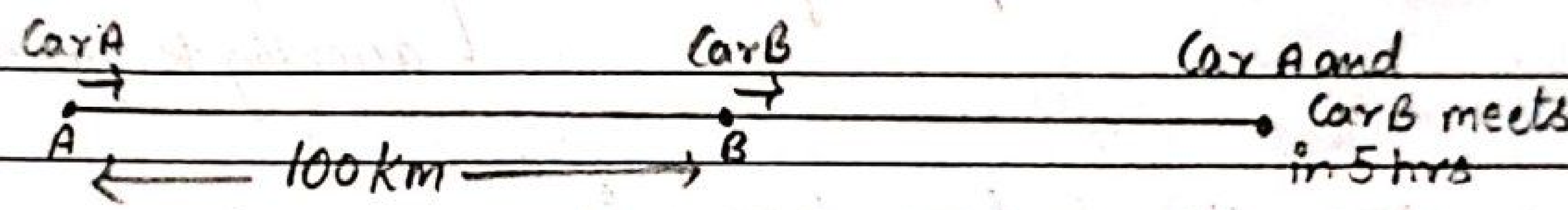
Ans·17) b)

Ans·18) a)

Ans·19) c)

Ans·20) a)

Ans·21)



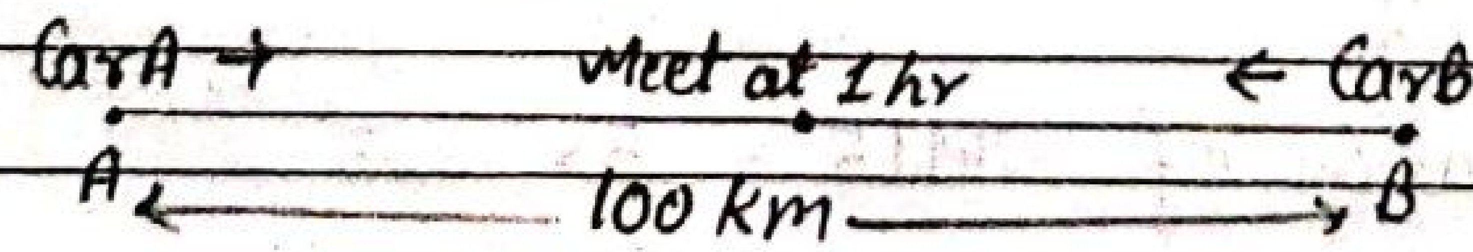
Case-I : If car moves in same direction

∴ By Relative Speed Concept

$$\text{Speed of A} - \text{Speed of B} = \frac{\text{Total distance apart}}{\text{Time at meets}}$$

$$\Rightarrow A - B = \frac{100}{5}$$

$$\Rightarrow \boxed{A - B = 20} \quad - (1)$$



Case-II : If car moves in opposite direction

∴ By Relative Speet Concept

$$\text{Speed of A} + \text{Speed of B} = \frac{\text{Distance apart}}{\text{Time at meets}}$$

$$\Rightarrow \boxed{A + B = 100} \quad - (2)$$

On Eliminating ② and ①

$$A+B=100$$
$$\oplus\ A-B=20$$
$$2A=120$$
$$\Rightarrow \boxed{A=60} \Rightarrow \text{Putting in ①}$$

4

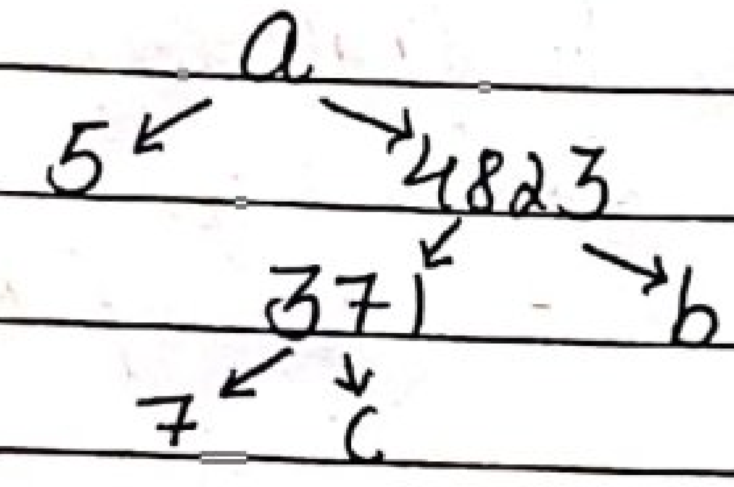
$\therefore A-B=20$

$\Rightarrow B = A-20 = 60-20$

$\Rightarrow \boxed{B=40}$

$\therefore$ Second car has speed of 40 km/h {Here, speed unit is according to question}

Ans 22) Here, the factor tree is



4

i) Value of a $= 5 \times 4823$
$= 24115$

ii) Value of b $= \frac{4823}{371}$
$= 13$

iii) Prime factorisation of 24115 $= 5 \times 4823$
$= 5 \times 13 \times 371$
$= 5 \times 13 \times 7 \times 53$
$= 5 \times 7 \times 13 \times 53$

$\left\{ \text{Here, value of } c = \frac{371}{7} = 53 \right\}$

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) ∵ Cards are from 10 to 74
∴ Total outcomes = $74 - 10 + 1 = 65$

∵ $P(E) = \frac{\text{favourable outcomes}}{\text{Total outcomes}}$

∴ $P(\text{even no.}) = \frac{33}{65}$

$P(\text{odd no.} < 30) = \frac{10}{65}$

$P(\text{prime no. between 50 and 74}) = \frac{6}{65}$

4

Q.24) Given: LCM = 14 x HCF and LCM + HCF = 600.
To find: Other no = ? if one no. = 280, {here LCM and HCF are for only two numbers}

Solution: ∵ LCM + HCF = 600
∴ 14HCF + HCF = 600 {as LCM = 14 HCF}
⇒ 15 HCF = 600
⇒ $\boxed{HCF = 40}$

∵ LCM = 14 x HCF
∴ LCM = 14 x 40
⇒ $\boxed{LCM = 560}$

2

∵ HCF x LCM = Product of two numbers
∴ 40 x 560 = 280 x x (let be other no.)
⇒ 560 = 7 x x
⇒ $\boxed{x = 80}$
∴ Other no. = 80

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Ans.25) $\because f(x) = 2x^2 - 4x + 5$

$\therefore \alpha + \beta = 4/2 = 2$ and $\alpha\beta = 5/2$

Now, (i) $(\alpha - \beta)^2 = (\alpha+\beta)^2 - 4\alpha\beta$

$= (2)^2 - 4(5/2)$

$= 4 - 10$

$= \boxed{-6}$

(ii) $\frac{1}{\alpha^2} + \frac{1}{\beta^2} = \frac{\beta^2 + \alpha^2}{(\alpha\beta)^2}$

$= \frac{(\alpha+\beta)^2 - 2\alpha\beta}{(\alpha\beta)^2}$

$= \frac{(2)^2 - 2(5/2)}{(5/2)^2}$

$= \frac{4-5}{25/4}$

$= \boxed{\frac{-4}{25}}$

2

Ans.26) Given: $\angle 1 = \angle 2$ and $\angle 3 = \angle 4$

2

To prove: $PT \times QR = PR \times ST$

Proof: $\because \angle 1 = \angle 2$ (given)

$\therefore \angle 1 + \angle QPT = \angle 2 + \angle QPT$ {as $\angle QPT$ is common angle}

$\Rightarrow \boxed{\angle SPT = \angle RPQ}$ — (1)

Now, In ΔSPT and ΔQPR

$\angle SPT = \angle QPR$ (from (1))

$\angle 3 = \angle 4$ (given)

$\therefore$ By AA similarity, $\Delta SPT \sim \Delta QPR$

By CPST, $\frac{ST}{QR} = \frac{PT}{PR}$

$\Rightarrow ST \times PR = PT \times QR$ proved

②

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Ans·27) Let, the point on y-axis be $(0,y)$

$\therefore$ ATQ, $A(0,y)$ is equidistant to $B(5,-2)$ and $C(-3,2)$

$\Rightarrow AB = AC$

$\Rightarrow AB^2 = AC^2$ (Square in both sides)

$\Rightarrow \left(\sqrt{(0-5)^2+(y+2)^2}\right)^2 = \left(\sqrt{(0+3)^2+(y-2)^2}\right)^2$ (using Distance formula)

$\Rightarrow 25 + \cancel{y^2} + \cancel{4} + 4y = 9 + \cancel{y^2} + \cancel{4} - 4y$

$\Rightarrow 16 = -8y$

$\Rightarrow \boxed{y = -2}$

$\therefore$ Coordinates of A are $(0,-2)$

2

Ans·28) $\because$ Two dices are thrown

$\therefore$ Total outcomes = 36

$P(E) = \frac{\text{No. of fav...}}{\text{Total outcomes}}$

1,1	1,2	1,3	1,4	1,5	1,6
2,1	2,2	2,3	2,4	2,5	2,6
3,1	3,2	3,3	3,4	3,5	3,6
4,1	4,2	4,3	4,4	4,5	4,6
5,1	5,2	5,3	5,4	5,5	5,6
6,1	6,2	6,3	6,4	6,5	6,1

i) $P(\text{sum} < 7) = \boxed{\frac{15}{36}}$

2

ii) $P(\text{product} < 16) = \boxed{\frac{25}{36}}$

Ans·29) Class	0-10	10-20	20-30	30-40	40-50	50-60	$h=10$
Cf	50	46	40	20(f)	10	3	~~$n/2=25$~~
f_i	4	6	20(f)	10	7	3	$\Sigma f_i = 50$
Cf(new)	4	10 (cf)	30	40	47	50	$n/2 = 25$

$\because$ Median Class is 20 - 30

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$\therefore$ Median $= l + \dfrac{(n/2 - cf)}{f} \times h$

$= 20 + \dfrac{(25-10)}{20} \times 10$

$= 20 + 15/2$

$= \boxed{27.5}$

3

Ans. 30)

Class	f_i	x_i	d_i	$f_i d_i$
25-30	14	27.5	-15	-210
30-35	22	32.5	-10	-220
35-40	16	37.5	-5	-80
40-45	6	42.5 = a	0	0
45-50	5	47.5	5	25
50-55	3	52.5	10	30
55-60	4	57.5	15	60
h = 5	$\Sigma f_i = 70$			$\Sigma f_i d_i = -395$

$\because$ Mean $(\bar{x}) = a + \dfrac{\Sigma f_i d_i}{\Sigma f_i}$

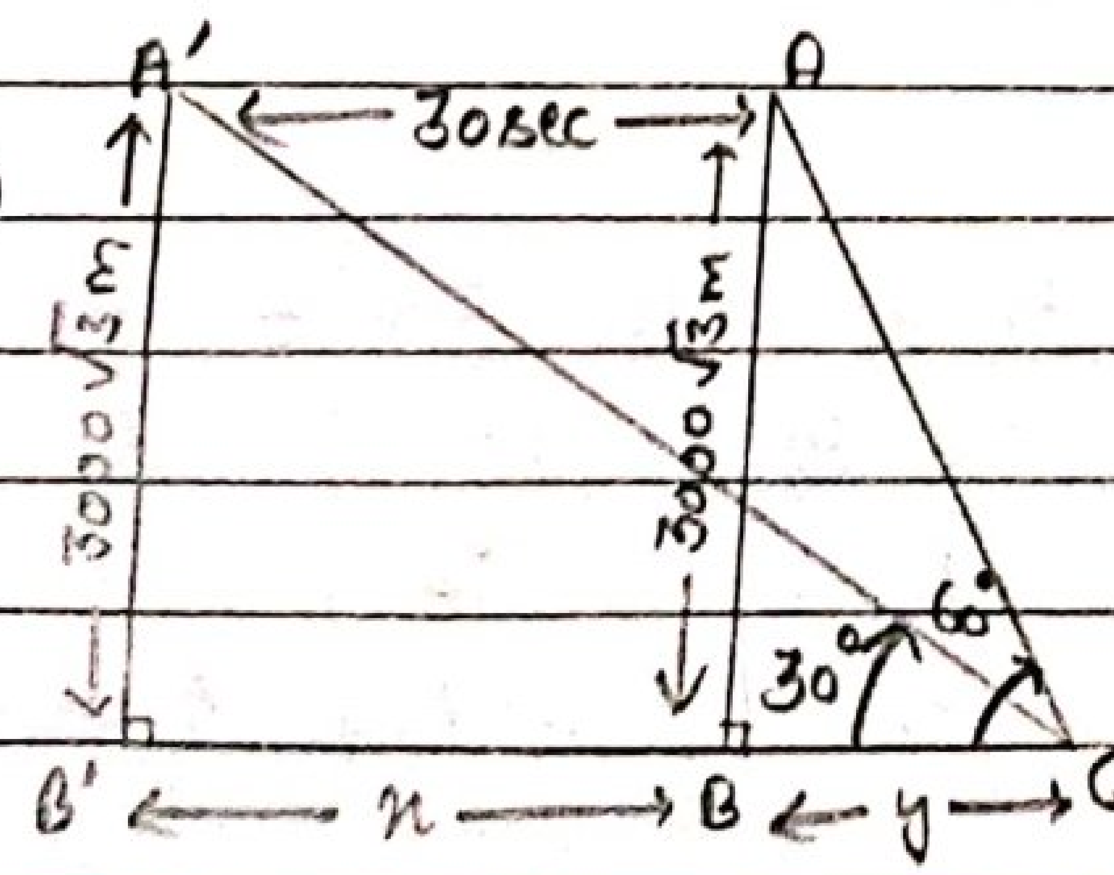
$= 42.5 - \dfrac{395}{70}$

$= 42.5 - 5.64$

$= \boxed{36.86}$

3

Ans. 31)



To find: Speed between A and A'.

Solution: In ΔABC, $\tan 60° = AB/BC$

$\Rightarrow \sqrt{3} = \dfrac{3000\sqrt{3}}{y}$

$\Rightarrow \boxed{y = 3000m}$

In $\Delta A'B'C$, $\tan 30° = A'B'/B'C$

$\Rightarrow 1/\sqrt{3} = \dfrac{3000\sqrt{3}}{x+y}$

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$\Rightarrow x + 3000 = 9000$

$\Rightarrow \boxed{x = 6000\,m}$

$\Rightarrow \boxed{B'B = 6000m}$

i.e. Distance between A and A' = 6000m

3

$\therefore$ Speed $= \frac{\text{Distance}}{\text{Time}} = \frac{6000}{30} = \boxed{200\,m/s}$

Ans.3) To prove: $\frac{\tan A}{1-\cot A} + \frac{\cot A}{1-\tan A} = 1 + \tan A + \cot A$

Proof: LHS $= \frac{\tan A}{1-\cot A} + \frac{\cot A}{1-\tan A}$

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

$= \frac{\sin A/\cos A}{\frac{\sin A-\cos A}{\sin A}} + \frac{\cos A/\sin A}{\frac{\cos A-\sin A}{\cos A}}$

$= \frac{\sin^2 A}{\cos A(\sin A-\cos A)} + \frac{\cos^2 A}{\sin A(\cos A-\sin A)}$

$= \frac{\sin^2 A}{\cos A(\sin A-\cos A)} - \frac{\cos^2 A}{\sin A\,\cancel{(\cos}\,(\sin A-\cos A)}$

$= \frac{\sin^3 A - \cos^3 A}{(\sin A-\cos A)\sin A\cos A}$

3

$= \frac{\cancel{(\sin A-\cos A)}(\sin^2 A+\cos^2 A+\sin A\cos A)}{\cancel{(\sin A-\cos A)}\sin A\cos A}$

$= \frac{\sin^2 A+\cos^2 A+\cos A\sin A}{\sin A\cos A}$

$= \frac{\sin^2 A}{\sin A\cos A} + \frac{\cos^2 A}{\sin A\cos A} + \frac{\cancel{\cos A\sin A}}{\cancel{\cos A\sin A}}$

$= \tan A + \cot A + 1$

$=$ RHS

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Ans 33 a) $\sec^2\theta - \frac{\sin^2\theta - 2\sin^4\theta}{2\cos^4\theta - \cos^2\theta} = 1$: To prove

Proof: $LHS = \sec^2\theta - \frac{\sin^2\theta - 2\sin^4\theta}{2\cos^4\theta - \cos^2\theta}$

$= \sec^2\theta - \frac{\sin^2\theta(1-2\sin^2\theta)}{\cos^2\theta(2\cos^2\theta-1)}$

$= \sec^2\theta - \frac{\sin^2\theta[1-2(1-\cos^2\theta)]}{\cos^2\theta(2\cos^2\theta-1)}$

$= \sec^2\theta - \tan^2\theta\frac{(1-2+2\cos^2\theta)}{(2\cos^2\theta-1)}$

$= \sec^2\theta - \tan^2\theta\frac{\cancel{(2\cos^2\theta-1)}}{\cancel{(2\cos^2\theta-1)}}$

$= \sec^2\theta - \tan^2\theta$

$= 1$

$= RHS$

3

Ans 34) Let, $\sqrt{5}$ be rational

$\therefore \sqrt{5} = \frac{p}{q}$ (where, p and q are co-prime and $q \neq 0$)

$\Rightarrow \boxed{5q^2 = p^2}$ — ① (square in both sides)

By fundamental theorem of Arithematic,

$\boxed{p \text{ is divisible by } 5}$ — ②

$\Rightarrow \boxed{p = 5r}$ — ③ {for some integer 'r'}

Putting ③ in ①

$\Rightarrow 5q^2 = (5r)^2$

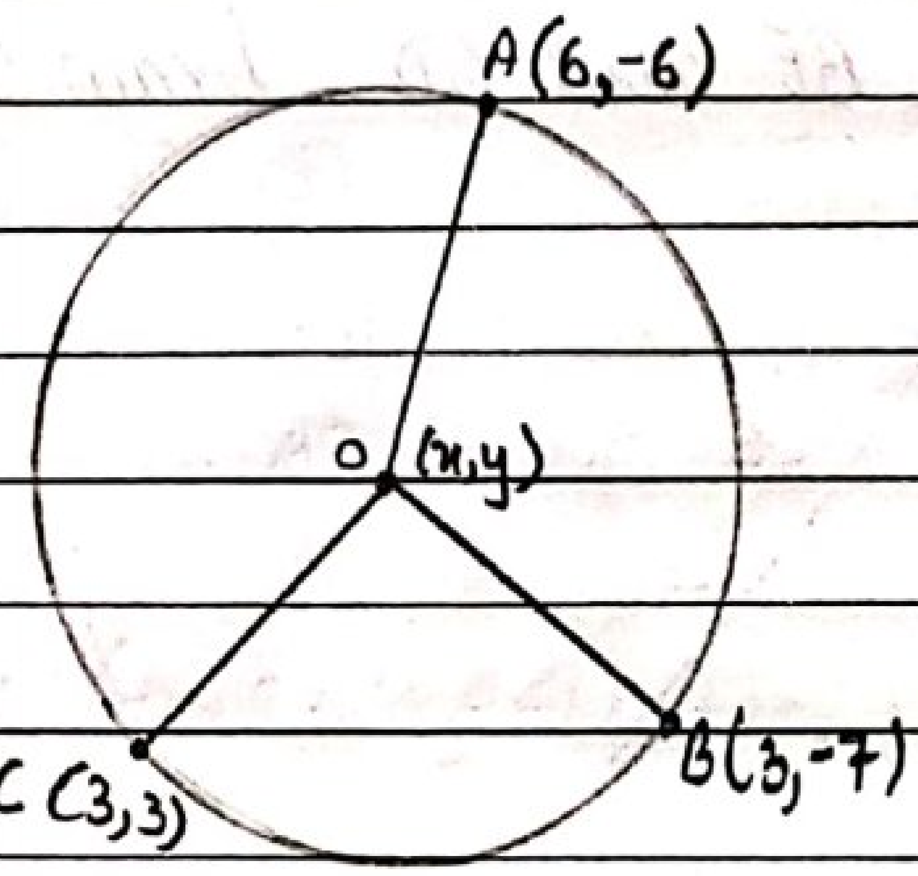
$\Rightarrow 5q^2 = 25r^2$

$\Rightarrow \boxed{q^2 = 5r^2}$

By fundamental theorem of Arithematic, $\boxed{q \text{ is divisible by } 5}$ - ④

from ② and ④, we get that atleast 5 is common factor of p and q which contradict the fact that p and q are co-prime.
Here, this contradiction happens because of our wrong assumption.
$\therefore \sqrt{5}$ is irrational number.

Ans. 35)



$\because$ A, B, C are on circle
$\therefore$ $OA = OB = OC$ (radii)
$\Rightarrow \underbrace{OA^2 = OB^2}_{\text{I-part}} \underbrace{= OC^2}_{\text{II-part}}$

Solving II-part, $OB^2 = OC^2$

$\Rightarrow \left[\sqrt{(x-3)^2 + (y+7)^2}\right]^2 = \left[\sqrt{(x-3)^2 + (y-3)^2}\right]^2$

$\Rightarrow \cancel{(x-3)^2} + \cancel{y^2} + 49 + 14y = \cancel{(x-3)^2} + \cancel{y^2} + 9 - 6y$

$\Rightarrow 40 = -20y$

$\Rightarrow \boxed{y = -2}$ - ①

Solving I-part, $OA^2 = OB^2$

$\Rightarrow \left(\sqrt{(x-6)^2 + (y+6)^2}\right)^2 = \left(\sqrt{(x-3)^2 + (y+7)^2}\right)^2$

$\Rightarrow (x-6)^2 + (4)^2 = (x-3)^2 + (5)^2$ (using ①)

$\Rightarrow \cancel{x^2} + 36 - 12x + 16 = \cancel{x^2} + 9 - 6x + 25$

S

~~$\Rightarrow 52 - 12y = -6y$~~

$\Rightarrow 52 - 12x = -6x + 34$

$\Rightarrow 18 = 6x$

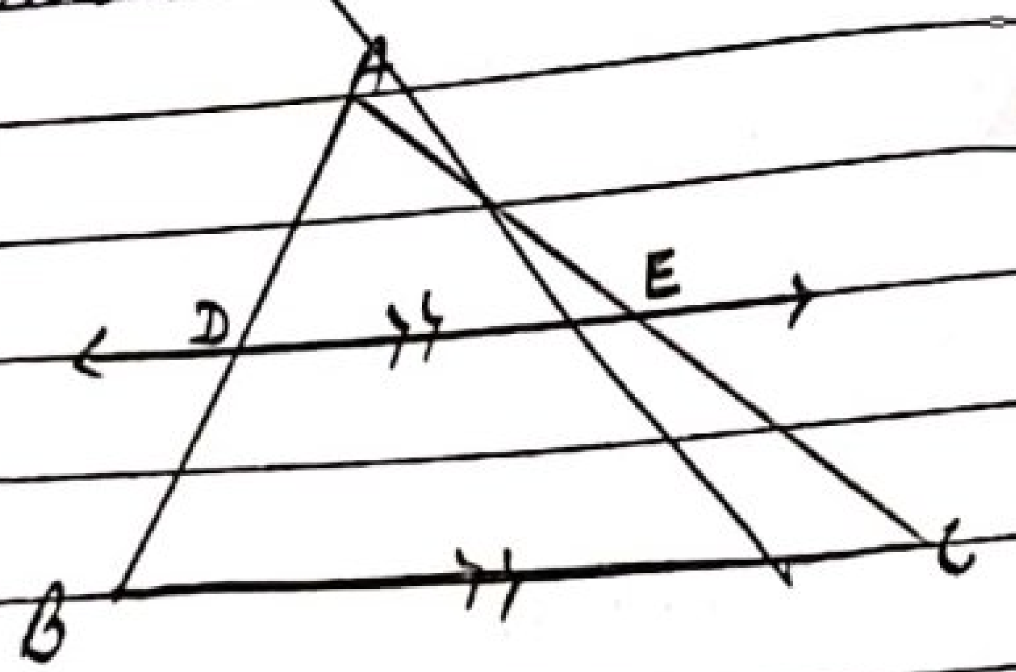
$\Rightarrow \boxed{x = 3}$

$\therefore$ Coordinates of centre 'O' are (x, y) i.e, $(3, -2)$

Ans. 36) Given: $DE \parallel BC$

To prove: $\frac{AD}{BD} = \frac{AE}{CE}$

Construction: Join BE and CD. Draw $DM \perp AC$ and $EN \perp AB$

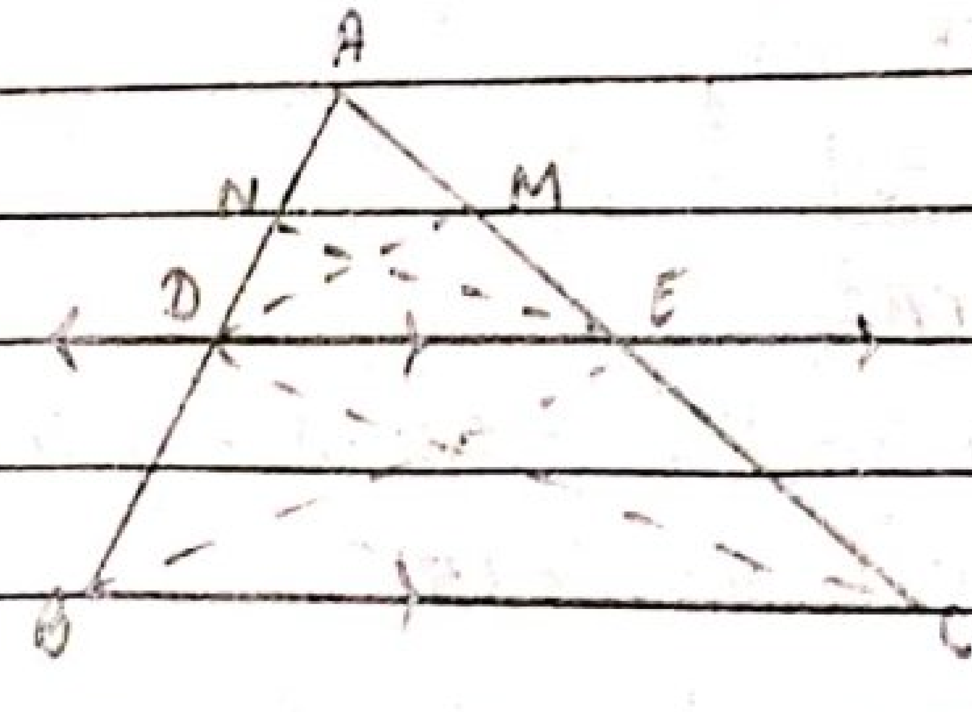


Ans. 36) If a line drawn parallel to any one side of a triangle to intersect other two sides at distinct points, then the sides divide in same ratio.

Given: $DE \parallel BC$

To prove: $\frac{AD}{BD} = \frac{AE}{EC}$

Construction: Join BE and CD. Draw $DM \perp AC$ and $EN \perp AB$



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Proof : $\frac{Ar(\Delta ADE)}{Ar(\Delta BDE)} = \frac{1/2 \times AD \times EN}{1/2 \times BD \times EN} = \frac{AD}{BD}$ - ①

$\frac{Ar(\Delta ADE)}{Ar(\Delta CED)} = \frac{1/2 \times AE \times DM}{1/2 \times CE \times DM} = \frac{AE}{EC}$ - ②

$\because$ ΔBDE and ΔCED are on same base and between same parallel lines

$\therefore$ $Ar(\Delta BDE) = Ar(\Delta CED)$ - ③

from ①, ②, ③

$$\frac{AD}{BD} = \frac{AE}{CE}$$

S

Ans:37) a) To prove : $(\tan\theta + \sec\theta - 1)(\tan\theta + \sec\theta + 1) = \frac{2\sin\theta}{1-\sin\theta}$

Proof: LHS $= (\tan\theta + \sec\theta - 1)(\tan\theta + \sec\theta + 1)$

$$= \left(\frac{\sin\theta}{\cos\theta} + \frac{1}{\cos\theta} - 1\right)\left(\frac{\sin\theta}{\cos\theta} + \frac{1}{\cos\theta} + 1\right)$$

$$= \frac{(\sin\theta - \cos\theta + 1)}{\cos\theta}\frac{(\sin\theta + \cos\theta + 1)}{\cos\theta}$$

$$= \frac{(\sin\theta + 1 - \cos\theta)}{\cos\theta}\frac{(\sin\theta + 1 + \cos\theta)}{\cos\theta}$$

$$= \frac{(\sin\theta + 1)^2 - (\cos\theta)^2}{\cos^2\theta \cancel{\sin\theta}}$$

$$= \frac{\sin^2\theta + 1 + 2\sin\theta - \cos^2\theta}{\cos^2\theta \cancel{\sin\theta}}$$

$$= \frac{\sin^2\theta + 2\sin\theta + 1 - \cos^2\theta}{\cos^2\theta \cancel{\sin\theta}}$$

$$= \frac{2\sin^2\theta + 2\sin\theta}{\cos^2\theta \cancel{\sin\theta}}$$

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$= \frac{2\sin\theta(1+\sin\theta)}{1-\sin^2\theta}$

$= \frac{2\sin\theta(1+\cancel{\sin\theta})}{(1-\sin\theta)(1+\cancel{\sin\theta})}$

$= \frac{2\sin\theta}{1-\sin\theta}$

$= RHS$

b) $\because \sec\theta = x + \frac{1}{4x}$

$\therefore \sec^2\theta = \left(x+\frac{1}{4x}\right)^2$ (square on both sides)

$\Rightarrow 1+\tan^2\theta = x^2 + \frac{1}{16x^2} + 2(x)\left(\frac{1}{4x}\right)$

$\Rightarrow \tan^2\theta = x^2 + \frac{1}{16x^2} + \frac{1}{2} - 1$

$\Rightarrow \tan^2\theta = x^2 + \frac{1}{16x^2} - \frac{1}{2}$

$\Rightarrow \tan^2\theta = x^2 + \frac{1}{16x^2} - 2(x)\left(\frac{1}{4x}\right)$

$\Rightarrow \tan^2\theta = \left(x-\frac{1}{4x}\right)^2$

$\Rightarrow \tan\theta = \pm\left(x-\frac{1}{4x}\right)$

Now, $\sec\theta + \tan\theta = x+\frac{1}{4x} + x - \frac{1}{4x}$ $\left\{\text{Here, } \tan\theta = x-\frac{1}{4x}\right\}$

$\Rightarrow \boxed{\sec\theta + \tan\theta = 2x}$

$\sec\theta + \tan\theta = x+\frac{1}{4x} - x + \frac{1}{4x}$ $\left\{\text{Here, } \tan\theta = -x+\frac{1}{4x}\right\}$

$\Rightarrow \boxed{\sec\theta + \tan\theta = \frac{1}{2x}}$

Ans.38) ∵ Equation are:

$x-y+1=0$

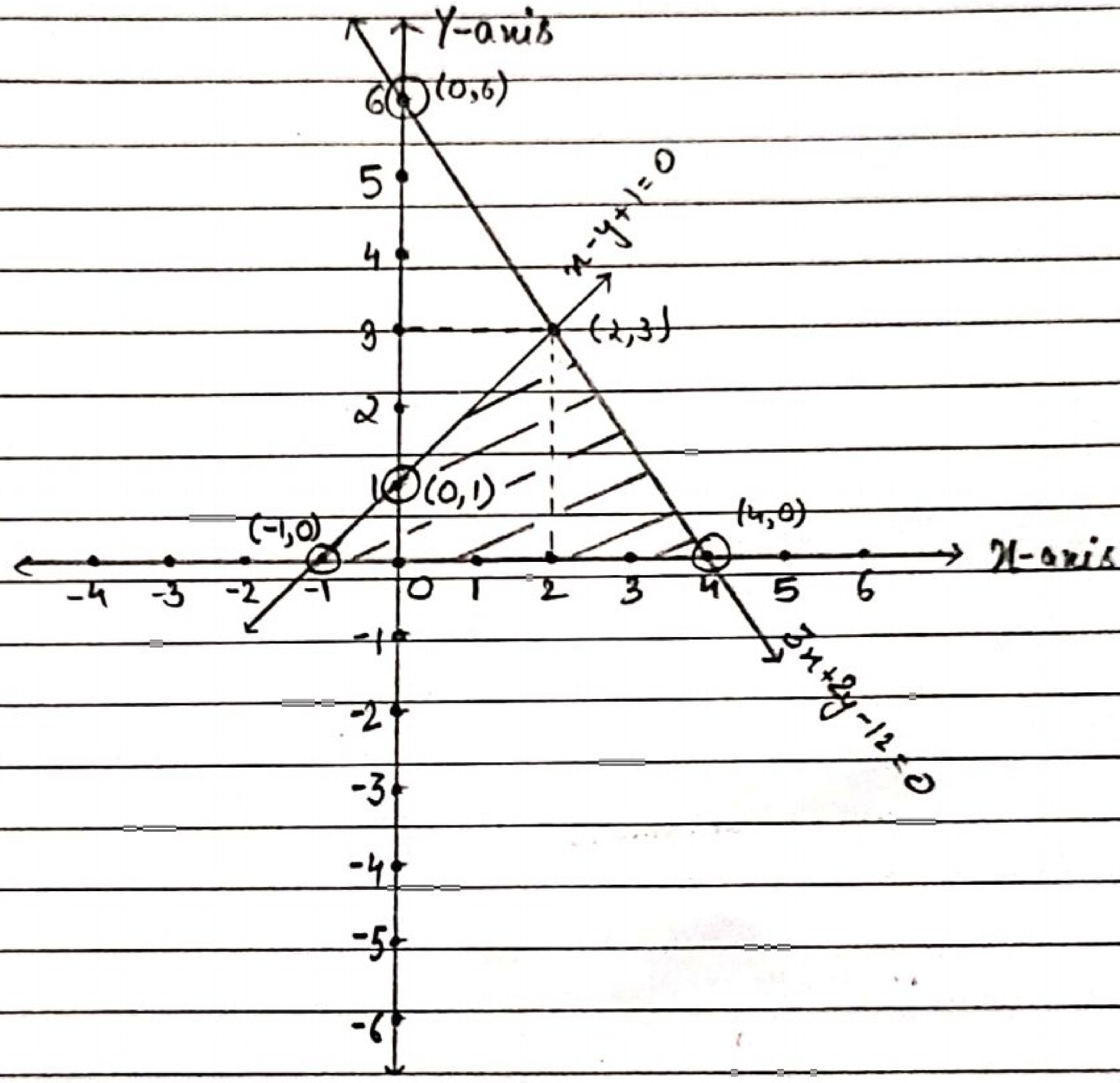
x	-1	0
y	0	1

$\Rightarrow (-1,0), (0,1)$

$3x+2y-12=0$

x	4	0
y	0	6

$\Rightarrow (4,0), (0,6)$



Coordinates of vertice of Δ formed by x-axis are (2,3), (4,0), (-1,0)

Area of Δ formed $= \frac{1}{2} \times 5 \times 3$

$= 7.5$ sq. units

S