FA – II
Class – X
Mathematics

Ch : Linear Equation in two Variables

Ex. 3.4

1 By Elimination method.

$x+y=5$ —① , $2x-3y=4$ —②.

$3x+3y=15$, $2x-3y=4$.

$5x=19$, $x=\frac{19}{5}$.

On putting $x=\frac{19}{5}$ in —①

$\frac{19}{5}+y=5$ $\quad y=5-\frac{19}{5}$

$y=6/5$, $x=\frac{19}{5}$.

2 (I) Let the fraction by x/y.

New Fraction $=\frac{x+1}{y-1}$.

According to Condition :

$\frac{x+1}{y-1}=1$ $\quad x-y=-2$. —(1).

II.

New fraction $=\frac{x}{y+1}$

According to Condition :

$\frac{x}{y+1}=\frac{1}{2}$ $\quad 2x-y=1$ —②

From ① and ②

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

$x=3$. fraction $=3/5$.

$y=5$.

IV Let no. of ₹50 notes $= x$.
 " ₹100 notes $= y$.

$\therefore \quad x+y=25 \quad \text{—— (1)}$

And $\quad 50x+100y=2000$

$x+2y=40.$

$x+2y-(x+y)=40-25$

$y=15$

then $\quad x+15=25$

$x=10.$

Hence no. of ₹50 notes is 10 and no. of ₹100 notes is 15

Ex. 3.5

1 (i) $x-3y-3=0 \qquad a_1=1,\ b_1=-3 \quad c_1=-3$

$3x-9y-2=0. \qquad a_2=3,\ b_2=-9 \quad c_2=-2$

$\therefore \quad \frac{a_1}{a_2}=\frac{1}{3},\quad \frac{b_1}{b_2}=\frac{1}{3} \quad \frac{c_1}{c_2}=\frac{3}{2}$

Thus $\frac{a_1}{a_2}=\frac{b_1}{b_2}\neq\frac{c_1}{c_2}$

$\therefore$ pair of L. Equation has no solution.

(III) $3x-5y=20$

$6x-10y=40.$

Compare.

$\therefore \quad a_1=3 \quad b_1=-5,\quad c_1=-20$

$a_2=6,\quad b_2=-10,\quad c_2=-40.$

$\frac{3}{6}=\frac{-5}{-10}=\frac{-20}{-40},\quad \frac{1}{2}=\frac{1}{2}=\frac{1}{2},\quad \frac{a_1}{a_2}=\frac{b_1}{b_2}=\frac{c_1}{c_2}$

$\therefore$ It has infinitely many solution.

3 $8x+5y=9, \quad 3x+2y=4.$

$$\frac{x}{[5(-4)-(2)(-9)]} = \frac{y}{-9\times 3 - -4\times 8} = \frac{1}{8\times 2 - 3\times 5}$$

$$\frac{x}{-20+18} = \frac{y}{-27+32} = \frac{1}{16-15}$$

$$\frac{x}{-2} = \frac{y}{5} = \frac{1}{1}$$

$$\frac{x}{-2} = \frac{1}{1} \qquad x=-2 \text{ and } y=5.$$

4(i) Let fixed hostel charge = ₹ y.
cost of food / day = x.

$20x+y=1000$
$26x+y=1180$

$26x-20x = 1180-1000$
$6x = 180$
$x = 30.$

now $20\times 30 + y = 1000$
$y = 1000 - 20\times 30 = 400.$

∴ monthly Charge = ₹ 400.
Cost of food = ₹ 30 /day.

Ex. 3.6

1(i) $\frac{1}{2x} + \frac{1}{3y} = 2 \qquad \frac{1}{3x} + \frac{1}{2y} = \frac{13}{6}$

put $\frac{1}{x} = u$ $\quad \frac{1}{y} = v$

$\therefore \frac{1}{2}u + \frac{1}{3}v = 2$, $\frac{1}{3}u + \frac{1}{2}v = \frac{13}{6}$.

$\therefore$ $3u + 2v = 12$ —— ① $\times 3$

$2u + 3v = 13$ —— ② $\times 2$

$\therefore$ $9u - 4u = 36 - 26$

$5u = 10$

$u = 2$.

put $u = 2$ in —— (1).

$3 \times 2 + 2v = 12$

$2v = 12 - 6$

$v = 3$.

If $u = 2$. then by $u = \frac{1}{x} \Rightarrow x = \frac{1}{2}$.

If $v = 3$ $\quad v = \frac{1}{y} \quad y = \frac{1}{3}$.

$\therefore x = \frac{1}{2}$ and $y = \frac{1}{3}$.

(III). $\frac{4}{x} + 3y = 14$, $\frac{3}{x} - 4y = 23$.

$\frac{1}{x} = X$, $\therefore$ $4X + 3y = 14$ —— ① $\times 4$

$3X - 4y = 23$ —— ② . 3

$16X + 9X = 4 \times 14 + 3 \times 23$

$25X = 125$

$X = 5$.

$\frac{1}{x} = X \quad \frac{1}{x} = 5$, $x = \frac{1}{5}$.

put $x = 5$ in —— (1).

$4 \times 5 + 3y = 14$

$3y = 14 - 20$, $3y = -6$, $y = -2$

$x = 1/5$ and $y = -2$.

ch: Triangles.

Exercise - 4.2

1 (i) Given: $AD = 1.5cm$, $DB = 3cm$, $AE = 1cm$

$DE \parallel BC$

$\Rightarrow \frac{AD}{DB} = \frac{AE}{EC}$ (By BPT)

$= \frac{1.5}{3} = \frac{1}{EC}$ $EC = \frac{3}{1.5} = 2cm$.

(ii) $AE = 1.8cm$, $EC = 5.4cm$.

$DB = 7.2cm$ $DE \parallel BC$, $\frac{AD}{DB} = \frac{AE}{EC}$ (By BPT)

$\frac{AD}{7.2} = \frac{1.8}{5.4}$ $AD = \frac{1.8 \times 7.2}{5.4} = 2.4cm$.

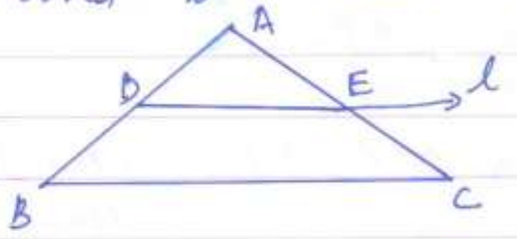
4 If $DE \parallel AC$ and If $DF \parallel AE$, then

$\frac{BE}{EC} = \frac{BD}{DA}$ (BPT) —— (1) $\frac{BF}{FE} = \frac{BD}{DA}$ (By BPT) —— (2)

from (1) and (2) $\frac{BF}{FE} = \frac{BE}{EC}$.

7 Consider ΔABC, in which D is the mid pt of AB. Then $\frac{AD}{DB} = 1$

Line l is drawn through D such that $l \parallel BC$ and it meet AC at E.



By BPT. $\frac{AD}{DB} = \frac{AE}{EC}$. $\frac{AE}{EC} = 1$. $AE = EC$.

So. E is the mid-point of AC. Hence a line drawn through the mid pt of one side of a triangle parallel to another side, bisects the third side.

Ex. 4.3

1 It is clear that DOB is a St line.

$\angle DOC + \angle COB = 180^\circ$ ($\angle$. pair)

$\angle DOC + 125^\circ = 180^\circ$

$\angle DOC = 180 - 125 = 55^\circ$

In ΔDOC, $\angle DCO + \angle CDO + \angle DOC = 180^\circ$

$\angle DCO + 70 + 55^\circ = 180^\circ$

$\angle DCO = 55^\circ$

$\Delta DCO \sim \Delta OBA$

$\angle OAB = \angle OCD = \angle DCO$

$\angle OAB = 55^\circ$, $\angle DOC = 55^\circ$, $\angle DCO = 55^\circ$, $\angle OAB = 55^\circ$

4 In fig $\angle 1 = \angle 2$ given.

$PR = PQ$

Given $\frac{QR}{QS} = \frac{QT}{PR}$

$\frac{QR}{QS} = \frac{QT}{PQ}$. [$PQ = PR$]

$\frac{QS}{QR} = \frac{PQ}{QT}$ [Taking Reciprocals]

In ΔPQS and ΔTQR, we have

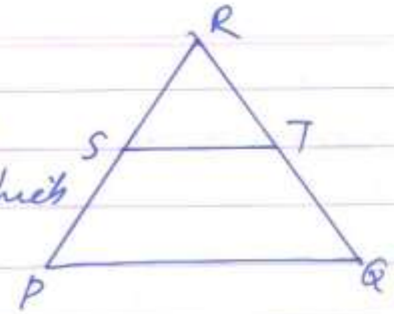
$\angle PQS = \angle TQR$. [each $\angle 1$]

and $\frac{QS}{QR} = \frac{QP}{QT}$

$\Delta PQS \sim \Delta TQR$. [SAS.].

Hence proved.

5 We have
ΔRPQ and
ΔRTS in which



$\angle RPQ = \angle RTS$ (given)
$\angle PRQ = \angle TRS$ (Common)
$\Delta RPQ \sim \Delta RTS$ (AA) Hence proved.

11 Given that ΔABC is an isosceles Δ; $AB = AC$.
$\angle C = \angle B$.
In ΔABD and ECF,
$\angle ABD = \angle ECF$.
$\angle ADB = \angle EFC$
$\Delta ABD \sim \Delta ECF$. (By AA Similarity).
Hence proved.

Ex. 4.4.

1 Given $\Delta ABC \sim \Delta DEF$.

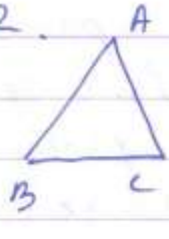
$$\frac{ar\ \Delta ABC}{ar\ \Delta DEF} = \frac{BC^2}{EF^2} \quad \text{(By property)}$$

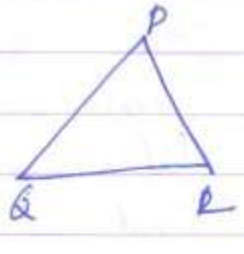
$$\frac{64}{121} = \frac{BC^2}{EF^2}, \quad \left(\frac{BC^2}{EF}\right)^2 = \left(\frac{8}{11}\right)^2$$

$$\frac{BC}{EF} = \frac{8}{11} \qquad BC = \frac{8}{11} \times EF$$

$$BC = \frac{8}{11} \times 15.4 = 11.2cm.$$

4 Let two ΔABC and ΔPQR.





$\Delta ABC \sim \Delta PQR$

$ar\ \Delta ABC = ar\ \Delta PQR$.

$$\frac{ar\ \Delta ABC}{ar\ \Delta PQR} = 1$$

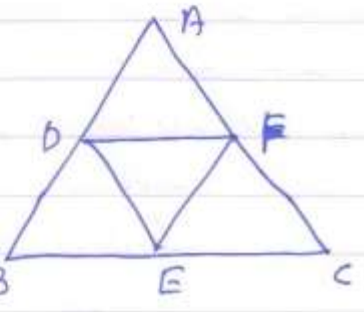
$$\therefore \frac{AB^2}{PQ^2} = \frac{BC^2}{QR^2} = \frac{CA^2}{PR^2} = 1$$

$\therefore AB = PQ, \quad BC = QR, \quad CA = PR$

$\therefore \Delta ABC \cong \Delta PQR$. (by SSS Congruence)

Hence proved.

5 Draw ΔABC, D, E, F are the mid pts of sides. Join D, E, F.



By mid pt theorem.

$DF = \frac{1}{2} BC$

$DE = \frac{1}{2} CA$

$EF = \frac{1}{2} AB$.

$$\frac{DF}{BC} = \frac{DE}{CA} = \frac{EF}{AB} = \frac{1}{2}$$

$\Delta DEF \sim \Delta CAB$.

$$\frac{ar(\Delta DEF)}{ar(\Delta CAB)} = \frac{DE^2}{CA^2}$$

$$\frac{\left(\frac{1}{2} CA\right)^2}{CA^2} = \frac{1}{4} \quad . \quad \frac{ar(\Delta DEF)}{ar\ \Delta ABC} = \frac{1}{4}.$$

$\therefore$ Hence the required ratio 1:4

6 State and prove Basic proportionaly theorem

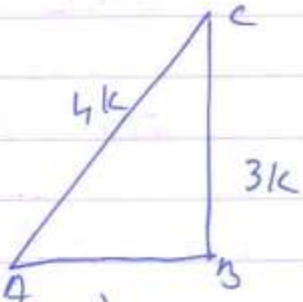
7 State and prove Area - theorem on Similar triangles

8 State and prove Basic proportionaly and pythagorous Theorem.

Ch: Introduction to Trigonometry

Exercise 5.1

3 $\sin A = \frac{3}{4}$ $\frac{P}{H} = \frac{3}{4}$.



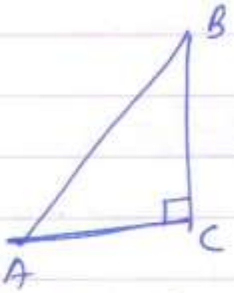
Let $BC = 3K$, $AC = 4k$.
In rt angled ΔABC.
$BC^2 + AB^2 = AC^2$ (By pytha. Theorem)

$(3k)^2 + AB^2 = (4k)^2$
$9k^2 + AB^2 = 16k^2$
$AB^2 = 7k^2$ $AB = k\sqrt{7}$.

$\cos A = \frac{B}{H} = \frac{k\sqrt{7}}{4k} = \frac{\sqrt{7}}{4}$

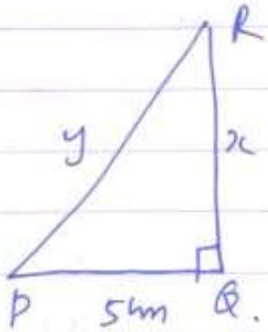
$\tan A = \frac{P}{B}$ $\frac{3k}{k\sqrt{7}} = \frac{3}{\sqrt{7}}$.

6 $\cos A = \cos B$.



$\frac{AC}{AB} = \frac{BC}{AB}$
$AC = BC$.
$\angle A = \angle B$. (By Isosceles prop)

10 Let $QR = x$ $PR = y$



$PR + QR = 25$
$y + x = 25$
$y = 25 - x$.

In rt angled ΔPQR.
$RQ^2 + PQ^2 = PR^2$

$$x^2+5^2=y^2$$
$$x^2+25=(25-x)^2$$
$$50x=600$$
$$x=12=QR.$$

$$\sin P=\frac{P}{H}=\frac{12}{13}$$

$$\sin\cos P=\frac{5}{13}$$

$$\tan P=\frac{12}{5}.$$

Ex. 5.2

3 $\tan(A+B)=\sqrt{3}$
$$\tan(A+B)=-\tan 60^\circ$$
$$A+B=60^\circ \quad , A=60-B.$$

$$\tan(A-B)=\frac{1}{\sqrt{3}}=-\tan 30^\circ.$$

$$A-B=30^\circ$$
$$60^\circ-B-B=30^\circ$$

$$30^\circ=2B \quad , B=15^\circ.$$
$$A=60^\circ-15^\circ=45^\circ$$
$$A=45^\circ \quad , B=15^\circ$$

2 (1) $$\frac{2\tan 30^\circ}{1+\tan^2 30^\circ}=\frac{2\left[\frac{1}{\sqrt{3}}\right]}{1+\left(\frac{1}{\sqrt{3}}\right)^2}=\frac{2/\sqrt{3}}{1+\frac{1}{3}}$$

$$=\frac{2/\sqrt{3}}{\frac{3+1}{3}}=\frac{2}{\sqrt{3}}\times\frac{3}{4}=\frac{\sqrt{3}}{2}=\sin 60^\circ$$

(ii) $\dfrac{1-\tan^2 45^\circ}{1+\tan^2 45} = \dfrac{1-(1)^2}{1+(1)^2} = \dfrac{1-1}{1+1} = \dfrac{0}{2} = 0$.

Ex. 5-3.

1 $\dfrac{\sin 18^\circ}{\cos 72^\circ} = \dfrac{\sin(90^\circ-72^\circ)}{\cos 72^\circ} = \dfrac{\cos 72^\circ}{\cos 72^\circ} = 1$.

2 (i) $\tan 48^\circ \tan 23^\circ \cot 48^\circ \cot 23^\circ$.

$\tan 48^\circ \tan 23^\circ \dfrac{1}{\tan 48^\circ} \dfrac{1}{\tan 23^\circ} = 1$

4 $\tan A = \cot B$

$\cot(90-A) = \cot B$

$90-A = B$

$90^\circ = A+B$

7 $\sin 67^\circ + \cos 75^\circ = \sin(90-23)^\circ + \cos(90-15^\circ)$

$= \cos 23^\circ + \sin 15^\circ$

Ex. 5-4

5 (i) $(\operatorname{cosec}\theta - \cot\theta)^2 = \left(\dfrac{1}{\sin\theta} - \dfrac{\cos\theta}{\sin\theta}\right)^2$

$= \left(\dfrac{1-\cos\theta}{\sin\theta}\right)^2 = \dfrac{(1-\cos\theta)^2}{\sin^2\theta}$

$= \dfrac{(1-\cos\theta)(\cancel{1+}\,1-\cos\theta)}{1-\cos^2\theta}$

$= \dfrac{1-\cos\theta}{1+\cos\theta}$ RHS.

(iv) $\dfrac{1+\sec A}{\sec A} = \dfrac{1+\dfrac{1}{\cos A}}{\dfrac{1}{\cos A}} = \dfrac{\dfrac{\cos A+1}{\cos A}}{\dfrac{1}{\cos A}}$

$$\frac{\cos A+1}{\cos A} \times \frac{\cos A}{1}$$

$$\cos A+1 = 1+\cos A$$

$$RHS = \frac{\sin^2 A}{1-\cos A} = \frac{1-\cos^2 A}{1-\cos A} = \frac{(1+\cos A)(1-\cos A)}{1-\cos A}$$

$$= 1+\cos A$$

$$LHS = RHS.$$

$\overline{VI}$ $$LHS = \sqrt{\frac{1+\sin A}{1-\sin A}} = \sqrt{\frac{1+\sin A}{1-\sin A} \times \frac{1+\sin A}{1+\sin A}}.$$

$$= \sqrt{\frac{(1+\sin A)^2}{1-\sin^2 A}} = \sqrt{\frac{(1+\sin A)^2}{\cos^2 A}}.$$

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

$$= \sec A + \tan A. = RHS.$$

$\overline{VII}$ $$LHS = \frac{\sin\theta - 2\sin^3\theta}{2\cos^3\theta - \cos\theta} = \frac{\sin\theta\,(1-2\sin^2\theta)}{\cos\theta\,(2\cos^2\theta-1)}$$

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

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

$$= \frac{\sin\theta\,(2\cos^2\theta-1)}{\cos\theta\,(2\cos^2\theta-1)} = \frac{\sin\theta}{\cos\theta} = \tan\theta.\ RHS.$$

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