Linear Equations in Two Variable

- Standard form
  $ax + by + c = 0$
  where $a \neq 0$, $b \neq 0$
  a, b, c are real no.

- Degree : 1

- Example :
  $-2x + 3y - 5 = 0$

→ Graphical Representation
Straight line

No. of Solutions : Infinite

Solution
(x, y) is solution of any $ax + by + c = 0$ if it gives.
LHS = RHS
Eg $(1, 4)$ is solution of $x + y = 5$

Table for consistency / Inconsistency conditions :-

Pair of linear eq. $a_1x + b_1y + c_1 = 0$, $a_2x + b_2y + c_2 = 0$	Algebric ~~Equations~~ conditions	Graphical Conditions
Consistent	Either $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$ Or, $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$	Straight lines in the graph be either intersecting or coincident.
Inconsistent	$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$	Straight lines in the graph be parallel to each other

Key Points -

(i) When the pair of linear equations $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ has $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ such equations are called dependent equations.

(ii) A pair of linear equation in two variables which has a solutions is called a consistent pair of linear equations

(iii) A pair of linear equations in two variable which has no solutions is called an inconsistent pair of linear equations.

Pair of lines	Algebric Conditions	Grabhical or Geometrical	Algebric Interpretation
$a_1x + b_1y + c_1 = 0$	$\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$	Intersecting lines	Exactly one Solution (unique)
$a_2x + b_2y + c_2 = 0$	$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$	Coincident lines	Infinite Solution
	$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$	Pair of parallel lines	No solution

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MCQs

1. The pair of equations $x + 2y = 5$ and $4x - 8y + 70 = 0$ have

a) Unique Solution
b) Exactly 2 Solutions
c) Infinitely many solutions
d) No solutions.

2. If a pair of linear Equation is consistent than linear are :-

a) parallel b) Always consistent c) Always intersecting
d) Intersecting or coincident

3. The pair of Equations $9x + 3y + 12 = 0$ and $18x + 6y + 26 = 0$ have

a) unique solution
b) Exactly 2 solutions
c) Infinitely Many solutions
d) No Solution

4. In lines $3x + 2ky - 2 = 0$ and $2x + 5y + 1 = 0$ are parallel, then $k =$:_____

a) 4/5
b) 15/4
c) 4/5
d) 5/4

5. In one equation of a pair of dependent linear equation is $-3x + 5y - 2 = 0$, the second equation will be:

a) $-6x + 10y - 4 = 0$
b) $-6x + 10y - 4 = 0$
c) $6x + 10y - 4 = 0$
d) $-6x + 10y + 4 = 0$

6. The solution of $x - y = 2$ and $x + y = 4$ is

a) 3 and 1 c) 5 and 1
b) 4 and 3 d) -1 and -3

7) The pair of equations $x = a$ and $y = b$ graphically represents lines which are ~~parallel~~

a) Parallel c) Coincident
b) Intersecting at (b, a) d) Intersecting at (a, b)

8) For what value of c will $cx - y = 2$ and $6x - 2y = 3$ will have ~~infi~~ infinitely many solution?

a) 3 c) -12
b) -3 d) No value.

9. Which of the following equation has a unique solution of $x = 2$ and $y = 3$

a) $x + y = -1$ and $2x - 3y + 5 = 0$
b) $2x + 5y + 11 = 0$ and $4x + 10y + 22 = 0$
c) $2x - y = 1$ and $3x - 2y = 0$
d) $x - 4y - 14 = 0$ and $5x - y - 13 = 0$

Do solution

10. If the pair of linear equations has a unique solution then the lines will

a) Coincide b) Intersect at one point
c) Be parallel to each other d) Parallel to x-axis.

Q. Find the two consecutive positive integers the sum of whose square is 365.

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Q3) Solve $2x^2 - 7x + 3 = 0$ by quadratic ~~Q~~ Formula.

Q4) ~~Fact~~ Find K if $Kx^2 + 4x + 1$ has real + equal roots.

Q5) If $x = 3$ is a root of quad. equation $x^2 - 2kx - 6 = 0$. Find k.

Q6) Find p, for which one root of the equation $px^2 - 14x + 8 = 0$ is 6 times the other.

Q7) Solve : (i) $6x^2 - 17x + 12 = 0$
(ii) $x^2 + 12x + 32 = 0$
(iii) $x^2 - 6 = 0$

Q. The diagonal of a ~~req~~ rectangular field is 60m more than shorter side. If the longer side is 30m more than the shorter side, Find the sides of the field.

1. $x + 2y = 5$

$4x - 8y + 70 = 0 \Rightarrow 4x - 8y = -70$

$a_1 = 1$, $a_2 = 4$ $\qquad \frac{a_1}{a_2} \neq \frac{b_1}{b_2} = \frac{1}{2} \neq \frac{-1}{2}$

$b_1 = 2$, $b_2 = -8$

Unique Solution Ans

2. dy Intersecting or coincident

3. $9x + 3y = -12$ $\qquad a_1 = 9 \quad b_1 = 3 \quad c_1 = -12$

$18x + 6y = -26$ $\qquad a_2 = 18 \quad b_2 = 6 \quad c_2 = -26$

$\frac{1}{2} = \frac{1}{2} \neq \frac{6}{13}$ $\qquad \frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$

No solution Ans

4. $3x + 3ky - 2 = 0$ $\qquad \frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$

$2x + 5y + 1 = 0$

$a_1 = 3$, $b_1 = 3k$ $\qquad \frac{3}{2} = \frac{3k}{5}$

$a_2 = 2$, $b_2 = 5$

$\Rightarrow 15 = 4k$

$\boxed{\frac{15}{4} = k}$

5. $-3x + 5y - 2 = 0$

$a_1x + b_1y + c_1 = 0$ $\qquad$ Let $k = 2$

$-3x + 5y + (-2) = 0$ $\qquad$ Multiply k will all coefficient

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$a_2 = -6$, $b_2 = 10$, $c_2 = -4$

Equation $= -6x + 10y - 4 = 0$

6. $x - y = 2$
$x + y = 4$
$2x = 6$
$x = 3$
$y = 1$

7. dy Intersecting at (a, b)

8. $cx - y = 2$
$6x - 2y = +3$

$a_1 = c$, $b_1 = -1$, $c_1 = 2$
$a_2 = 6$, $b_2 = -2$, $c_2 = 3$

$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2} \Rightarrow \frac{c}{6} = \frac{-1}{-2} = \frac{2}{3}$

from $\frac{a_1}{a_2} = \frac{b_1}{b_2}$, $c = 3$

$\frac{a_1}{a_2} = \frac{c_1}{c_2} = \frac{2}{3} \neq \frac{1}{2}$

No Value

9. a) Let $x = 2$, $y = -3$

$2(2) - (3) = 1$
$4 - 3 = 1$

$3x - 2y = 0$
$6 - 6 = 0$

10. ~~b) Tase~~ Intersect at a point

11. Let one be x

other $x+1$

$x^2 + (x+1)^2 = 365$

$x^2 + x^2 + 2x + 1 = 365$

$2x^2 + 2x = 364$

$x^2 + x = 182$

$x^2 + x - 182 = 0$

$(x-13)(x+14) = 0$

$x = 13, -14$

Neglect -14

$x = 13$, Two consecutive No. $-$ 13, 14

12. $2x^2 - 7x + 3 = 0$

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

$= a = 2, b = -7, c = 3$

$\Delta = b^2 - 4ac = 49 - 24 = 25$

$$x = \frac{-(-7) \pm \sqrt{25}}{2 \times 2}$$

$\frac{12}{4} = 3$, $\frac{2}{4} = \frac{1}{2}$

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13) $kx^2 + 4x + 1 = 0$ [Real & Equal Roots]

$D = 0$, $a = k$, $b = 4$, $c = 1$

$D = 16 - 4k = 0$

$k = 4$

14) Given, $x = 3$

$x^2 - 2kx - 6 = 0$

$9 - 6k - 6 = 0$

$3 - 6k = 0$

$k = \frac{1}{2}$

15) $px^2 - 14x + 8 =$ 6 times the other

first root $= \alpha$, Second root $= 6\alpha$

Sum of roots $= -\frac{b}{a}$, Product of root $= \frac{c}{a}$

$7\alpha = \frac{14}{p}$, $6\left[\frac{2}{p}\right]^2 = \frac{8}{p}$

$\frac{24}{p^2} = \frac{8}{p}$

$24 = 8p$

$3 = p$

16. a) $6x^2 - 17x + 12 = 0$

$6x^2 - 8x - 9x + 12 = 0$

$(6x^2 - 8x) - (9x - 12) = 0$

$2x[3x - 4] + 3[3x - 4] = 0$

$(3x - 4)[2x - 3] = 0$

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

b) $x^2 + 12 + 32 = 0$

$x^2 + 8x + 4x + 32 = 0$

$x(x+8) + 4[x+8] = 0$

$(x+4)(x+8) = 0$

$x = -4$

$x = -8$

c) $x^2 - 6 = 0$

$x^2 = 6$

$x = \pm\sqrt{6}$ [Square Root]

$x = \sqrt{6}$, $x = -\sqrt{6}$

17. Shorter side $= x$

Longer sider $= x + 30$

Diagonal $= x + 60$

$H^2 = B^2 + P^2$

$(x+60)^2 = x^2 + (x+30)^2$

$\rightarrow -x^2 + 600 + 2700 = 0$

$\rightarrow x^2 - 600 - 2700 = 0$

$x = 90$, -30

Shorter side = 90m, Longer side = 120m, Diagonal = 150m

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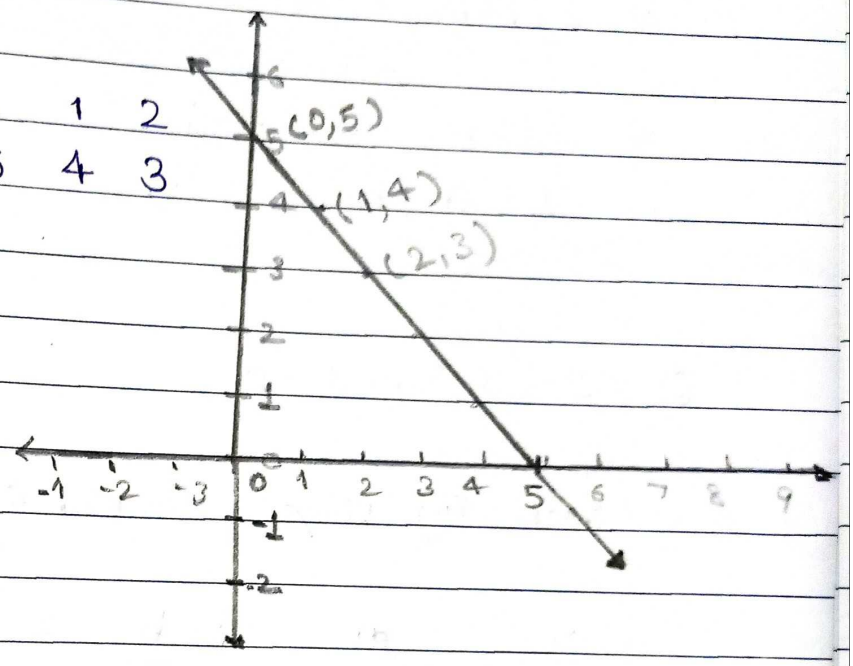
Exercise 3.1

4. Which of the following pairs of linear equation - - graphically

1. $x+y=5$, $2x+2y=10$

x	0	1	2
y	5	4	3

x	0	1	2
y	5	4	3



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

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

$\therefore$ It is coincident.

$\Rightarrow$ It is consistent.

Since, graphical representation of both equations is the same line.

$\Rightarrow$ It has infinite numbers of solutions.

2. $x-y-8=0$, $3x-3y-16=0$

$$\frac{a_1}{a_2} = \frac{1}{3} , \frac{b_1}{b_2} = \frac{1}{3} , \frac{c_1}{c_2} = \frac{-8}{-16}$$

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

$\therefore$ In consistent

5. Half the perimeter of a rectangular garden, whose length is 4m more than its width - - - - garden.

Let length = l m & breath be b m

$\frac{P}{2} = 36$

$= \frac{2(l+b)}{2} = 36$

$= l+b = 36$ --(i)

$l = 4+b$ --- (ii)

$l+b = 36$

$4+b+b = 36$

$2b = 32$

$\boxed{b = 16 \text{ m}}$

$l = 4+b$

$\boxed{l = 20 \text{ m}}$

6. $2x + 3y - 8 = 0$

(i) Intersecting lines: $6x + 7y - 8 = 0$

$\frac{a_1}{a_2} = \frac{2}{3}$; $\frac{b_1}{b_2} = \frac{3}{7}$

$\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$

(ii) Parallel lines

$6x + 9y + 1 = 0$

$\frac{a_1}{a_2} = \frac{2}{6} = \frac{1}{3}$

$\frac{b_1}{b_2} = \frac{3}{9} = \frac{1}{3}$

$\frac{c_1}{c_2} = \frac{-8}{1} = -8$

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

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(iii) Coincident lines

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2} \Rightarrow \frac{1}{2} = \frac{1}{2} = \frac{1}{2} = 0$$

$$= \frac{2}{4} = \frac{3}{6} = \frac{-8}{-16} = 0$$

$4x + 6y - 16 = 0$

7. Draw the graphs - - - triangular Region. Also find its Area.

$x - y + 1 = 0$

$x + 1 = y$

x	0	1	2
y	1	2	3

Put $x = 0$

$y = 0 + 1 = 1$

Put $x = 1$

$y = 1 + 1 = 2$

Put $x = 2$

$y = 2 + 1 = 3$

$3x + 2y - 12 = 0$

Put $x = 0$

$y = 6$

Put $x = 2$

$y = 3$

Put $x = 4$

$y = 0$

x	0	2	4
y	6	3	0

Area of $\Delta = \frac{1}{2} bh$

$\frac{1}{2} \times 5 \times 3$

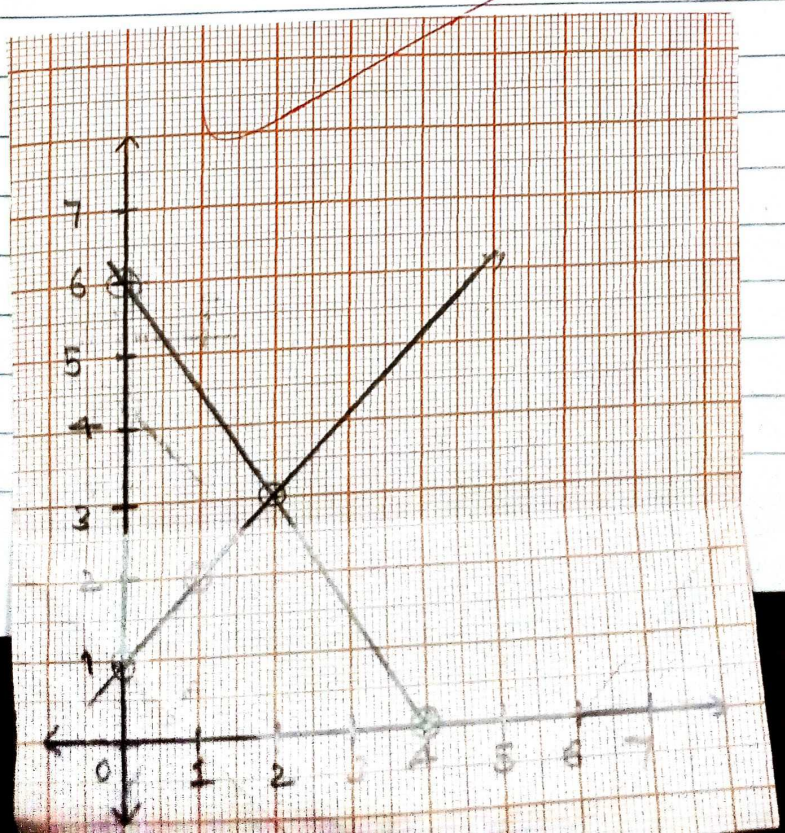
$= 7.5$ sq units

Coordinates of vertices of ΔABC

$= A(2,3)$

$= B(-1,0)$

$= C[4,0]$



Ex 3.2

1. $x+y=14$
$x-y=4$

$x=4+y$ --(i)
$x+y=14$
$4+y+y=14$ [put (i)]
$2y=10$
$y=5$
$x=4+y$
$x=9$

(ii) $s-t=3$
$\frac{s}{3}+\frac{t}{2}=6$

$s=3+t$ --(i)

$\frac{s}{3}+\frac{t}{2}=6$

$\frac{3+t}{3}+\frac{t}{2}=6$ [Put (i)]

$\frac{6+2t+3t}{}=36$
$5t=30$
$t=6$
$s-t=3$
$s=9$

3. $3x-y=3$
$9x-3y=9$

$3x-3=y$ --(i)
$9x-3y=9$
~~3x=3~~
$9x-3[3x-3]=9$
$9x-9x+9=9$
$0=0$

~~# has~~
These have infinite number of solutions.

4. $0.2x+0.3y=1.3$
$\frac{0.2x}{10}+\frac{3}{10}y=\frac{13}{10}$
$\frac{2x+3y}{\cancel{10}}=\frac{13}{\cancel{10}}$

$2x=13-3y$ --(i)

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$0.4x + 0.5y = 2.3$

$\frac{4x}{10} + \frac{5y}{10} = \frac{23}{10}$

$4x + 5y = 23$

$2[13 - 3y] + 5y = 23$

$26 - 6y + 5y = 23$

$-y = -3$

$y = 3$

$4x + 5y = 23$

$4x + 15 = 23$

$4x = 8$

$x = 2$

5) $\sqrt{2}x + \sqrt{3}y = 0$

$\sqrt{3}x - \sqrt{8}y = 0$

$\sqrt{2}x = -\sqrt{3}y$

$x = \frac{-\sqrt{3}y}{\sqrt{2}}$ - (i)

$\sqrt{2}x + \sqrt{3}y = 0$

$\sqrt{2}x + 0 = 0$

$x = 0$

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

$\boxed{x = 0}$

$\sqrt{3}\left[\frac{-\sqrt{3}y}{\sqrt{2}}\right] - \sqrt{8}y = 0$ Put (i)

$= \frac{-3y}{\sqrt{2}} - 2\sqrt{2}y = 0$

$= \frac{+3\sqrt{2}y}{2} + 2\sqrt{2}y = 0$

$0 = \frac{3\sqrt{2}y}{2} + 2\sqrt{2}y$

$0 = \frac{3\sqrt{2}y + 4\sqrt{2}y}{2}$

$0 = 7\sqrt{2}y$

$\boxed{0 = y}$

(vi) $\frac{3x}{2} - \frac{5y}{3} = -2$

$\frac{9x - 10y}{6} = -2$

$9x - 10y = -12$

$\frac{x}{3} + \frac{y}{2} = \frac{13}{6}$

$\frac{2x + 3y}{6} = \frac{13}{6}$

$(9x - 10y = 12)\,2$
$(2x + 3y = 13)\,9$

$= 18x - 20y = -24$
$= 18x + 27y = 117$
$(-) \quad (-) \quad (-)$

$-47y = -131$

$y = 3$

$2x + 3y = 13$
$2x + 9 = 13$
$x = 2$

2. Solve $2x + 3y = 11$ & $2x - 4y = -24$. - - - -
$y = mx + 3$

$2x + 3y = 11$
$2x - 4y = -24$
$(-) \quad (+) \quad (+)$

$7y = 35$
$y = 5$

$2x + 3y = 11$
$2x + 15 = 11$
$x = -2$

$y = mx + 3$
$5 = -2m + 3$
$2 = -2m$
$-1 = m$

3) i) The difference between two numbers is 26 - - - - . Find them.

Larger no - x
Smaller no - y

$x - y = 26$
$3y = x$

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$3y - y = 26$
$2y = 26$
$y = 13$

$x = 3y$
$= 39$

(ii) The larger of two supplementary angle - - . Find them.

Larger no - x
Smaller no - y

$x + y = 180$
$x - y = 18$
$2x = 198$
$x = 99$

$x + y = 180$
$y = 81$

(iii) The Coach of a cricket team - - - - - each ball.

Bat $= x$
balls $= y$

$7x + 6y = 3800$
$3x + 5y = 1750$
$5(4x + y = 2050)$

$3x + 5y = 1750$
$20x + 5y = 5250$
$-17x = 3500$
$x =$

$[7x + 6y = 3800]\ 3$
$[3x + 5y = 1750]\ 7$

$21x + 18y = 11400$
$21x + 35y = 12250$
$17y = 850$
$y = 50$

$3x + 5y = 1750$
$3x + 250 = 1750$
$x = 500$

(iv) The taxi charges in a city consist of a fixed - - - - of 25 Km.

Fixed Charge $= x$
Charge /km $= y$

$x + 10y = 105$
$x + 10y = 155$

$y = 10,\ x = 5$

for 25km,

$x + 25y =$

$5 + 250 = 255$ ₹

v) A fraction becomes $\frac{9}{11}$, if 2 is added - - - -
Find the fraction

Numerator = x
Denominator = y

$\frac{x}{y} + \frac{2}{2} = \frac{9}{11}$, $\frac{x}{y} + \frac{3}{3} = \frac{5}{6}$

$\frac{x}{y} = \frac{7}{9}$ $x = 7$, $y = 9$

vi) Five year hence, the age of Jacob - - - will be - - - Present age.

Jacob age = x
Son age = y

$(x+5) = 3(y+5)$
$(x-5) = 7(y-5)$

$x + 5 = 3y + 15$ $\Rightarrow$ $x - 3y = 10$
$x - 5 = 7y - 35$ $\quad x - 7y = -30$

$4y = 40$

$y = 10$

$x - 3y = 10$
$x - 30 = 10$
$x = 40$

Exercise 3.1 [Continued]

1. From the pair of linear Equations in the following problems - - - - solution graphically.

(i) 10 students of Class X took part in a mathematics quiz - - quiz.

No. boys = x

No of girls = y

$x + y = 10$ - (i)

$y = x + 4$ - (ii)

x	3	6
y	7	4

x	0	2
y	4	6

$x = 3$

$y = 7$

(ii) 5 pencils and 7 pens together - - - - of one pen.

Cost of pencil = x

Cost of pen = y

$5x + 7y = 50$ - (i)

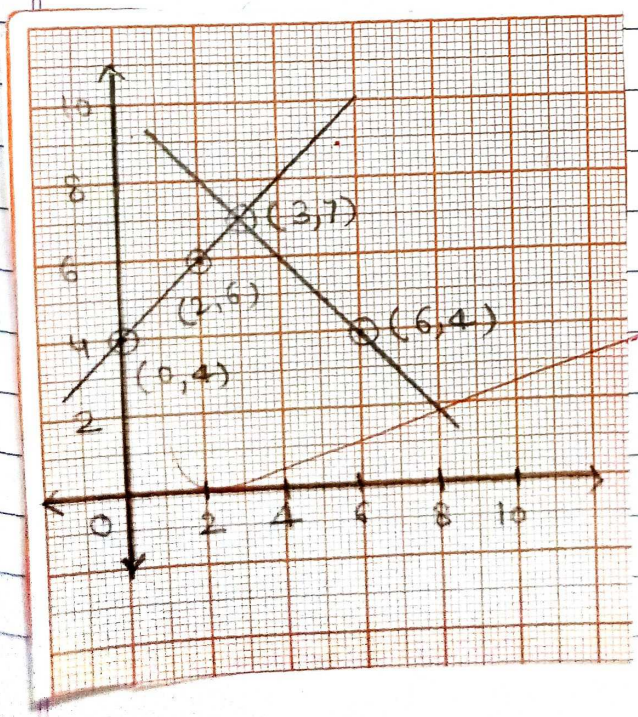
$7x + 5y = 46$ - (ii)

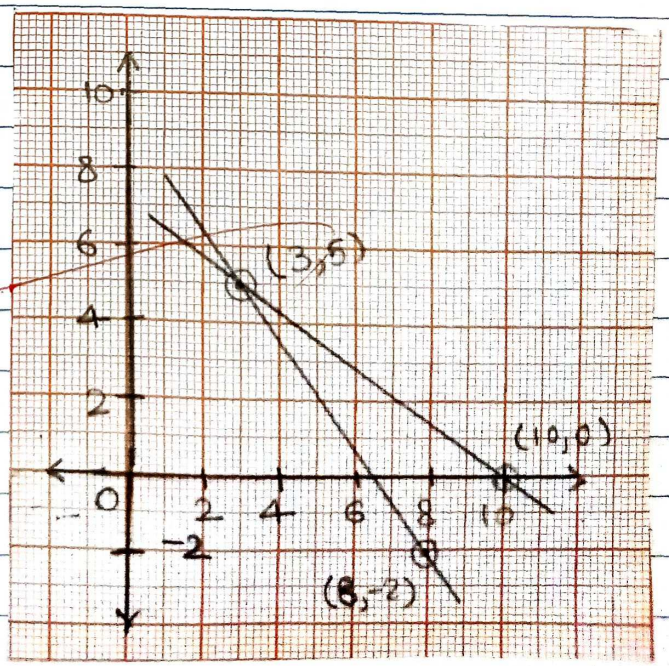
x	3	10
y	5	0

x	8	3
y	-2	5

$x =$

$y =$





Q2. On Comparing the ratios $\frac{a_1}{a_2}$, $\frac{b_1}{b_2}$, $\frac{c_1}{c_2}$, find out whether - - coincident:

i) $5x - 4y + 8 = 0$
$7x + 6y - 9 = 0$

$\frac{a_1}{a_2} = \frac{5}{7}$, $\frac{b_1}{b_2} = \frac{-4}{6}$, $\frac{c_1}{c_2} = \frac{8}{9}$

$\therefore \frac{a_1}{a_2} \neq \frac{b_1}{b_2}$ The lines are intersect at a point.

ii) $9x + 3y + 12 = 0$
$18x + 6y + 24 = 0$

$\frac{a_1}{a_2} = \frac{9}{18}$, $\frac{b_1}{b_2} = \frac{3}{6}$, $\frac{c_1}{c_2} = \frac{12}{24}$

$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ The lines are coincident

iii) $6x - 3y + 10 = 0$
$2x - y + 9 = 0$

$\frac{a_1}{a_2} = \frac{6}{2}$, $\frac{b_1}{b_2} = \frac{-3}{-1}$, $\frac{c_1}{c_2} = \frac{10}{9}$

$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$ These lines are parallel.

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5. Which of the following - - - - - - consistent, or inconsistent.

(i) $3x + 2y = 5$
$2x - 3y = 7$

$\frac{a_1}{a_2} = \frac{3}{2}$, $\frac{b_1}{b_2} = \frac{2}{-3}$, $\frac{c_1}{c_2} = \frac{5}{7}$

$\frac{a_1}{a_2} = \frac{b_1}{b_2}$ The Lines are intersecting
$\therefore$ Consistent.

(ii) $2x - 3y = 8$
$4x - 6y = 9$

$\frac{a_1}{a_2} = \frac{2}{4}$, $\frac{b_1}{b_2} = \frac{-3}{-6}$, $\frac{c_1}{c_2} = \frac{8}{9}$

$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$ Lines are parallel
$\therefore$ Inconsistent

(iii) $\frac{3}{2}x + \frac{5}{3}y = 7$
$9x - 10y = 14$

$\frac{a_1}{a_2} = \frac{3}{2 \times 9}$, $\frac{b_1}{b_2} = \frac{5}{3(-10)}$, $\frac{c_1}{c_2} = \frac{7}{14}$

$\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$ Lines are intersecting
$\therefore$ Consistent.

$-10x + 6y = -22$

(iv) $5x - 3y = 11$

$\frac{a_1}{a_2} = \frac{5}{-10}$ $\quad \frac{b_1}{b_2} = \frac{-3}{6}$ $\quad \frac{c_1}{c_2} = \frac{11}{-22}$

$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ The lines are coincident

$\therefore$ Consistent

(v) $\frac{4}{3}x + 2y = 8$ $\quad 2x + 3y = 12$

$\frac{a_1}{a_2} = \frac{4}{3 \times 2}$, $\frac{b_1}{b_2} = \frac{2}{3}$, $\frac{c_1}{c_2} = \frac{8}{12}$

$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ The lines are coincident

$\therefore$ Consistent

Q4. (iii) $2x + y - 6 = 0$

$4x - 2y - 4 = 0$

$\frac{a_1}{a_2} = \frac{2}{4}$, $\frac{b_1}{b_2} = \frac{1}{-2}$, $\frac{c_1}{c_2} = \frac{-6}{-4}$

$\frac{a_1}{a_2} = \frac{b_1}{b_2}$ $\quad \therefore$ Lines are intersecting

$\therefore$ Consistent

x	3	0
y	0	6

x	0	1
y	-2	0

$x = 2$, $y = 2$

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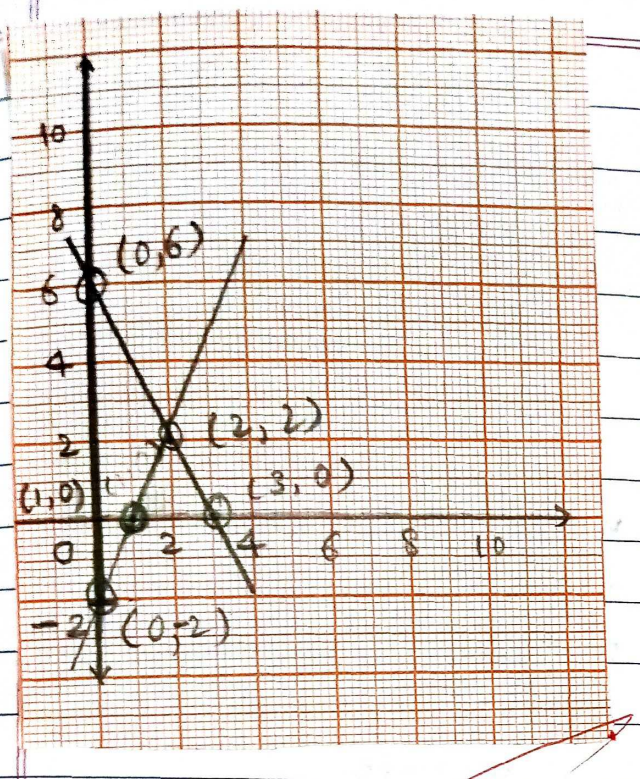

(iv) $2x - 2y - 2 = 0, \quad 4x - 4y - 5 = 0$

$a_1 = 2 \qquad a_2 = 4 \qquad \frac{2}{4} = \frac{-2}{4} \neq \frac{-2}{5}$

$b_1 = -2 \qquad b_2 = -4$

$c_1 = -2 \qquad c_2 = -5$

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

$\therefore$ Lines are parallel to each other

$\therefore$ Inconsistent

Exercise 3.3

Q1.

(i) $x + y = 5$
$2x - 3y = 4$

By substitution:

$x = 5 - y$ —(i)

put in 2nd eq.

$2(5-y) - 3y = 4$

$10 - 2y - 3y = 4$

$10 - 5y = 4$

$y = 6/5$ —(ii)

$x = 5 - 6/5$ from (ii)

$= 19/5$

By Elimination:

$2x + 2y = 10$
$2x - 3y = 4$

$5y = 6$

$y = 6/5$

$2(x) + 2(6/5) = 10$

$x = 19/5$

(ii) $3x + 4y = 10$ and $2x - 2y = 2$

By substitution:

$x = 10 - 4y/3$ —(i)

Put (i) in 2nd eq

$2\left(\frac{10 - 4y}{3}\right) - 2y = 2$

$y = 1$

$x = 10 - 4/3$

$= 2$

By elimination:

$3x + 4y = 10$
$4x - 4y = 4$

$7x = 14$

$x = 2$

$3(2) + 4(y) = 10$

$y = 1$

(iii) $3x - 5y - 4 = 0$
$9x = 2y + 7$

By Subsition:

$x = 2y+7/9$

Put it in 2nd eq.

$3\left(\frac{2y+7}{9}\right) - 5y - 4 = 0$

$y = \frac{-5}{13}$

$x = \frac{2\left[\frac{-5}{13}\right] + 7}{9} = \frac{9}{13}$

By Elimination:

$3[3x - 5y = 4]$

$9x - 2y = 7$

$\Rightarrow 9x - 15y = 12$

$(-)9x (+) 2y = (-)7$

$-13y = 5$

$y = -5/13$

$3x - 5\left[\frac{-5}{13}\right] = 4$

$x = \frac{9}{13}$

(iv) $\frac{x}{2} + \frac{2y}{3} = -1$ and $x - \frac{y}{3} = 3$

By substitution:

$\frac{3x + 4y}{6} = -1$

$3x + 4y = -6$

$x = \frac{-6 - 4y}{3}$ — (i)

Put (i) in (ii) equ.

$\left[\frac{-6 - 4y}{3}\right] - \frac{y}{3} = 3$

$\frac{-6 - 5y}{3} = 3$

$-5 - 5y = 9 + 6$

$y = -3$

$x = \frac{-6 - 4y}{3}$

$= \frac{-6 + 12}{3} = 2$

By Elimination:

$\frac{x}{2} + \frac{2y}{3} = -1$

$2x - \frac{2y}{3} = 6$

$\frac{x}{2} + 2x = 5$

$5x = 10$

$x = 2$

$x - \frac{y}{3} = 3$

$\frac{2}{1} - \frac{y}{3} = 3$

$\frac{6 - y}{3} = 3$

$-y = 9 - 6$

$y = -3$

2.

(i) If we add 1 to the numerator and ----. What is fraction?

Let numerator be x

Let Denominator be y

(i) $\frac{x+1}{y-1} = \frac{1}{1}$ $\Rightarrow x+1 = y-1$

$\Rightarrow x - y = -2$

(ii) $\frac{x}{y+1} = \frac{1}{2}$ $\Rightarrow 2x = y+1$

$\Rightarrow 2x - y = 1$

By Elemination:

$x - y = -2$

$2x - y = 1$

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

$-x = -3$

$x = 3$

$x - y = -2$

$3 - y = -2$

$y = 5$

fraction will be

$\frac{3}{5}$

(ii) Five years ago, Nuri was thrice ---- Sonu.

Let ages of Nuri & Sonu will x & y

Five years ago

$x + 5 = 3y - 15$

$x - 3y = -10$ -(i)

10 years later

$x + 10 = 2y + 20$

$x - 2y = 10$

$x - 3y = -10$

$(-)\ x\ (+)\ 2y = (-)\ 10$

$-y = -20$

$y = 20 \Rightarrow$ Sonu age

Nuri age $= x + 5 = 60 - 15$

$x = 50$

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(iii) The sum of the digits of ------ find the number.

Let the one's & Ten's place be x & y

$x + y = 9$ --- (i)

$9(10y + x) = 2(10x + y)$ --- (ii)

$90y + 9x = 20x + 2y$

$88y = 11x$

$-11x + 88y = 0$

$-11(x - 8y) = 0$

$x - 8y = 0$ --- (ii)

$$\begin{aligned} x + y &= 9 \\ (-)\ x - (+)8y &= 0 \\ \hline 9y &= 9 \\ y &= 1 \end{aligned}$$

$x + y = 9$

$x = 8$

The number is 18.

(iv) Meena went to a bank ------ she recived.

Let the no. of notes of 50 & 100 be x & y

$x + y = 25$ --- (i)

$50x + 100y = 200$

$50[x + 2y = 40]$ --- ~~(ii)~~

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

$$\begin{aligned} x + y &= 25 \\ (-)\ x + 2y &= 40 \\ (-) \quad (-) \quad & (-) \\ \hline -y &= -15 \end{aligned}$$

$y = 15$

$x + y = 25$

$x = 10$

There were 10 50 rupee notes & 15 100 rupee notes.

(v) A lending library has a fixed charge for ---- entire day.

Let the fixed & additional charges be x & y

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$3x + 4y = 27$ --- (i)

$3x + 2y = 21$ --- (ii)

$2y = 6$

$y = 3$

The fixed charges for 3 day = ₹15

$3x + 4y = 27$

$3x + 12 = 27$

$x = 5$

$3x = 15$

The additional charge = ₹3/day