hw

Ch-3 Pair of linear Equations in two variables

1. Form the pair of linear equations in the following problems & find their solutions

(i) 10 students of class X took part in a Mathematics quiz. If the no. of girls is 4 more than the no. of boys, find the no. of boys & girls who took part in quiz.

A. let the no. of girls be x
" " " " boys be y
Total 10 students took part in quiz
$x+y=10$ —— (1)
No. of girls is 4 more than boys
$x=4+y$
$\Rightarrow x-y=4$ —— (2)

For eq (1)

x	4	6
y	6	4

For eq (2)

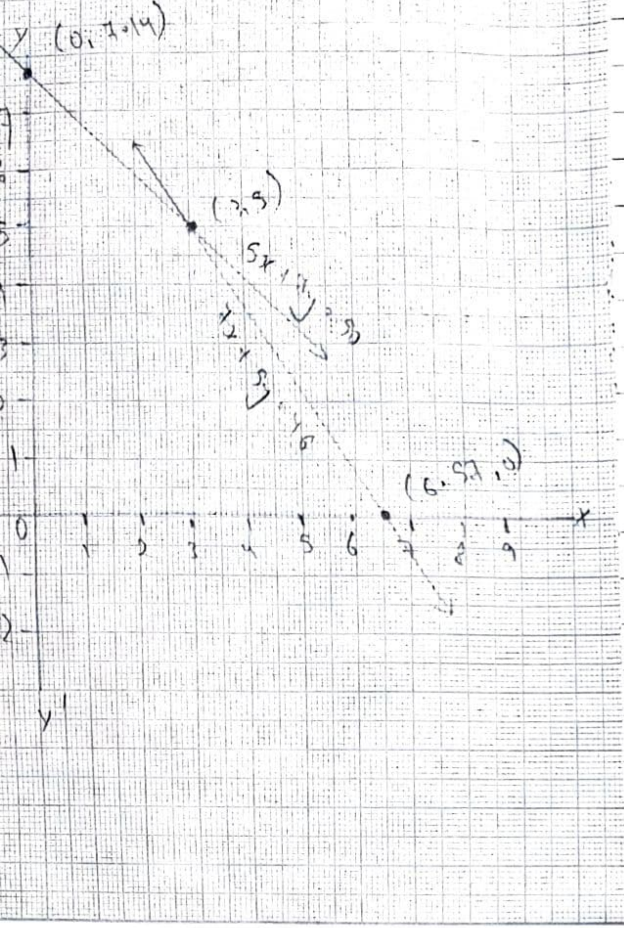
x	4	6
y	0	2

No. of girls = x = 7
No. of boys = y = 3

(ii) 5 pencils & 7 pens together cost ₹ 50, whereas 7 pencil & 5 pens together cost ₹ 46. Find the cost of one pencil & that of one pen.

A let cost of one pencil be x
" " " " pen be y

5 pencils & 7 pens together cost ₹ 50
$\Rightarrow 5x+7y=50$ —— (1)



comparing the ratio $\frac{a_1}{a_2}$, $\frac{b_1}{b_2}$ & $\frac{c_1}{c_2}$ find out whether lines representing the following pairs of linear equations intersect at a point, are parallel or coincident

$5x - 4y + 8 = 0$ $\quad a_1 = 5,\ b_1 = -4,\ c_1 = 8$

$7x + 6y - 9 = 0$ $\quad a_2 = 7,\ b_2 = 6,\ c_2 = -9$

$\frac{a_1}{a_2} = \frac{5}{7}$, $\frac{b_1}{b_2} = \frac{-4}{6} = \frac{-2}{3}$

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

It have unique solution

∴ lines that represent the linear equations intersect at a point

(ii) $9x + 3y + 12$

$18x + 6y + 24$

$a_1 = 9,\ b_1 = 3,\ c_1 = 12$

$a_2 = 18,\ b_2 = 6,\ c_2 = 24$

$\frac{a_1}{a_2} = \frac{9}{18} = \frac{1}{2}$, $\frac{b_1}{b_2} = \frac{3}{6} = \frac{1}{2}$, $\frac{c_1}{c_2} = \frac{12}{24} = \frac{1}{2}$

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

So, we have infinite solution

∴ lines that represent the linear equations are coincident.

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

$2x - y + 9 = 0$

$a_1 = 6,\ b_1 = -3,\ c_1 = 10$

$a_2 = 2,\ b_2 = -1,\ c_2 = 9$

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

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

So we have no solution

∴ lines represent the linear equations are parallel

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

$3x + 2y - 5 = 0$
$2x - 3y - 7 = 0$

$a_1 = 3$, $b_1 = 2$, $c_1 = -5$
$a_2 = 2$, $b_2 = -3$, $c_2 = -7$

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

$\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$ So, we have a unique solution

∴ ~~So~~ It is consistent.

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

$2x - 3y - 8 = 0$
$4x - 6y - 9 = 0$
$a_1 = 2$, $b_1 = -3$, $c_1 = -8$
$a_2 = 4$, $b_2 = -6$, $c_2 = -9$

$\frac{a_1}{a_2} = \frac{\cancel{2}}{\cancel{4}} \frac{1}{2}$, $\frac{b_1}{b_2} = \frac{\cancel{-3}}{\cancel{-6}} \frac{1}{2}$, $\frac{c_1}{c_2} = \frac{\cancel{-8}}{\cancel{-9}}$

$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$ ∴ We have no solution

∴ It is inconsistent

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

$\frac{3}{2}x + \frac{5}{3}y - 7 = 0$; $9x - 10y - 14 = 0$

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

$a_2 = 9$, $b_2 = -10$, $c_2 = -14$

$\frac{a_1}{a_2} = \frac{\frac{3}{2}}{9} = \frac{3}{2 \times 9} = \frac{1}{6}$

$\frac{b_1}{b_2} = \frac{\frac{5}{3}}{-10} = \frac{-5}{3 \times 10} = \frac{-1}{6}$

$\frac{c_1}{c_2} = \frac{\cancel{-7}}{\cancel{-14}} = \frac{1}{2}$ ∴ $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$

It is a unique solution
So It is consistent.

(iv) $5x - 3y = 11$; $-10x + 6y = -22$

$5x - 3y - 11 = 0$
$-10x + 6y + 22 = 0$

$a_1 = 5$, $b_1 = -3$, $c_1 = -11$
$a_2 = -10$, $b_2 = 6$, $c_2 = 22$

$\frac{a_1}{a_2} = \frac{\cancel{5}}{\cancel{-10}} \frac{-1}{2}$, $\frac{b_1}{b_2} = \frac{\cancel{-3}}{\cancel{6}} \frac{-1}{2}$, $\frac{c_1}{c_2} = \frac{\cancel{-11}}{\cancel{22}} \frac{-1}{2}$

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

It have infinitely many solution
It is consistent.

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

$\frac{4}{3}x + 2y - 8 = 0$

$2x + 3y - 12 = 0$

$a_1 = \frac{4}{3}$, $b_1 = 2$, $c_1 = -8$

$a_2 = 2$, $b_2 = 3$, $c_2 = -12$

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

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

$\therefore$ It have infinitely many solution
It is consistent

4. Which of the following pairs of linear equations are consistent / inconsistent? If consistent obtain the solution graphically

(i) $x + y = 5$, $2x + 2y = 10$

$x + y - 5 = 0$ —— (1)
$2x + 2y - 10$ —— (2)
$a_1 = 1$, $b_1 = 1$, $c_1 = -5$
$a_2 = 2$, $b_2 = 2$, $c_2 = -10$

$\frac{a_1}{a_2} = \frac{1}{2}$, $\frac{b_1}{b_2} = \frac{1}{2}$, $\frac{c_1}{c_2} = \frac{-\cancel{5}}{-\cancel{10}}$ $\frac{1}{}$

(ii) $x-y=8$; $3x-3y=16$

$x-y-8=0$ —— ①
$3x-3y-16=0$ —— ②

$a_1=1$, $b_1=-1$, $c_1=-8$
$a_2=3$, $b_2=-3$, $c_2=-16$

$\frac{a_1}{a_2}=\frac{1}{3}$, $\frac{b_1}{b_2}=\frac{-1}{-3}$, $\frac{c_1}{c_2}=\frac{-8}{-16}=\frac{1}{2}$

$\frac{a_1}{a_2}=\frac{b_1}{b_2}\neq\frac{c_1}{c_2}$ It have no solution
It is inconsistent

(iii) $2x+y-6=0$, $4x-2y-4=0$

$2x+y-6$ —— ①
$4x-2y-4=0$ —— ②
$a_1=2$, $b_1=1$, $c_1=-6$
$a_2=4$, $b_2=-2$, $c_2=-4$

$\frac{a_1}{a_2}=\frac{2}{4}=\frac{1}{2}$, $\frac{b_1}{b_2}=\frac{1}{-2}=\frac{-1}{2}$, $\frac{c_1}{c_2}=\frac{-6}{-4}=\frac{3}{2}$

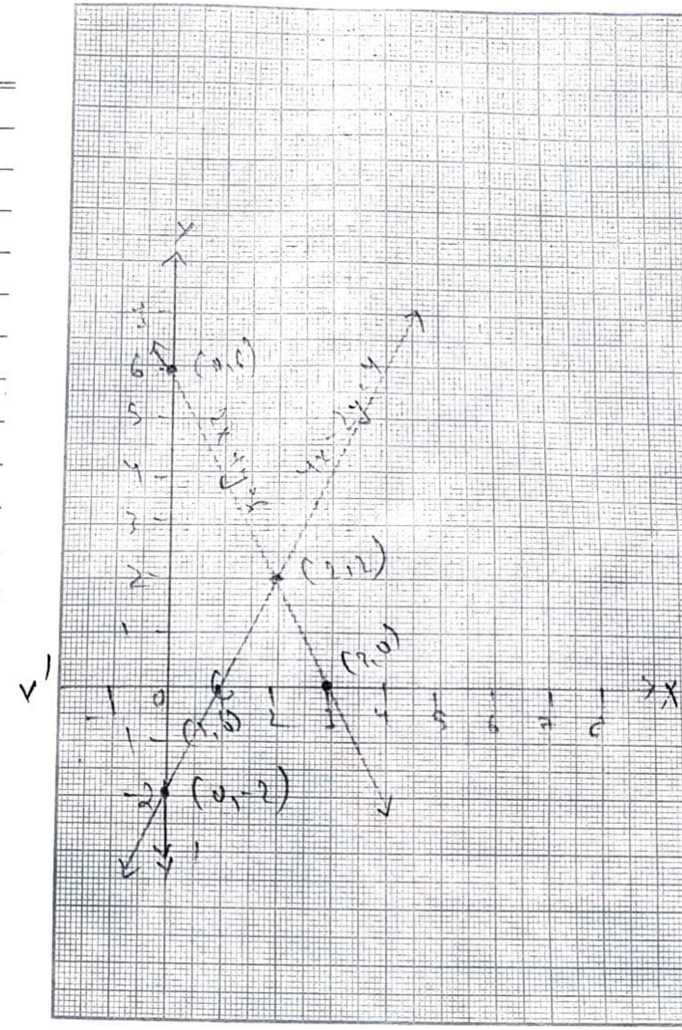
$\frac{a_1}{a_2}\neq\frac{b_1}{b_2}$
It is a unique solution
It is consistent

$2x+y=6$

x	0	3
y	6	0

$4x-2y=4$

x	0	1
y	−2	0



A8. let length be x
" Breadth be y

A/q $\frac{1}{2}\times$ Perimeter $=36$
$\Rightarrow \frac{1}{2}\times 2(l+b)=36$

$\Rightarrow x+y=36$ —— ①
$l=4+$ width

$x = 4 + y$ —— (2)

placing $x = 4 + y$ in eq (1)

$x + y = 36$

$\Rightarrow 4 + y + y = 36$

$\Rightarrow 4 + 2y = 36$

$\Rightarrow 2y = 36 - 4$ $\Rightarrow 2y = 32$ $\Rightarrow y = \frac{\cancel{32}}{\cancel{2}}$ 16

$x = 4 + y$

$\Rightarrow 4 + 16 = 20$

6. A. (i) Intersecting lines

$\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$ $2x + 3y - 8 = 0$

$5x + 7y - 10 = 0$

(ii) Parallel lines

$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$ $2x + 3y - 8 = 0$

$4x + 6y - 15 = 0$

(iii) Coincident lines

$2x + 3y - 8 = 0$

$8x + 12y - 32 = 0$

7A $x - y + 1 = 0$ —— (1)

$x = y - 1$

x	0	1	-2	2
y	1	2	-1	3

$3x + 2y = 12$ —— (2)

$\Rightarrow 3x = 12 - 2y$

$\Rightarrow x = \frac{12 - 2y}{3}$

x	4	2	0
y	0	3	6