No. 34

2. (i) For which values of a and b does the following pair of linear equations have an infinite number of solutions?

$$2x + 3y = 7$$

$$(a - b)x + (a + b)y = 3a + b - 2$$

Soln. $2x + 3y = 7$

$2x + 3y - 7 = 0$ ... (i)

$(a - b)x + (a + b)y = 3a + b - 2$

$(a - b)x + (a + b)y - (3a + b - 2) = 0$ ... (ii)

Comparing equation (i) with $a_1x + b_1y + c_1 = 0$

and equation (ii) with $a_2x + b_2y + c_2 = 0$

$a_1 = 2$ $\quad b_1 = 3$ $\quad c_1 = -7$

$a_2 = a - b$ $\quad b_2 = a + b$ $\quad c_2 = -(3a + b - 2)$

For infinite solution

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

$$\therefore \frac{2}{a - b} = \frac{3}{a + b} = \frac{7}{(3a + b - 2)}$$

$$\therefore \frac{2}{a - b} = \frac{7}{(3a + b - 2)}$$

$$\therefore 6a + 2b - 4 = 7a - 7b$$

$$\therefore a - 9b + 4 = 0$$

$$\therefore \frac{2}{a - b} = \frac{3}{a + b}$$

$$\therefore 2a + 2b = 3a - 3b$$

$$\therefore a = 5b$$

Substituting a = 5b in (iii)-

$$5b - 9b + 4 = 0$$

$$\therefore -4b = -4$$

$$\therefore b = 1$$

Substituting b = 1 in (iv)

$$a = 5(1)$$

$$\therefore a = 5$$

No. 35

(ii) For which value of k will the following pair of linear equations have no solution ?

$3x + y = 1$

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

Soln. $3x + y = 1$

$3x + 1y - 1 = 0$ ... (i)

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

$(2k - 1)x + (k - 1)y - (2k + 1) = 0$ ... (ii)

Comparing equation (i) with $a_1x + b_1y + c_1 = 0$

and equation (ii) with $a_2x + b_2y + c_2 = 0$

We get $a_1 = 3$, $b_1 = 1$, $c_1 = -1$

$a_2 = 2k - 1$, $b_2 = k - 1$, $c_2 = -(2k + 1)$

$3(k - 1) = 3k - 3$

$1(2k - 1) = 2k - 1$

$\therefore \frac{3}{2k-1} = \frac{1}{k-1}$ ... (iii)

$3k - 2k = 3 - 1$

$k = 2$

$\therefore \frac{3}{2k-1} = \frac{1}{k-1}$ ... (iv)

$\therefore 3k - 3 = 2k - 1$

$\therefore k = 2$

$\frac{c_1}{c_2} = \frac{-1}{-(2k+1)}$ ... (v)

For no solution

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

No. 36

1. Which of the following pairs of linear equations has unique solution, no solution, or infinitely many solutions. In case there is a unique solution, find it by using cross multiplication method

(i) $x - 3y - 3 = 0$; $3x - 9y - 2 = 0$

$1x - 3y - 3 = 0$ ... (i)

$3x - 9y - 2 = 0$ ... (ii)

Comparing equation (i) with $a_1x + b_1y + c_1 = 0$

and equation (ii) with $a_2x + b_2y + c_2 = 0$

We get $a_1 = 1$ $b_1 = -3$ $c_1 = -3$

$a_2 = 3$ $b_2 = -9$ $c_2 = -2$

$$\frac{a_1}{a_2} = \frac{1}{3} \quad \text{... (iii)}$$

$$\frac{b_1}{b_2} = \frac{-1}{-3} = \frac{1}{3} \quad \text{... (iv)}$$

$$\frac{c_1}{c_2} = \frac{3}{2} \quad \text{... (v)}$$

From (iii), (iv) and (v)

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

∴ The equations have No Solution

$\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$ Equations has unique solution (Consistent)

$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$ Equations has no solution (Inconsistent)

$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ Equations has infinite solutions (Consistent)

(iv) $x - 3y - 7 = 0,\ 3x - 3y - 15 = 0$

Soln. $1x - 3y - 7 = 0$ ... (i)

$3x - 3y - 15 = 0$ (ii)

Comparing ... $= 0$

0

We ... -7

... $= -15$

$3 \times -3 = -9$

$$\frac{a_1}{a_2} = \frac{1}{3} \quad \text{... (iii)}$$

$$\frac{b_1}{b_2} = \frac{-3}{-3} = 1 \quad \text{... (iv)}$$

$$\frac{c_1}{c_2} = \frac{7}{15} \quad \text{... (v)}$$

From (iii), (iv) and (v)

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

$\therefore$ The given pair of linear equations has a unique solution.

$$\frac{x}{b_1 c_2 - b_2 c_1} = \frac{y}{c_1 a_2 - c_2 a_1} = \frac{1}{a_1 b_2 - a_2 b_1}$$

$$\therefore \quad \frac{x}{45 - 21} = \frac{y}{-21 - (-15)} = \frac{1}{-3 - (-9)}$$

$$\therefore \quad \frac{x}{24} = \frac{y}{-6} = \frac{1}{6}$$

$$\therefore \quad \frac{x}{24} = \frac{1}{6} \qquad x = 4$$

$$\therefore \quad \frac{y}{-6} = \frac{1}{6} \qquad y = -1$$

$\therefore$ Solution is $x = 4,\ y = -1$

No. 37

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

(i) $x + y = 5$

$2x + 2y = 10$

Soln.

$1x + 1y - 5 = 0$ ... (i)

$2x + 2y - 10 = 0$ ... (ii)

Comparing equation (i) with $a_1x + b_1y + c_1 = 0$

and equation (ii) with $a_2x + b_2y + c_2 = 0$

$a_1 = 1 \quad b_1 = 1 \quad c_1 = -5$

$a_2 = 2 \quad b_2 = 2 \quad c_2 = -10$

$$\frac{a_1}{a_2} = \frac{1}{2} \quad \text{... (iii)}$$

$$\frac{b_1}{b_2} = \frac{1}{2} \quad \text{... (iv)}$$

$$\frac{c_1}{c_2} = \frac{-5}{10} = \frac{1}{2} \quad \text{... (v)}$$

From (iii), (iv) and (v)

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

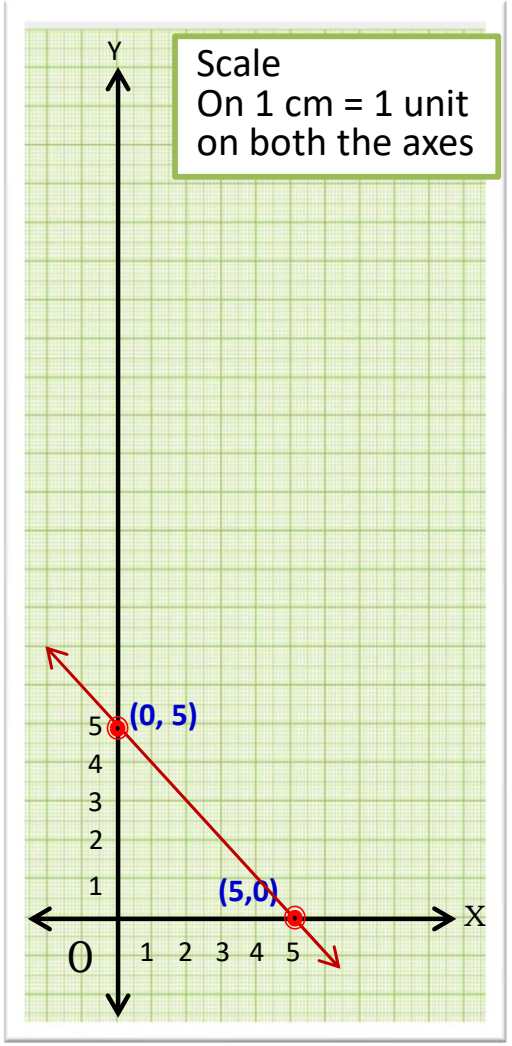
$\therefore$ **The equations are consistent**

$x + y = 5$

x	0	5
y	5	0
(x, y)	(0, 5)	(5, 0)

$2x + 2y = 10$

x	0	5
y	5	0
(x, y)	(0 , 5)	(5, 0)



No. 38

Q. **2x + 3y – 8 = 0 is a linear equation. Write another equation in 2 variables such that the Geometrical interpretation of the pair so formed is as follows:**
a) Parallel lines b) Intersecting lines c) Overlapping lines.

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

Comparing the given equations with $a_1x + b_1y + c_1 = 0$, we get

$a_1 = 2, \quad b_1 = 3, \quad c_1 = -8$

Let second line's equation be $a_2x + b_2y = c_2$

a) The condition for the lines to be Parallel, we know

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

One set of the possible values of a_2, b_2 and c_2 satisfying the above condition could be: $a_2 = 4$, $b_2 = 6$, $c_2 = -5$

The second line's equation could be $4x + 6y + 5 = 0$

b) The condition

$$\frac{b_1}{b_2} = \frac{1}{2}$$

One of th… the above condition …, $c_2 = 1$

The second line's equation could be $4x + 4y + 1 = 0$

c) The condition for the lines to be Overlapping,

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

One o…

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

…2 ≠ -16

…6 = 0

No. 39


Word
Problems

Ram is 8 more than twice the age of Rahim.

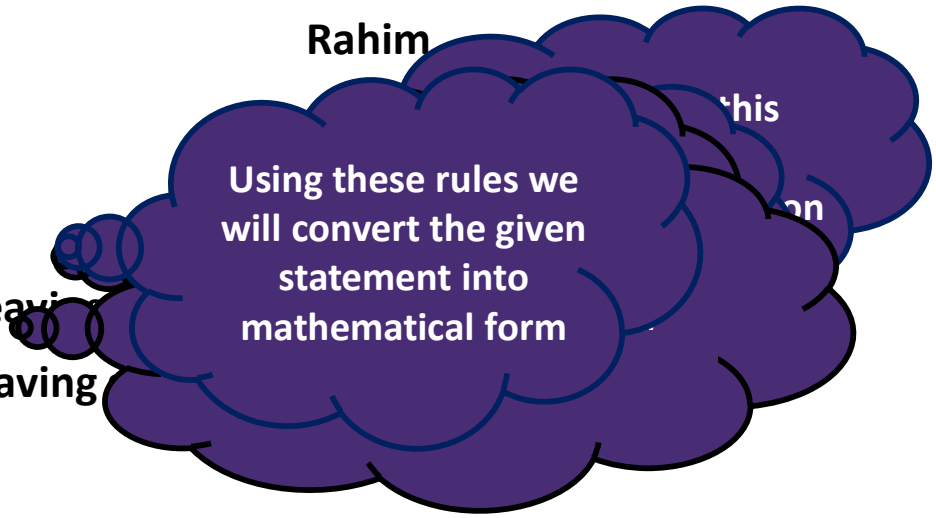
Find their present ages.

Ram

x

Rahim

$x = 2y + 8$



Rules

is / was	=
More/Greater /Exceeds	+ (after leavi
Less/Smaller	- (after leaving
Sum of two numbers	x + y
Difference of two numbers	x - y
Twice / thrice…..	Multiplication

Formulae / Properties.

Dividend = Divisor x Quotient + Remainder.

Perimeter of a triangle = sum of all the three sides.

Perimeter of a rectangle = 2 (l + b)

Sum of the measures of the angles of a triangle = 180°

Speed = Distance / Time

Q. Form the pair of linear equations for the following problems and find their solution by substitution method.

(ii) The larger of two supplementary angles exceeds the smaller by 18 degrees. Find them.

Soln. Let the larger angle be x^o and the smaller angle be y^o

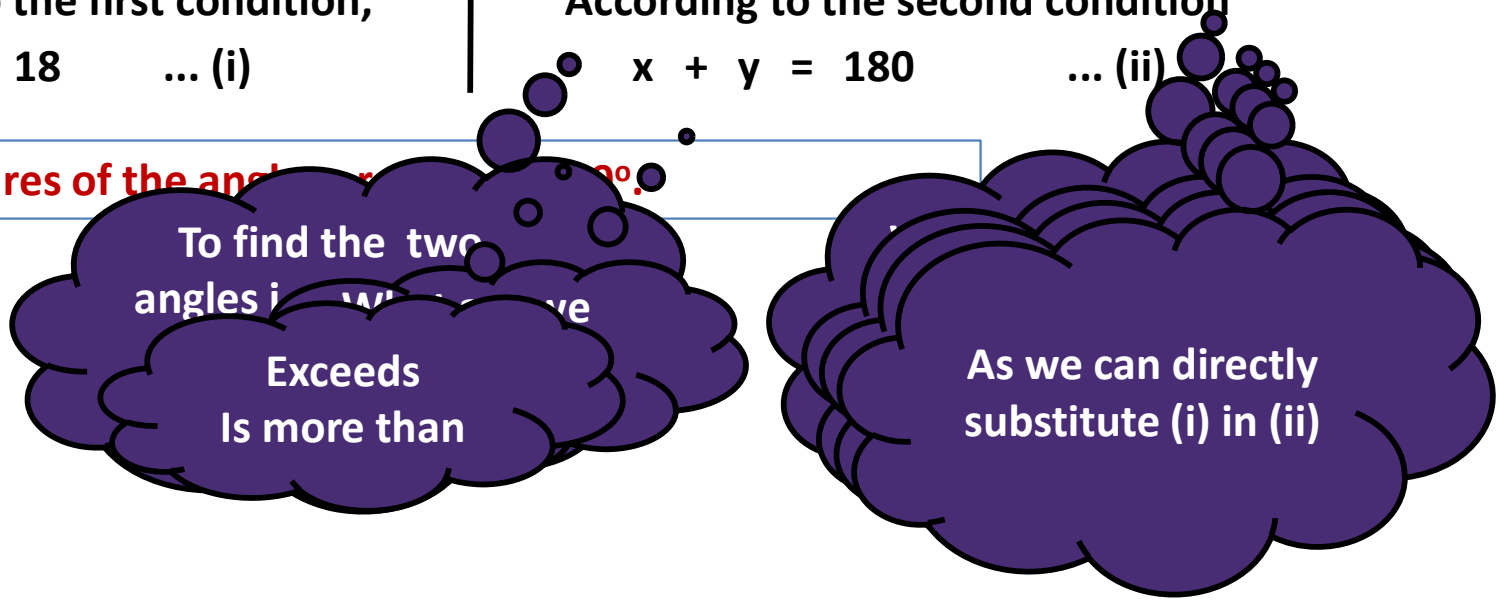
According to the first condition,

$x = y + 18$ ... (i)

According to the second condition

$x + y = 180$ ... (ii)

$\therefore$ The measures of the ang[illegible]^o.



No. 40

Q. Aftab tells his daughter "Seven years ago, I was seven times as old as you were then. Also, three years from now, I shall be three times as you will be". Represent this situation algebraically and graphically.

Sol.

	Aftab	Daughter
Present Age	x years	y years
7 years ago	(x – 7) years	(y – 7) years
3 years after	(x + 3) years	(y + 3) years

Lets represent given situation algebraically

$(x - 7) = 7 \times (y - 7)$

$\therefore \quad x - 7 = 7y - 49$

$\therefore \quad x - 7y = -49 + 7$

$\therefore \quad x - 7y = -42 \quad .....(i)$

$(x + 3) = 3 \times (y + 3)$

$\therefore \quad x + 3 = 3y + 9$

$\therefore \quad x - 3y = 9 - 3$

$\therefore \quad x - 3y = 6 \quad .....(ii)$

Q. Aftab tells his daughter "Seven years ago, I was seven times as old as you were then. Also, three years from now, I shall be three tim
Represent this situation algebraically and graphicall

Sol. $x - 7y = -42$ .....(i)

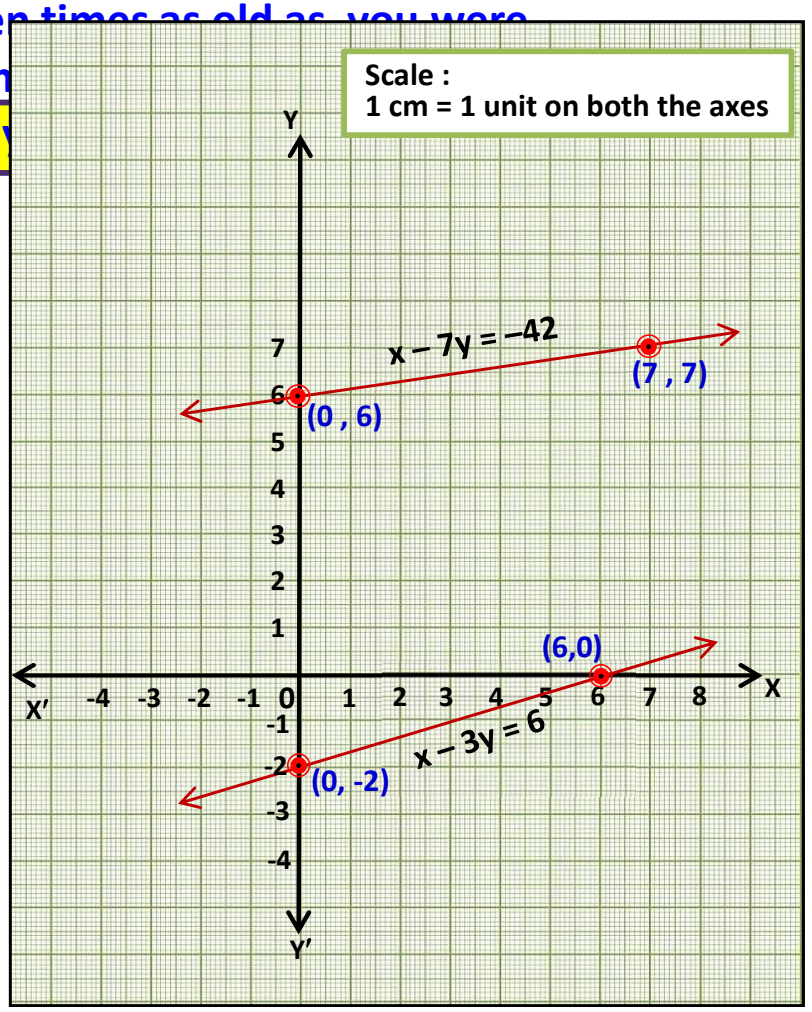
x	0	7
y	6	7
(x, y)	(0, 6)	(7, 7)

$7 - 7y = -42$
$-7y = -42 - 7$
$-7y = -49$
$y = 7$

$x - 3y = 6$ .....(ii)

x	0	6
y	- 2	0
(x, y)	(0, - 2)	(6, 0)

$6 - 3y = 6$
$-3y = 6 - 6$
$-3y = 0$
$y = 0$



Thank You