Linear Equations in Two Variables

Exercise – 4.1

Solution 1:

1. $2x + 5y = 7$; $x - 10y = 11$; $4x + 9y = 13$
2. No. The given equation is not of the type $ax + by = c$, hence it is not a linear equation.
3. P is a real number. $P > 0$.
4. (1, 17), (2, 16), etc. There are infinite solutions.
5. Substituting $x = 1$ and $y = a$ in the equation $x + 3y = 10$, we get, $1 + 3a = 10$
   $\therefore 3a = 10 - 1$
   $\therefore 3a = 9$
   $\therefore a = 3$

Solution 2(i):

$x + y = 4 \qquad \ldots(i)$

$2x - 5y = 1 \qquad \ldots(ii)$

Here the coefficients of y are $+1$ and -5 which are opposite in sign and numerically also not same.

To make them numerically same we will multiply the equation (i) by 5. We get,

$5x + 5y = 20 \qquad \ldots(iii)$

Adding, equation (ii) and (iii), we get

$$\begin{array}{r} 2x - 5y = 1 \\ +\ \ 5x + 5y = 20 \\ \hline 7x = 21 \end{array}$$

$\therefore x = 3$

Substitute $x = 3$ in equation (i),

$3 + y = 4$

$\therefore y = 4 - 3$

$\therefore y = 1$

$\therefore x = 3$ and $y = 1$ is the solution of the given equations.

Solution 2(ii):

$2x + y = 5 \qquad \ldots(i)$

$3x - y = 5 \qquad \ldots(ii)$

Adding equation (i) and (ii),

$$\begin{array}{r} 2x + y = 5 \\ + \; 3x - y = 5 \\ \hline 5x \quad\;\; = 10 \end{array}$$

$\therefore x = \dfrac{10}{5}$

$\therefore x = 2$

Substitute $x = 2$ in equation (i),

$2(2) + y = 5$

$\therefore 4 + y = 5$

$\therefore y = 5 - 4$

$\therefore y = 1$

$\therefore x = 2$ and $y = 1$ is the solution of the given equations.

Solution 2(iii):

$4m + 3n = 18 \qquad \ldots(i)$

$3m - 2n = 5 \qquad \ldots(ii)$

Multiplying equation (i) by 2 and equation(ii) by 3 and adding them,

$$\begin{array}{r} 8m + 6n = 36 \\ + \; 9m - 6n = 15 \\ \hline 17m \quad\;\; = 51 \end{array}$$

$\therefore m = \dfrac{51}{17}$

$\therefore m = 3$

Substitute $m = 3$ in equation (ii),

$3(3) - 2n = 5$

$9 - 2n = 5$

$2n = 9 - 5$

$2n = 4$

$n = \dfrac{4}{2}$

$n = 2$

$\therefore m = 3$ and $n = 2$ is the solution of the given equations.

Solution 2(iv):

$$\frac{x+y}{4} - \frac{x-y}{3} = 1 \qquad \ldots(i)$$

$$\frac{x+y}{2} + \frac{x-y}{6} = 12 \qquad \ldots(ii)$$

Multiplying both the equations by 12,

$3(x + y) - 4(x - y) = 12$

$\therefore\ 3x + 3y - 4x + 4y = 12$

$\therefore\ -x + 7y = 12 \qquad \ldots(iii)$

and

$6(x + y) + 2(x - y) = 144$

$\therefore\ 6x + 6y + 2x - 2y = 144$

$\therefore\ 8x + 4y = 144$

Dividing both sides by 4,

$2x + y = 36 \qquad \ldots(iv)$

Multiplying equation (iii) by 2 and add equation (iii) from (iv),

$$\begin{array}{r} -2x + 14y = 24 \\ +\ \ 2x + y = 36 \\ \hline 15y = 60 \end{array}$$

$\therefore\ y = \dfrac{60}{15}$

$\therefore\ y = 4$

Substitute $y = 4$ in equation (iii),

$-x + 7(4) = 12$

$\therefore\ -x + 28 = 12$

$\therefore\ -x = 12 - 28$

$\therefore\ -x = -16$

$\therefore\ x = 16$

$\therefore\ x = 16$ and $y = 4$ is the solution of the given equations.

Solution 2(v):

$$\frac{x + y - 8}{2} = \frac{x + 2y - 14}{3} \quad \ldots(i)$$

$$\frac{x + y - 8}{2} = \frac{3x + y - 12}{11} \quad \ldots(ii)$$

Multiplying equation (i) by 6,

$3(x + y - 8) = 2(x + 2y - 14)$

$\therefore\ 3x + 3y - 24 = 2x + 4y - 28$

$\therefore\ 3x - 2x + 3y - 4y = -28 + 24$

$\therefore\ x - y = -4 \quad \ldots(iii)$

Multiplying equation (i) by 33,

$11(x + y - 8) = 2(3x + y - 12)$

$\therefore\ 11x + 11y - 88 = 6x + 2y - 24$

$\therefore\ 11x - 6x + 11y - 2y = -24 + 88$

$\therefore\ 5x + 9y = 64 \quad \ldots(iv)$

Multiplying equation (iii) by 9,

$9x - 9y = -36 \quad \ldots(v)$

Adding equations (v) and (iv)

$$\begin{array}{rrcr} & 9x - 9y & = & -36 \\ + & 5x + 9y & = & 64 \\ \hline & 14x & = & 28 \end{array}$$

$\therefore\ x = \dfrac{28}{14}$

$\therefore\ x = 2$

Substitute $x = 2$ in equation (iii),

$2 - y = -4$

$\therefore\ y = 2 + 4$

$\therefore\ y = 6$

$\therefore\ x = 2$ and $y = 6$ is the solution of the given equations.

Exercise – 4.2

Solution 1(i):

$2x + 3y = -4$ …(i)
$x - 5y = 11$ …(ii)
From equation (ii), we can express x in terms of y,
$\therefore x = 5y + 11$ …(iii)
Substitute this value of x in equation (i)
$\therefore 2(5y + 11) + 3y = -4$
$\therefore 10y + 22 + 3y = -4$
$\therefore 13y + 22 = -4$
$\therefore 13y = -4 - 22$
$\therefore 13y = -26$
$\therefore y = -2$
Substituting $y = -2$ in equation (iii),
$x = 5(-2) + 11$
$\therefore x = -10 + 11$
$\therefore x = 1$
$\therefore x = 1$ and $y = -2$

Solution 1(ii):

$x + 2y = 0$ …(i)
$10x + 15y = 105$ …(ii)
Dividing both sides of equation (ii) by 5, we get
$2x + 3y = 21$ …(iii)
Expressing x in terms of y in equation (i)
$x = 2y$ …(iv)
Substitute $x = 2y$ in equation (iii)
$\therefore 2(2y) + 3y = 21$
$\therefore 4y + 3y = 21$
$\therefore 7y = 21$
$\therefore y = 3$
Substituting $y = 3$ in equation (iii),
$x = 2(3)$
$\therefore x = 6$
$\therefore x = 6$ and $y = 3$

Solution 1(iii):

$4p = 3q + 5 \quad \dots \text{(i)}$

$p - q = \frac{7}{6} \quad \dots \text{(ii)}$

Expressing p in terms of q in equation (ii),

$p = q + \frac{7}{6} \quad \dots \text{(iii)}$

Substitute $p = q + \frac{7}{6}$ in equation (i),

$4\left(q + \frac{7}{6}\right) = 3q + 5$

$\therefore 4q + \frac{4 \times 7}{6} = 3q + 5$

$\therefore 4q + \frac{14}{3} = 3q + 5$

$\therefore 4q - 3q = 5 - \frac{14}{3}$

$\therefore q = \frac{1}{3}$

Put $q = \frac{1}{3}$ in equation (iii),

$p = \frac{1}{3} + \frac{7}{6}$

$\therefore p = \frac{2 + 7}{6}$

$\therefore p = \frac{9}{6}$

$\therefore p = \frac{3}{2}$

$\therefore p = \frac{3}{2}$ and $q = \frac{1}{3}$

Solution 1(iv):

$5y - 3x = 14 \quad ...(i)$
$3y - 2x = 1 \quad ...(ii)$
$y = \frac{2x+1}{3} \quad ...(iii)$
put $y = \frac{2x+1}{3}$ in equation (i),
$5\left(\frac{2x+1}{3}\right) - 3x = 14$
$\therefore \frac{10x+5}{3} - 3x = 14$
$\therefore 10x + 5 - 9x = 42$ (multiplying throughtout by 3)
$\therefore x = 42 - 5$
$\therefore x = 37$
Put $x = 37$ in equation (iii),
$\therefore y = \frac{2(37)+1}{3}$
$\therefore y = \frac{74+1}{3}$
$\therefore y = \frac{75}{3}$
$\therefore y = 25$
$\therefore x = 37$ and $y = 25$

Solution 1(v):

$2x – y – 3 = 0$ …(i)
$4x – y – 5 = 0$ …(ii)
$\therefore 2x – y – 3 = 0$
$\therefore y = 2x – 3$ …(iii)
Substitute $y = 2x – 3$ in equation (ii),
$\therefore 4x – (2x – 3) – 5 = 0$
$\therefore 4x – 2x + 3 – 5 = 0$
$\therefore 2x = 5 – 3$
$\therefore 2x = 2$
$\therefore x = 1$
Put $x = 1$ in equation (iii),

$y = 2(1) – 3$
$\therefore y = 2 – 3$
$\therefore y = -1$
$\therefore x = 1$ and $y = -1$

Solution 1(vi):

$3x - 2y = 4 \quad ...(i)$
$6x + 7y = 19 \quad ...(ii)$
$3x - 2y = 4$
$\therefore 3x = 2y + 4$
$\therefore x = \frac{2y + 4}{3} \quad ...(iii)$
Put $x = \frac{2y + 4}{3}$ in equation (ii),
$6\left(\frac{2y + 4}{3}\right) + 7y = 19$
$\therefore 2(2y + 4) + 7y = 19$
$\therefore 4y + 8 + 7y = 19$
$\therefore 11y = 19 - 8$
$\therefore 11y = 11$
$\therefore y = 1$
Put $y = 1$ in equation (iii),
$x = \frac{2(1) + 4}{3}$
$\therefore x = \frac{6}{3}$
$\therefore x = 2$
$\therefore x = 2$ and $y = 1$

Exercise – 4.3

Solution 1(i):

$4x + 3y = 24 \quad \ldots(i)$

$3x + 4y = 25 \quad \ldots(ii)$

We observe that the coefficients of x and y in the first equation are interchanged in the second equation.

Add equations (i) and (ii) as follows.

$$\begin{array}{r} 4x + 3y = 24 \\ +\ 3x + 4y = 25 \\ \hline 7x + 7y = 49 \end{array}$$

$\therefore 7(x + y) = 49$

$\therefore x + y = 7$

Subtract equation (ii) from (i) as follows,

$$\begin{array}{rrr} 4x & +\ 3y & = 24 \\ 3x & +\ 4y & = 25 \\ - & - & - \\ \hline x & -\ y & = -1 \end{array}$$

$\therefore x + y = 7$ and $x - y = -1$

Solution 1(ii):

$5x + 7y = 17 \quad \ldots(i)$

$7x + 5y = 19 \quad \ldots(ii)$

We observe that the coefficients of x and y in the first equation are interchanged in the second equation.

Add equations (i) and (ii) as follows.

$$\begin{array}{rrr} 5x & +\ 7y & = 17 \\ +\ 7x & +\ 5y & = 19 \\ \hline 12x & +\ 12y & = 36 \end{array}$$

$12(x + y) = 36$

$\therefore x + y = 3$

Subtract equation (i) from (ii) as follows,

$$\begin{array}{rrr} 7x & +\ 5y & = 19 \\ 5x & +\ 7y & = 17 \\ - & - & - \\ \hline 2x & -\ 2x & = 2 \end{array}$$

$2(x - y) = 2$

$\therefore x - y = 1$

$\therefore x + y = 3$ and $x - y = 1$

Solution 1(iii):

$7x - 5y = -1$ ...(i)

$5x - 7y = -11$ ...(ii)

We observe that the coefficients of x and y in the first equation are interchanged in the second equation.

Add equations (i) and (ii) as follows.

$$\begin{array}{r} 7x - 5y = -1 \\ +\ 5x - 7y = -11 \\ \hline 12x - 12y = -12 \end{array}$$

$12(x - y) = -12$

$\therefore x - y = -1$

Subtract equation (ii) from (i) as follows,

$$\begin{array}{r} 7x - 5y = -1 \\ 5x - 7y = -11 \\ -\quad +\quad\quad + \\ \hline 2x + 2y = 10 \end{array}$$

$2(x + y)\ 10$

$\therefore x + y = 5$

$\therefore x + y = 5$ and $x - y = -1$

Solution 1(iv):

$5x - 3y = 14$ ...(i)

$3x - 5y = 2$ ...(ii)

We observe that the coefficients of x and y in the first equation are interchanged in the second equation.

Add equations (i) and (ii) as follows.

$$\begin{array}{r} 5x - 3y = 14 \\ +\ 3x - 5y = 2 \\ \hline 8x - 8y = 16 \end{array}$$

$8(x - y) = 16$

$\therefore x - y = 2$

Subtract equation (ii) from (i) as follows,

$$\begin{array}{r} 5x - 3y = 14 \\ 3x - 5y = 2 \\ -\quad +\quad\quad - \\ \hline 2x + 2y = 12 \end{array}$$

$2(x + y) = 12$

$\therefore x + y = 6$

$\therefore x + y = 6$ and $x - y = 2$

Solution 2(i):

$3x + 4y = 18 \quad \ldots(i)$

$4x + 3y = 17 \quad \ldots(ii)$

We observe that the coefficients of x and y in the first equation are interchanged in the second equation.

Add equations (i) and (ii) as follows.

$$\begin{array}{r} 3x + 4y = 18 \\ + \; 4x + 3y = 17 \\ \hline 7x + 7y = 35 \end{array}$$

$7(x + y) = 35$

$\therefore x + y = 5 \quad \ldots(iii)$

Subtract equation (i) from (ii) as follows,

$$\begin{array}{r} 4x + 3y = 17 \\ 3x + 4y = 18 \\ - \quad - \quad\quad - \\ \hline x - y = -1 \end{array}$$

$\therefore x - y = -1 \quad \ldots(iv)$

The coefficient of y in equations (iii) and (iv) are opposite numbers.

$\therefore$ By adding these equations we can eliminate y.

$$\begin{array}{r} x + y = 5 \\ + \; x - y = -1 \\ \hline 2x \quad\quad = 4 \end{array}$$

$\therefore x = 2$

Substitute $x = 2$ in the equation (iii)

$2 + y = 5$

$\therefore y = 3$

$\therefore x = 2, y = 3$ is the solution of the given equations.

Solution 2(ii):

$33x + 32y = 34 \quad \ldots(i)$

$32x + 33y = 31 \quad \ldots(ii)$

We observe that the coefficients of x and y in the first equation are interchanged in the second equation.

Add equations (i) and (ii) as follows.

$$\begin{array}{r} 33x + 32y = 34 \\ +\ 32x + 33y = 31 \\ \hline 65x + 65y = 65 \end{array}$$

$65(x + y) = 65$

$\therefore x + y = 1 \quad \ldots(iii)$

Subtract equation (ii) from (i) as follows,

$$\begin{array}{r} 33x + 32y = 34 \\ 32x + 33y = 31 \\ - \quad - \quad - \\ \hline x - y = 3 \end{array}$$

$\therefore x - y = 3$

The coefficient of y in equations (iii) and (iv) are opposite numbers.

$\therefore$ By adding these equations we can eliminate y.

$$\begin{array}{r} x + y = 1 \\ +\ x - y = 3 \\ \hline 2x \quad = 4 \end{array}$$

$\therefore x = 2$

Substitute $x = 2$ in the equation (iii)

$2 + y = 1$

$\therefore y = -1$

$\therefore x = 2, y = -1$ is the solution of the given equations.

Solution 2(iii):

$15x - 17y = 28 \quad ...(i)$

$15y - 17x + 36 = 0 \quad ...(ii)$

$17x - 15y = 36 \quad ...(iii)$

We observe that the coefficients of x and y in the first equation are interchanged in the third equation.

Add equations (i) and (iii) as follows.

$$\begin{array}{r} 15x - 17y = 28 \\ +\ 17x - 15y = 36 \\ \hline 32x - 32y = 64 \end{array}$$

$32(x - y) = 64$

$\therefore x - y = 2 \quad ...(iv)$

Subtract equation (i) from (iii) as follows,

$$\begin{array}{r} 17x - 15y = 36 \\ 15x - 17y = 28 \\ - \quad\ + \quad\ - \\ \hline 2x + 2y = 8 \end{array}$$

$2(x + y) = 8$

$\therefore x + y = 4 \quad ...(v)$

The coefficient of y in equations (iv) and (v) are opposite numbers.

$\therefore$ By adding these equations we can eliminate y.

$$\begin{array}{r} x + y = 4 \\ +\ x - y = 2 \\ \hline 2x \quad = 6 \end{array}$$

$\therefore x = 3$

Put $x = 3$ in equation (v),

$3 + y = 4$

$\therefore y = 1$

$\therefore x = 3, y = 1$ is the solution of the given equations.

Solution 2(iv):

$37x + 29y = 13 \quad \ldots(i)$

$29x + 37y = 53 \quad \ldots(ii)$

We observe that the coefficients of x and y in the first equation are interchanged in the second equation.

Add equations (i) and (ii) as follows.

$$\begin{array}{r} 37x + 29y = 13 \\ +\ 29x + 37y = 53 \\ \hline 66x + 66y = 66 \end{array}$$

$66(x + y) = 66$

$\therefore x + y = 1 \quad \ldots(iii)$

Subtract equation (ii) from (i) as follows,

$$\begin{array}{r} 37x + 29y = 13 \\ 29x + 37y = 53 \\ - \quad\ - \quad\ - \\ \hline 8x - 8y = -40 \end{array}$$

$8(x - y) = -40$

$\therefore x - y = -5 \quad \ldots(iv)$

The coefficient of y in equations (iii) and (iv) are opposite numbers.

$\therefore$ By adding these equations we can eliminate y.

$$\begin{array}{r} x + y = 1 \\ +\ x - y = -5 \\ \hline 2x \quad = -4 \end{array}$$

$\therefore x = -2$

Put $x = -2$ in equation (iii)

$-2 + y = 1$

$y = 1 + 2$

$\therefore y = 3$

$\therefore x = -2,\ y = 3$ is the solution of the given equations.

Solution 2(v):

$\frac{3}{2}x + \frac{2}{3}y = 13\frac{1}{3}$

$\therefore \frac{3}{2}x + \frac{2}{3}y = \frac{40}{3}$ ...(i)

$\frac{2}{3}x + \frac{3}{2}y = 8\frac{1}{3}$

$\therefore \frac{2}{3}x + \frac{3}{2}y = \frac{25}{3}$ ...(ii)

Multiplying each of the equation (i) and (ii) by 6,

$9x + 4y = 80$ ...(iii)

$4x + 9y = 50$ ...(iv)

We observe that the coefficients of x and y in the third equation are interchanged in the fourth equation.

Add equations (iii) and (iv) as follows.

$$\begin{array}{r} 9x + 4y = 80 \\ +\ 4x + 9y = 50 \\ \hline 13x + 13y = 130 \end{array}$$

$13(x + y) = 130$

$\therefore x + y = 10$ ...(v)

Subtract equation (iv) from (iii) as follows,

$$\begin{array}{r} 9x + 4y = 80 \\ 4x + 9y = 50 \\ - \quad - \quad - \\ \hline 5x - 5y = 30 \end{array}$$

$5(x - y) = 30$

$\therefore x - y = 6$ ...(vi)

The coefficient of y in equations (v) and (vi) are opposite numbers.

$\therefore$ By adding these equations we can eliminate y.

$$\begin{array}{r} x + y = 10 \\ +\ x - y = 6 \\ \hline 2x \quad = 16 \end{array}$$

$\therefore x = 8$

Put $x = 8$ in equation (v),

$8 + y = 10$

$y = 2$

$\therefore x = 8, y = 2$ is the solution of the given equations.

Exercise – 4.3

Solution 1(i):

Let the two numbers be x and y. $x > y$
According to the first condition,
$x + y = 125$ …(i)
According to the second condition,
$x – y = 25$ …(ii)

Solution 1(ii):

Let the complementary angles be x and y. $x > y$
So, $x + y = 90°$ (∵Sum of complementary angles is 90°)
According to the given condition,
$x – y = 6°$

Solution 1(iii):

Let the length of the rectangle be x cm and the breadth be y cm.
According to the first condition,
$x = y + 4$
$x – y = 4$ …(i)
According to the second condition,
$2(x + y) = 40$
$x + y = 20$ …(ii)

Solution 1(iv):

Let Sonali's age be x years and Monali's age of y years.
According to the first condition,
$x + y = 29$ …(i)
According to the second condition,
$y = x – 3$
$x – y = 3$ …(ii)

Solution 1(v):

Let the father's age be x years and the son's age be y years.
According to the first condition,
$x = 4y$
$x – 4y = 0$ …(i)

According to the second condition,
x – y = 30 …(ii)

Solution 2(i):

Let the first number be x and the second number be y.

Their ratio is 3 : 4 ...(Given)

$$\therefore \frac{x}{y} = \frac{3}{4}$$

$$\therefore 4x = 3y \quad \text{...(i)}$$

If 4 is added to each number, then the ratio becomes 4 : 5.

$$\therefore \frac{x+4}{y+4} = \frac{4}{5}$$

$$\therefore 5(x+4) = 4(y+4)$$

$$\therefore 5x + 20 = 4y + 16$$

$$\therefore 5x - 4y = 16 - 20$$

$$\therefore 5x - 4y = -4 \quad \text{...(ii)}$$

$$\therefore y = \frac{5x+4}{4} \quad \text{...(iii)}$$

Substituting this value of y in equation (i) we get,

$$4x = 3\left(\frac{5x+4}{4}\right)$$

$$\therefore 16x = 3(5x+4)$$

$$\therefore 16x = 15x + 12$$

$$\therefore 16x - 15x = 12$$

$$\therefore x = 12$$

Substitute the value of x in equation (iii) we get,

$$y = \frac{5(12)+4}{4}$$

$$\therefore y = \frac{60+4}{4}$$

$$\therefore y = \frac{64}{4}$$

$$\therefore y = 16$$

$\therefore$ The first number is 12 and the second number is 16.

Solution 2(ii):

Let the first number be x and the second number be y.

Their ratio is 5 : 6 ...(Given)

$\therefore \frac{x}{y} = \frac{5}{6}$

$\therefore 6x = 5y$ ...(i)

If 8 is subtracted from each number, then the ratio becomes 4 : 5.

$\therefore \frac{x - 8}{y - 8} = \frac{4}{5}$

$\therefore 5(x - 8) = 4(y - 8)$

$\therefore 5x - 40 = 4y - 32$

$\therefore 5x - 4y = -32 + 40$

$\therefore 5x - 4y = 8$ ...(ii)

$\therefore 4y = 5x - 8$

$\therefore y = \frac{5x - 8}{4}$ ...(iii)

Substitute this value of y in equation (i) we get,

$6x = 5\left(\frac{5x - 8}{4}\right)$

$\therefore 6x \times 4 = 25x - 40$

$\therefore 24x = 25x - 40$

$\therefore 25x - 24x = 40$

$\therefore x = 40$

Substitute this value of x in equation (iii) we get,

$y = \frac{5(40) - 8}{4}$

$\therefore y = \frac{200 - 8}{4}$

$\therefore y = \frac{192}{4}$

$\therefore y = 48$

$\therefore$ The first number is 40 and the second number is 48.

Solution 2(iii):

Let the digit in the units place be x and in the tens place be y.

$\therefore$ The number is $10y + x$.

The number obtained by interchanging the digits is $10x + y$

Sum of these two numbers is 99

$\therefore 10y + x + 10x + y = 99$

$\therefore 11x + 11y = 99$

$\therefore 11(x + y) = 99$

$\therefore x + y = 9 \qquad \ldots(i)$

Here, digits differ by 3, so there are two cases

Case(1) : $x > y$

$\therefore x - y = 3 \qquad \ldots(ii)$

Adding equation (i) and (ii) we get

$$\begin{array}{r} x + y = 9 \\ + \; x - y = 3 \\ \hline 2x \quad\quad = 12 \end{array}$$

$\therefore x = 6$

Substitute $x = 6$ in $x + y = 9$

$\therefore 6 + y = 9$

$\therefore y = 9 - 6$

$\therefore y = 3$

$\therefore$ The two digit number $= 10y + x$

$= 10(3) + 6$

$= 30 + 6$

$= 36$

Case(2) : $y > x$

$\therefore \ y - x = 3$

$\therefore -x + y = 3 \qquad \ldots(iii)$

Adding equation (i) and (iii) we get

$$\begin{array}{r} x + y = 9 \\ + \ -x + y = 3 \\ \hline 2y = 12 \end{array}$$

$\therefore \ y = 6$

Substitute $y = 6$ in $x + y = 9$

$\therefore \ x + 6 = 9$

$\therefore \ x = 9 - 6$

$\therefore \ x = 3$

$\therefore$ The two digit number $= 10y + x$

$= 10(6) + 3$

$= 60 + 3$

$= 63$

$\therefore$ The two digit number is either 36 or 63.

Solution 2(iv):

The sum of the measures of the angles of a triangle is 180°.

$\therefore \ x + 3x + y = 180.$

$\therefore \ 4x + y = 180 \qquad \ldots(i)$

$3y - 5x = 30$

$\therefore \ -5x + 3y = 30 \qquad \ldots(ii)$

Multiplying (i) equation by 3,

$12x + 3y = 540 \qquad \ldots(iii)$

Subtracting equation (ii) from (iii),

$$\begin{array}{rcrcl} 12x & + & 3y & = & 540 \\ -5x & + & 3y & = & 30 \\ + & & - & & - \\ \hline 17x & & & = & 510 \end{array}$$

$\therefore x = \dfrac{510}{17}$

$\therefore x = 30$

Substituting $x = 30$ in equation(i),

$4(30) + y = 180$

$\therefore 120 + y = 180$

$\therefore y = 180 - 120$

$\therefore y = 60$

$\therefore m\angle A = x = 30°,$

$m\angle B = 3x = 3 \times 30° = 90°$

$m\angle C = y = 60°$

$\therefore \Delta ABC$ is a right angled triangle with $m\angle B = 90°$.

Solution 2(v):

Let the numerator of the fraction be x and its denominator be y.

Twice the numerator = $2x$

The sum of the numerator and denominator = $x + y$

From the first condition,

$x + y = 2x + 4$

$\therefore x + y - 2x = 4$

$\therefore -x + y = 4 \quad \ldots(i)$

From the second condition,

$$\frac{(x+3)}{(y+3)} = \frac{2}{3}$$

$\therefore 3(x + 3) = 2(y + 3)$

$\therefore 3x + 9 = 2y + 6$

$\therefore 3x - 2y = 6 - 9$

$\therefore 3x - 2y = -3 \quad \ldots(ii)$

Multiplying equation (i) by 2

$-2x + 2y = 8 \quad \ldots(iii)$

Adding equation (ii) and (iii),

$$\begin{array}{rrcr} & 3x - 2y & = & -3 \\ + & -2x + 2y & = & 8 \\ \hline & x & = & 5 \end{array}$$

$\therefore x = 5$

Substituting $x = 5$ in equation (i)

$-5 + y = 4$

$\therefore y = 4 + 5$

$\therefore y = 9$

The required fraction is $\frac{5}{9}$.

Solution 2(vi):

Let the number of children be x and the sum of their present age be y years.

The sum of the present ages of the husband and his wife

= 4 x sum of the ages of their children

= 4y years.

Four years ago,

the sum of ages of husband and his wife was $(4y - 4 - 4)$ years

i.e. $(4y - 8)$ years

the sum of the ages of the children was $(y - 4x)$ years

From the first condition,

$$\frac{4y - 8}{y - 4x} = \frac{18}{1}$$

$\therefore\ 4y - 8 = 18(y - 4x)$

$\therefore\ 4y - 8 = 18y - 72x$

$\therefore\ 4y + 72x - 18y = 8$

$\therefore\ 72x - 14y = 8$

$\therefore\ 36x - 7y = 4 \qquad \ldots(i)$

Two years hence,

the sum of ages of husband and his wife will be $(4y + 4)$ years and

the sum of the ages of their children will be $(y + 2x)$ years

From the second condition,

$$\frac{4y + 4}{y + 2x} = \frac{3}{1}$$

$\therefore\ 4y + 4 = 3(y + 2x)$

$\therefore\ 4y + 4 = 3y + 6x$

$\therefore\ 6x + 3y - 4y = 4$

$\therefore\ 6x - y = 4 \qquad \ldots(ii)$

Multiplying equation (ii) by 7

$42x - 7y = 28 \qquad \ldots(iii)$

Subtracting equation (i) from (iii),

$$\begin{array}{rcl} 42x - 7y & = & 28 \\ 36x - 7y & = & 4 \\ - \quad + & & - \\ \hline 6x & = & 24 \end{array}$$

$\therefore\ x = \frac{24}{6}$

$\therefore\ x = 4$

$\therefore$ The number of children are 4.