5. Linear equations in two variables
Extra Questions

Q. 1) By using variables x and y form any four linear equations in two variables. (2 mark)

Ans : i) $x + y = 6$ ii) $4x - 3y = 5$

iii) $x - 2y = 8$ iv) $5x + 7y = 28$

Q. 2) Write three solutions of the equation $x + y = 10$ (2 mark)

Ans : $x + y = 10$

i) $x = -1$

$\therefore -1 + y = 10$

$\therefore y = 10 + 1$

$\therefore y = 11$

$\therefore (-1, 11)$

ii) $x = 3$

$\therefore 3 + y = 10$

$\therefore y = 10 - 3$

$\therefore y = 7$

$\therefore (3, 7)$

iii) $x = -2$

$\therefore -2 + y = 10$

$\therefore y = 10 + 2$

$\therefore y = 12$

$\therefore (-2, 12)$

- Create a simultaneous equations from the following terms : (1 mark)

Q. 3) sum of two numbers is 48.

Ans : $x + y = 48$

Q. 4) Four times of a larger number is equal to five times of smaller number.

Ans : Let larger number be x and small number be y

$\therefore 4x = 5y$

Q. 5 Reena is 4 years older than Tina.

Ans : Let Reena be x and Tina be y.

$\therefore x = y + 4$

- Elimination method of solving simultaneous equations (3 mark)

Q. 6 $x + y = 8, x - y = 2$

Ans : $x + y = 8$ ……. (I)

$x - y = 2$ ……. (II)

The coefficients of 'y' variable are the same, but signs are different.

∴ Adding equations (I) and (II) ,

$$\begin{array}{r} x + y = 8 \\ x - y = 2 \\ \hline 2x + 0 = 10 \end{array}$$

$\therefore \quad 2x = 10$

$\therefore \quad x = \frac{10}{2}$

$\therefore \quad \boxed{x = 5}$

Substituting $x = 5$ in equations (I), We get

$x + y = 8$

$\therefore 5 + y = 8$

$\therefore y = 8 - 5$

$\therefore \boxed{y = 3}$

$\therefore (5, 3)$ is the solution of given equations.

Q. 7) $x + 2y = 4$, $x + 3y = 16$ (3mark)

Ans : $x + 2y = 4$ …… (I)

$x + 3y = 16$ ……. (II)

Here, the coefficient of 'x' variable are the same and signs are same.

Subtracting equations (II) from (I)

$$\begin{array}{r} x + 2y = 4 \\ x + 3y = 16 \\ - \quad - \quad - \\ \hline 0 - y = -12 \end{array}$$

Substitating $\boxed{y = 12}$ in equations (I), we get

$x + 2y = 4$

$x + 2(12) = 4$

$x + 24 = 4$

$x = 4 - 24$

$\therefore \boxed{x = -20}$

$\therefore (-20, 12)$ is the solution of given equations.

Q. 8) $2x + y = 10, x - y = 8$

Ans : $2x + y = 10$ …… (I)

$x - y = 8$ …….. (II)

Here the coefficient of 'y' variable are the same, but signs are different.

∴ Adding equations (I) & (II),

$$2x + y = 10$$
$$x - y = 8$$
$$3x + 0 = 18$$

$$\therefore 3x = 18$$

$$\therefore x = \frac{18}{3}$$

$$\therefore \boxed{x = 6}$$

Substituting $\boxed{x = 6}$ in equations (II) we get,

$$x - y = 8$$

$$\therefore 6 - y = 8$$

$$\therefore -y = 8 - 6$$

$$\therefore -y = 2$$

$$\therefore \boxed{y = -2}$$

∴ $(6, -2)$ is the solution of the given equations.

Q. 9) $6x + 3y = 18$, $2x - 3y = 6$

Ans : $6x + 3y = 18$ …… (I)

$2x + 3y = 6$ ……. (II)

The coefficient of 'y' variable are the same, but signs are different.

Adding equations (I) & (II)

$$\begin{array}{r} 6x + 3y = 18 \\ + \quad 2x - 3y = 6 \\ \hline 8x + 0 = 24 \end{array}$$

$$8x = 24$$

$$x = \frac{24}{8}$$

$$\boxed{x = 3}$$

Substituting $x = 3$ in equations (II) we get,

$$2x - 3y = 6$$

$$2(3) - 3y = 6$$

$$6 - 3y = 6$$

$$-3y = 0$$

$$y = 0$$

∴ (3, 0) is the solution of the given equations.

Q. 10) Sum of the ages of father and son is 50 years if son's age is subtracted from twice of father's age then we get answer 52. Find the ages of father and son. (4 mark)

Ans : Let the father's today's age be x years.

And son's today's age be y years.

From the first condition, $x + y = 50$ …… (I)

From the second condition , $2x - y = 52$ …… (II)

The coefficient of 'y' variable are the same, but signs are different.

∴ Adding equations (I) & (II) we get,

$$\begin{array}{r} x + y = 50 \\ + \quad 2x - y = 52 \\ \hline 3x + 0 = 102 \end{array}$$

$$3x = 102$$

$$\therefore x = \frac{102}{3}$$

$$\therefore \boxed{x = 34}$$

Substituting $x = 34$ in equations (I) we get,

$x + y = 50$

$\therefore 34 + y = 50$

$\therefore y = 50 - 34$

$\therefore \boxed{y = 16}$

∴ Father's today's age = 34 years and son's today's age = 16 years.

➢ By equating coefficients of variables solve the following equations : (3 mark)

Q. 11) $4x + 3y = 18,\ 3x - 2y = 5$

Ans : $4x + 3y = 18$ ……. (I)

$3x - 2y = 5$ …….. (II)

To eliminate y, multiply equation (I) by 2 and multiply equation (II) by 3.

$\therefore 8x + 6y = 36$ …… (III)

$9x - 6y = 15$ ……. (IV)

In above two equations, coefficients of y are opposite numbers.

Adding equation (III) & (IV) we get,

$$\begin{array}{rl} & 8x + 6y = 36 \\ + & 9x - 6y = 15 \\ \hline & 17x + 0 = 51 \end{array}$$

$$17x = 51$$

$$x = \frac{51}{17}$$

$$\therefore \boxed{x = 3}$$

Substituting $x = 3$ in equation (I)

$$4(3) + 3y = 18$$

$$12 + 3y = 18$$

$$3y = 18 - 12$$

$$3y = 6$$

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

$$\therefore \boxed{y = 2}$$

$\therefore$ (3, 2) is the solution of given equation.

Q. 12) $2x + 3y = -4$; $x - 5y = 11$

Ans : $2x + 3y = -4$ …….. (I)

$x - 5y = 11$ …… (II)

To eliminate x , multiply equation (II) by 2

$2x + 3y = -4$ …….. (I)

$\therefore\ 2x - 10y = 22$ ……. (II)

In above two equations, coefficients of x are same and sign are also same.

Therefore subtracting equation (II) from (I)

$$\begin{array}{r} 2x + 3y = -4 \\ 2x - 10y = 22 \\ - \quad - \quad - \\ \hline 0x + 13y = -26 \end{array}$$

$13y = -26$

$y = \frac{-26}{13}$

$\therefore\ \boxed{y = -2}$

Substituting $y = -2$ in equation (II)

$x - 5y = 11$

$x - 5(-2) = 11$

$x + 10 = 11$

$\therefore x = 11 - 10$

$\therefore \boxed{x = 1}$

$\therefore (1, -2)$ is the solution of given equation.

Q. 13) $3x + 4y = 18$; $4x + 3y = 17$ complete the activity.

(3 mark)

$3x + 4y = 18$ …… …..(I)

$\square$ ……. (II)

To eliminate x , multiply equation (I) by $\square$ and multiply equation (II) by $\square$

$\therefore 12x + 16y = 72$ …… (III)

$\square$ …… (IV)

In above two equations, coefficient of x are same and sign are also same

$\therefore$ Subtracting equation (IV) from (III)

$12x + 16y = 72$
$12x + 9y = 51$
$- \quad - \quad -$

$\square$

$y = 3$

Substituting $y = 3$ in equation (I)

$$3x + 4y = 18$$

$$3x + 4(3) = 18$$

$$3x = 6$$

$$\therefore x = 2$$

$\therefore$ (2, 3) is solution of the given equation.

Ans : $3x + 4y = 18$ …… (I)

$4x + 3y = 17$ …… (II)

To eliminate x , multiply equation (I) by 4 and multiply equation (II) by 3

$\therefore 12x + 16y = 72$ …… (III)

$12x + 9y = 51$ …… (IV)

In above two equations, coefficient of x are same and sign are also same.

∴ Subtracting equation (IV) from (III)

$$\begin{array}{r} 12x + 16y = 72 \\ 12x + 9y = 51 \\ - \quad - \quad - \\ \hline 0x + 7y = 21 \end{array}$$

$$7y = 21$$

$$y = \frac{21}{7}$$

$$\therefore y = 3$$

Substituting $y = 3$ in equation (I)

$$3x + 4y = 18$$

$$3x + 4(3) = 18$$

$$\boxed{3x + 12 = 18}$$

$$\boxed{3x = 18 - 12}$$

$$3x = 6$$

$$\boxed{x = \frac{6}{3}}$$

$$\therefore x = 2$$

∴ (2, 3) is solution of the given equation.

Q. 14) $3a - 2b = -10$; $2a + 3b = 2$

Ans: $3a - 2b = -10$ …… (I)

$2a + 3b = 2$ …… (II)

To eliminate b, multiply equation (I) by 3 and multiply equation (II) by 2.

$9a - 6b = -30$ ……. (III)

$4a + 6b = 4$ ……. (IV)

Coefficient of b are same but signs are different.

∴ Adding equation (III) & (IV)

$$\begin{array}{r} 9a - 6b = -30 \\ 4a + 6b = \quad 4 \\ \hline 13a + 0 = -26 \end{array}$$

$$13a = -26$$

$$a = \frac{-26}{13}$$

$$\boxed{a = -2}$$

Substituting $a = -2$ in equation (II)

$$2a + 3b = 2$$

$2(-2) + 3b = 2$

$-4 + 3b = 2$

$3b = 2 + 4$

$3b = 6$

$b = \frac{6}{3}$

$\boxed{b = 2}$

$\therefore (-2, 2)$ is the solution of given equation.

Q. 15) $37x + 29y = 13$, $29x + 37y = 53$

Ans : $37x + 29y = 13$ ..... (i)

$29x + 37y = 53$.....(ii)

Adding equation (i) and (ii)

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

dividing both sides by 66

$\frac{66}{66}x + \frac{66}{66}y = \frac{66}{66}$

$x + y = 1$ ……. (III)

Subtracting equation (II) from (I),

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

dividing both sides by 8,

$$\frac{8}{8}x - \frac{8}{8}y = \frac{-40}{8}$$

$$\therefore x - y = -5 \text{ ….. (IV)}$$

Adding equation (III) & (IV),

$$\begin{array}{r} x + y = 1 \\ +\ x - y = -5 \\ \hline 2x + 0 = -4 \end{array}$$

$$2x = -4$$

$$x = \frac{-4}{2}$$

$$\boxed{x = -2}$$

Substituting $x = -2$ in equation (III)

$$x + y = 1$$

$$-2 + y = 1$$

$y = 1 + 2$

$\boxed{y = 3}$

$\therefore (-2, 3)$ is the solution of given equation.

- Substitution method of solving simultaneous equations.

(3 marks)

Q. 16) $x + y = 7,\ 5x + 12y = 7$

Ans : $x + y = 7$

$x + y - 7 = 0$ ..... (I)

$5x + 12y = 7$

$5x + 12y - 7 = 0$ ..... (II)

From equation (I) , $x = -y + 7$ ..... (III)

Substituting this value of x in equation (II)

$5(-y + 7) + 12y - 7 = 0$

$-5y + 35 + 12y - 7 = 0$

$7y = 7 - 35$

$7y = -28$

$$y = \frac{-28}{7}$$

$$\boxed{y = -4}$$

Substituting $y = -4$ in equation (III)

$$x = -y + 7$$

$$\therefore x = -(-4) + 7$$

$$\therefore x = 4 + 7$$

$$\therefore x = 11$$

$\therefore (11, 4)$ is the solution of given simultaneous equation.

Q. 17) $x + 8y = 19$, $2x + 11y = 28$

Ans : $x + 8y = 19$ ..... (I)

$2x + 11y = 28$ ..... (II)

From equation (I), $x = -8y + 19$ ..... (III)

Substituting this value of x in equation (II)

$$2x + 11y = 28$$

$$2(-8y + 19) + 11y = 28$$

$$-16y + 38 + 11y = 28$$

$$-16y + 11y = 28 - 38$$

$$-5y = -10$$

$$y = \frac{10}{5}$$

$$\boxed{y = 2}$$

Substituting $y = 2$ in equation (III)

$$x + 8y = 19$$

$$x + 8(2) = 19$$

$$x + 16 = 19$$

$$x = 19 - 16$$

$$\boxed{x = 3}$$

∴ (3, 2) is solution of given equation.

Q. 18) $2x + 3y = 8$, $2x = 2 + 3y$

Ans : $2x + 3y = 8$ …….. (I)

$2x = 2 + 3y$ …… (II)

From equation (II), $x = \frac{2 + 3y}{2}$

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

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

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

$$x = \frac{5}{2} y \ldots\ldots \text{(III)}$$

Substituting this value of x in equation (I)

$$2x + 3y = 8$$

$$2\left(\frac{5}{2}\right) y + 3y = 8$$

$$5y + 3y = 8$$

$$8y = 8$$

$$y = \frac{8}{8}$$

$$\boxed{y = 1}$$

Substituting y = 1 in equation (III)

$$x = \frac{5}{2} (1)$$

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

$$\boxed{x = 2.5}$$

∴ (2.5, 1) is the solution of given equation.

Q. 19) $2x + 7y = 39, \quad 3x + 5y = 31$

Ans : $2x + 7y = 39 \quad \ldots\ldots (I)$

$3x + 5y = 31 \quad \ldots\ldots (II)$

From equation (II) $3x = -5y + 31$

$$\therefore x = \frac{-5y + 31}{3} \ldots\ldots (III)$$

Substituting this value of x in equation (I)

$$2x + 7y = 39$$

$$2\left(\frac{-5y + 31}{3}\right) + 7y = 39$$

Multiply both sides by 3.

$$\Rightarrow 3 \times 2\left(\frac{-5y + 31}{3}\right) + 3 \times 7y = 3 \times 39$$

$$\Rightarrow 2(-5y + 31) + 21y = 117$$

$$\Rightarrow -10y + 62 + 21y = 117$$

$$\Rightarrow -10y + 21y = 117 - 62$$

$$\Rightarrow 11y = 55$$

$$\Rightarrow y = \frac{55}{11}$$

$\Rightarrow \therefore \boxed{y = 5}$

Substituting y = 5 in equation (III)

$$x = \frac{-5y + 31}{3}$$

$$x = \frac{-5(5) + 31}{3}$$

$$x = \frac{-25 + 31}{3}$$

$$x = \frac{6}{3}$$

$$\boxed{x = 2}$$

$\therefore$ (2, 5) is the solution of given equation.

Q. 20) $2x = 5y + 4,\ 5x = 11y + 4$

Ans : $2x = 5y + 4$ ……. (I)

$5x = 11y + 4$

$5x - 11y = 4$ ……. (II)

From equation (I), $2x = 5y + 4$

$$x = \frac{5y + 4}{2} \quad \text{……. (III)}$$

Substituting this value of x in equation (II)

$5\left(\frac{5y+4}{2}\right) - 11y = 4$

Multiply both sides by 2

$2 \times 5\left(\frac{5y+4}{2}\right) - 11 \times 2y = 4 \times 2$

$25y + 20 - 22y = 8$

$25y - 22y = 8 - 20$

$3y = -12$

$y = \frac{-12}{3}$

$\boxed{y = -4}$

Substituting $y = -4$ in equation

$x = \frac{5(-4)+4}{2}$

$x = \frac{-20+4}{2}$

$x = \frac{-16}{2}$

$\boxed{x = -8}$

$\therefore (-8, -4)$ is the solution of given equation.

➢ Solve : (4 Mark)

Q. 21) $\frac{3x}{2} + \frac{2y}{3} = \frac{40}{3}$; $\frac{2x}{3} + \frac{3y}{2} = \frac{25}{3}$

Ans : $\frac{3x}{2} + \frac{2y}{3} = \frac{40}{3}$ ……. (I)

$\frac{2x}{3} + \frac{3y}{2} = \frac{25}{3}$ ……. (II)

Multiplying each term of equation (I) by 6.

$6 \times \frac{3x}{2} + 6 \times \frac{2y}{3} = \frac{40}{3} \times 6$

$9x + 4y = 80$ …….. (III)

Multiplying each term of equation (II) by 6.

$6 \times \frac{2x}{3} + 6 \times \frac{3y}{2} = \frac{25}{3} \times 6$

$4x + 9y = 50$ ….. (IV)

Adding equations (III) & (IV)

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

\+ $4x + 9y = 50$ ..... (IV)

$13x + 13y = 130$

dividing both sides by 13,

$\frac{13}{13}x + \frac{13}{13}y = \frac{130}{13}$

$x + y = 10$ ……. (V)

subtracting equations (III) and (IV),

$$\begin{array}{rl} & 9x + 4y = 80 \quad \text{..... (III)} \\ - & 4x + 9y = 50 \quad \text{..... (IV)} \\ \hline & 5x - 5y = 30 \end{array}$$

dividing both sides by 5

$$\frac{5x}{5} - \frac{5y}{5} = \frac{30}{5}$$

$x - y = 6$ …… (VI)

Adding equations (V) and (VI)

$$\begin{array}{rl} & x + y = 10 \quad \text{..... (V)} \\ + & x - y = 6 \quad \text{..... (VI)} \\ \hline & 2x + 0 = 16 \end{array}$$

$2x = 16$

$x = \frac{16}{2}$

$\boxed{x = 8}$

Substituting $x = 8$ in equation (V)

$x + y = 10$

$\therefore 8 + y = 10$

$\therefore y = 10 - 8$

$\therefore \boxed{y = 2}$

$\therefore$ (8, 2) is the solution of given equation.

Q. 22) $2x - \frac{3y}{4} = 3, \quad x = y - 1$

Ans : $2x - \frac{3y}{4} = 3$ ..... (I)

$x = y - 1$ ..... (II)

Multiply equation (I) by 4

$4 \times 2x - \frac{3y}{4} \times 4 = 3 \times 4$

$8x - 3y = 12$ ..... (III)

From equation (II), $x = y - 1$

Substituting this value of x in equation (III)

$8x - 3y = 12$

$8 (y - 1) - 3y = 12$

$8y - 8 - 3y = 12$

$$8y - 3y = 12 + 8$$

$$5y = 20$$

$$y = \frac{20}{5}$$

$$\boxed{y = 4}$$

Substituting $y = 4$ in equation (II)

$$x = y - 1$$

$$x = 4 - 1$$

$$\therefore \boxed{x = 3}$$

$\therefore (3,4)$ is the solution of given equation.

Q. 23) $\frac{x}{3} + \frac{y}{4} = 4, \quad \frac{5x}{6} - \frac{y}{8} = 4$

Ans : $\frac{x}{3} + \frac{y}{4} = 4$ ……. (I)

$\frac{5x}{6} - \frac{y}{8} = 4$ ……. (II)

Multiplying each term of equation (I) by 12,

$$12 \times \frac{x}{3} + 12 \times \frac{y}{4} = 4 \times 12$$

$4x + 3y = 48$ …….. (III)

Multiplying each term of equation (II) by 48,

$$48 \times \frac{5x}{6} - 48 \times \frac{y}{8} = 48 \times 4$$

$$40x - 6y = 192 \quad \ldots\ldots \text{(IV)}$$

Adding equation (III) × 2 and equation (IV),

$$4x \times 2 + 3 \times 2y = 48 \times 2$$

$$8x + 6y = 96 \ldots\ldots \text{(V)}$$

$$\therefore 8x + 6y = 96 \quad \ldots\ldots \text{(V)}$$
$$+40x - 6y = 192 \quad \ldots\ldots \text{(IV)}$$

$$48x + 0 = 288$$

$$48x = 288$$

$$x = \frac{288}{48}$$

$$\boxed{x = 6}$$

Substituting $x = 6$ in equation (III)

$$4x + 3y = 48$$

$$4\,(6) + 3y = 48$$

$$3y = 48 - 24$$

$$3y = 24$$

$$y = \frac{24}{3}$$

$$\boxed{y = 8}$$

∴ (6, 8) is the solution of given equation.

Q. 24 $\frac{x+y}{4} - \frac{x-y}{3} = 1$, $\frac{x+y}{2} + \frac{x-y}{6} = 12$ (4 marks)

Ans : $\frac{x+y}{4} - \frac{x-y}{3} = 1$ ……. (I)

$$\therefore \frac{3(x+y) - 4(x-y)}{4 \times 3} = 1$$

$$\therefore \frac{3x + 3y - 4x + 4y}{12} = 1$$

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

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

$$\therefore -x + 7y = 12 \quad \text{……. (III)}$$

And $\frac{x+y}{2} - \frac{x-y}{6} = 12$ …… (II)

Multiplying each term of equation (II) by 6,

$$\therefore 6 \times \frac{x+y}{2} + \frac{x-y}{6} \times 6 = 12 \times 6$$

$$\therefore 3(x + y) + x - y = 72$$

$$\therefore 3x + 3y + x - y = 72$$

$\therefore 4x + 2y = 72$ ..... (IV)

To eliminate x, multiply equation (III) by 4,

$-4x + 28y = 48$ ..... (V)

Adding equations (IV) and (V)

$$\begin{array}{r} 4x + 2y = 72 \\ -\ 4x + 28y = 48 \\ \hline 0 + 30y = 120 \end{array}$$

$$30y = 120$$

$$y = \frac{120}{30}$$

$$\boxed{y = 4}$$

Substituting $y = 4$ in equation (III),

$\therefore -x + 7y = 12$

$\therefore -x + 7(4) = 12$

$\therefore -x + 28 = 12$

$\therefore -x = 12 - 28$

$\therefore -x = -16$

$\therefore \boxed{x = 16}$

$\therefore (16, 4)$ is the solution of given equation.

Q. 25) $\frac{x + y - 8}{2} = \frac{x + 2y - 14}{3} = \frac{3x + y - 12}{11}$ (4 marks)

Ans : $\frac{x + y - 8}{2} = \frac{x + 2y - 14}{3}$ ……. (I)

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

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

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

$\therefore x - y = -4$ …… (III)

And $\frac{x + y - 8}{2} = \frac{3x + y - 12}{11}$ …… (II)

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

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

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

$\therefore 5x + 9y = 64$ …… (IV)

Multiply equation (III) by 5,

$5x - 5y = -20$ …… (V)

Subtracting equation (IV) from equation (V)

$$\begin{array}{r} 5x - 5y = -20 \\ 5x + 9y = 64 \\ \hline 0 - 14y = -84 \end{array}$$

$14y = 84$

$y = \frac{84}{14}$

$\boxed{y = 6}$

Substituting $y = 6$ in equation (III)

$x - y = -4$

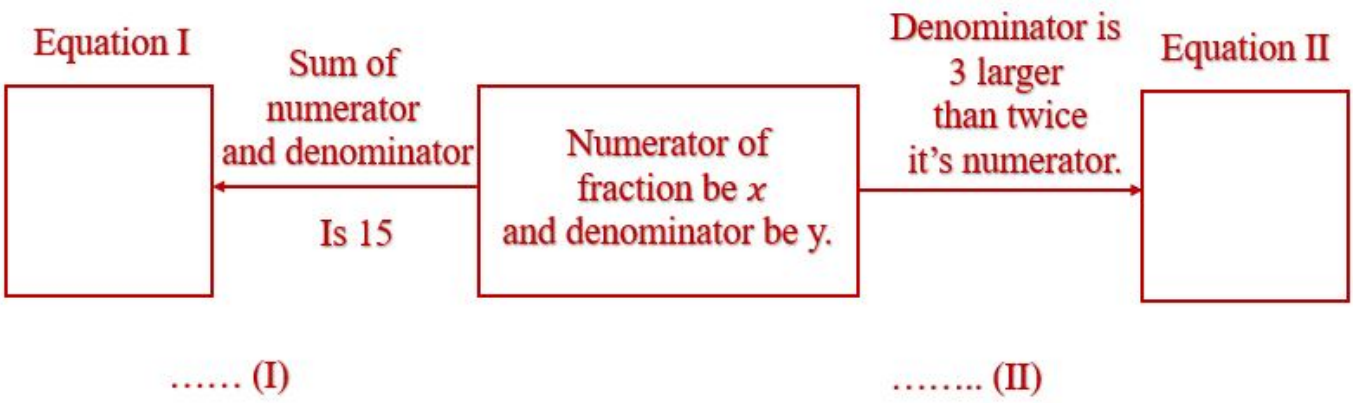
$x - 6 = -4$

$x = -4 + 6$

$\boxed{x = 2}$

$\therefore (2, 6)$ is the solution of given equation.

26. Instructions are given for following activity. From it, create and solve simultaneous equation. (3 marks)



Substituting value of equation (II) in equation (I)

Numerator : ☐ , Denominator : ☐ , Fraction : ☐

Ans : Let numerator of fraction be x and denominator be y.

From the first condition,

$$\boxed{x + y = 15} \qquad \ldots\ldots. (I)$$

From the second condition,

$$\boxed{y = 2x + 3} \qquad \ldots\ldots. (II)$$

Substituting $y = 2x + 3$ in equation (I), we get

$$x + y = 15$$

$$x + 2x + 3 = 15$$

$$3x = 15 - 3$$

$$3x = 12$$

$$x = \frac{12}{3}$$

$$\boxed{x = 4}$$

Substituting $x = 4$ in equation (II)

$$y = 2x + 3$$

$y = 2(4) + 3$

$y = 8 + 3$

$\boxed{y = 11}$

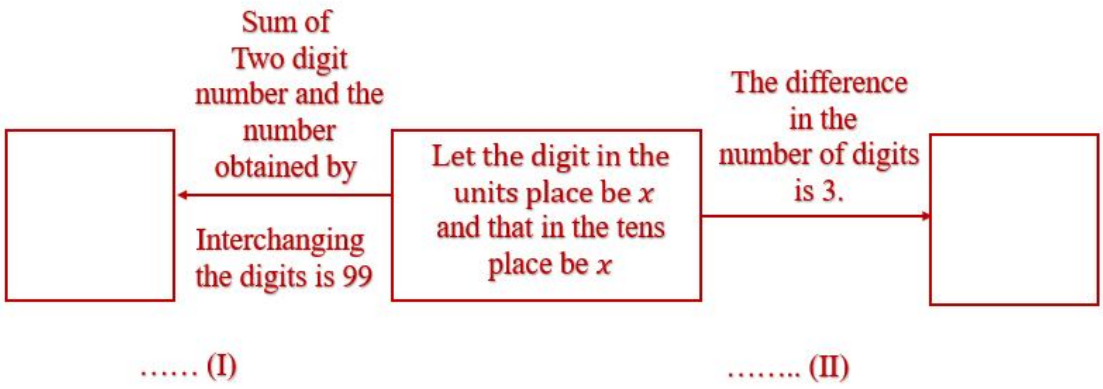
∴ Numerator = $\boxed{4}$, Denominator = $\boxed{11}$

From given condition, $= \frac{\text{Numerator}}{\text{Denominator}}$

$= \frac{x}{y}$

Fraction $= \frac{4}{11}$

Q. 27)



Solve the equation and find the number.

Ans : Let the digit in the unit place be x and that in the tens place be y.

∴ Then the number is $10y + x$

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

From first condition, we get.

$$10y + x + 10x + y = 99$$

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

$$\therefore x + y = 9 \ldots \text{(dividing both sides by 11) .. (I)}$$

From second condition,

$$x - y = 3 \quad \ldots\ldots \text{(II)}$$

Adding equation (I) & (II)

$$\begin{array}{rll} & x + y = 9 & \ldots\ldots \text{(I)} \\ + & x - y = 3 & \ldots\ldots \text{(II)} \\ \hline & 2x + 0 = 12 & \end{array}$$

$$2x = 12$$

$$x = \frac{12}{2}$$

$$\boxed{x = 6}$$

Substituting $x = 6$ in equation (I), we get

$$x + y = 9$$

$6 + y = 9$

$y = 9 - 6$

$\boxed{y = 3}$

Given number $= 10y + x$

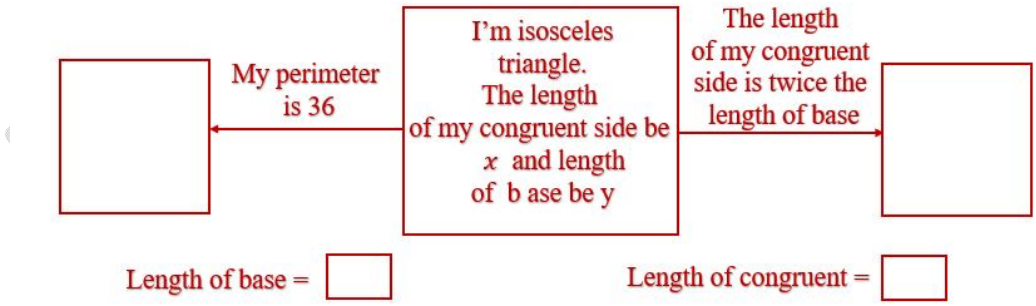
$= 10 \times 3 + 6$

$= 30 + 6$

$= 36$

$\therefore$ number $= 36$

Q. 28)



Ans : From first condition,

Length of congruent side be x and length of base be y.

Isosceles triangle = $x + x = 2x$

Perimeter of triangle = $2x + y = 30$ ….. (I)

From second condition, $x = 2y$ ….. (II)

From equation (II),

Substituting this value of x in equation (I),

$$2x + y = 30$$

$$2(2y) + y = 30$$

$$4y + y = 30$$

$$5y = 30$$

$$y = \frac{30}{5}$$

$$\boxed{y = 6}$$

Substituting y = 6 in equation (I),

$$2x + 6 = 30$$

$$2x = 30 - 6$$

$$2x = 24$$

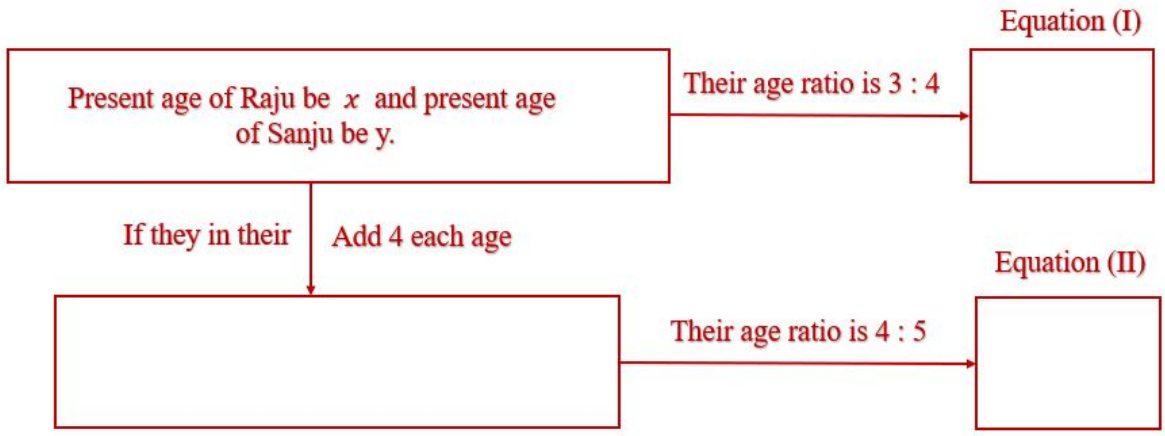
$$x = \frac{24}{2}$$

$x = 12$

Length of base = y = 6

Length of congruent side = x = 12

Q. 29



Ans : Present age of Raju be x and present age of Sanju be y.

From first condition $\frac{x}{y} = \frac{3}{4}$

$$4x = 3y$$

$$4x - 3y = 0 \ldots\ldots (I)$$

From second condition, $\frac{x+4}{y+4} = \frac{4}{5}$

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

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

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

$$5x - 4y = -4 \quad \ldots\ldots \text{(II)}$$

To eliminate x , multiplying equation (II) by 4 and multiplying equation (I) by 5.

$$20x - 15y = 0 \qquad \ldots\ldots \text{(III)}$$
$$20x - 16y = -16 \qquad \ldots\ldots \text{(IV)}$$
$$- \quad - \quad -$$

$0 + y = 16$ ..... subtracting equation (III) & (IV)

$\therefore \boxed{y = 16}$

Substituting y = 16 in equation (I)

$$4x - 3(16) = 0$$

$$4x - 48 = 0$$

$$4x = 48$$

$$x = \frac{48}{4}$$

$$\boxed{x = 12}$$

$\therefore$ Present age of Raju $= x =$ 12 years

Present age of Sanju = y = 16 years

Q. 30 The length of rectangle is 4 cm more than its breadth. Perimeter of rectangle is 40 cm. Find it's length and breadth. (4 marks)

Let length of Rectangle be x cm and breadth of rectangle be y cm. From first condition,

$\therefore x - \square = 4$ …… (I)

From second condition, perimeter of rectangle = 40 cm.

Perimeter of Rectangle = 2 (length + breadth)

….. (formulae)

$\therefore \square = 40$

$\therefore x + y = \square$ …… (II)

Adding equation (I) & (II)

$$\begin{array}{rll} & x - \square = 4 & \text{..... (I)} \\ + & x + y = \square & \text{..... (II)} \\ \hline & 2x = 24 & \end{array}$$

$\therefore x = \square$ cm

Substituting $x = \square$ in equation (II)

$12 + y = \square$

$\therefore y = \square - 12$

$\therefore y = \square$ cm

Length of Rectangle = $\square$ cm and breadth = $\square$ cm.

Ans : Let length of Rectangle be x cm and breadth of rectangle be y cm.

From first condition,

$\therefore x - \boxed{y} = 4$ …… (I)

From second condition, perimeter of rectangle = 40 cm.

Perimeter of Rectangle = 2 (length + breadth)

….. (formulae)

$\therefore \boxed{2(x + y)} = 40$

$2x + 2y = 40$

Dividing both sides by 2,

$x + y = \boxed{20}$ ……. (I)

Adding equation (I) & (II)

$x - \boxed{y} = 4$ ……. (I)

$+ x + y = \boxed{20}$ ……. (II)

$2x = 24$

$\therefore x = \boxed{\frac{24}{2}}$ cm

$x = \boxed{12}$ cm

Substituting $x = \boxed{12}$ in equation (II)

$12 + y = \boxed{20}$

$\therefore y = \boxed{20} - 12$

$\therefore y = \boxed{8}$ cm

Length of Rectangle = $\boxed{12\text{ cm}}$ cm and breadth = $\boxed{8\text{ cm}}$ cm.

Q. 31 Solve the following sets of simultaneous equation (2mark)

$2x - 7y = 7$; $3x + y = 22$

Ans : Let the smaller number be x and larger number be y.

From first condition,

$\therefore 2x - 7y = 7$ ……. (i)

$3x + y = 22$

$\therefore y = 22 - 3x$ …… (ii)

Substituting $y = 22 - 3x$ in equation (i),

$2x - 7(22 - 3x) - 7$

$\therefore 2x - 154 + 21x - 7$

$\therefore 23x - 7 + 154$

$\therefore 23x = 161$

$\therefore x = \frac{161}{23}$

$\therefore x = 7$

Substituting x = 7 in equation (ii)

$y = 22 - 3x$

$\therefore y - 22 - 3(7)$

$\therefore y = 22 - 21 = 1$

$\therefore$ (7, 1) is the solution of the given equtions.

Q. 32. Sum of two numbers is 35 and difference between two numbers is 15 then find the numbers.(3 marks)

Ans : Let first number be x and second number be y.

From first condition, $x + y = 35$ …. (I)

From second condition, $x - y = 15$ …… (II)

Adding equations (I) and (II)

$$\begin{array}{rrll} & x + y & = 35 & \ldots\ldots (I) \\ + & x - y & = 15 & \ldots\ldots (II) \\ \hline & 2x + 0 & = 50 & \end{array}$$

$2x = 50$

$x = \frac{50}{2}$

$\boxed{x = 25}$

Substituting $x = 25$ in equation (I)

$25 + y = 35$

$y = 35 - 25$

$\boxed{y = 10}$

∴ That numbers 25 and 10.

Q. 33) The total cost of 3 books and 10 pens is 300 rupees and the total cost of 2 books and 3 pens is 145 rupees. Find the cost of 1 book and 3 pens. (3 marks)

Ans : Let the cost of 1 book be x and 1 pen be y.

From first condition, $3x + 10y = 300$ …… (I)

From second condition, $2x + 3y = 145$ ……. (II)

To eliminate x, multiply equation (I) by 2 and multiply equation (II) by 3.

$(3x + 10y = 300)$

$6x + 20y = 600$

$(2x + 3y = 145)$

$6x + 9y = 435$

Adding above the equation

$$6x + 20y = 600 \quad \ldots\ldots (I)$$
$$6x + 9y = 435 \quad \ldots\ldots (II)$$
$$- \quad - \quad - \quad -$$
$$11y = 165$$

$$y = \frac{165}{11}$$

$$\therefore \boxed{y = 15}$$

Substituting y = 15 in equation (I)

$$3x + 10\,(15) = 300$$

$$3x + 150 = 300$$

$$3x = 300 - 150$$

$$3x = 150$$

$$x = \frac{150}{3}$$

$$\therefore \boxed{x = 50}$$

Cost of 1 book = Rs. $\boxed{50}$

Cost of 1 pen = Rs. 15

∴ Cost of 3 pen = 3 × 15

= Rs. 45

∴ Cost of one book and 3 pen = 50 + 45 = Rs. 95

Q. 34) The total cost of 5 Rings and 3 Bracelet is 15, 000 rupees and the total cost of 3 Rings and 5 Bracelets is 17, 000 rupees. Find the total cost of 2 rings and 4 Bracelets?

Ans : Let cost of one Ring be x and

Cost of 1 Bracelet be y.

From first condition,

$5x + 3y = 15000$ ..... (I)

From second condition, $3x + 5y = 17{,}000$ ..... (II)

Adding equation (I) and (II)

$$\begin{array}{r} 5x + 3y = 15000 \\ 3x + 5y = 17000 \\ \hline 8x + 8y = 32000 \end{array}$$

Dividing both sides by 8,

$\frac{8}{8}x + \frac{8}{8}y = \frac{32000}{8}$

$x + y = 4000$ ..... (III)

Subtracting equation (I) and (II)

$$5x + 3y = 15000$$
$$3x + 5y = 17000$$
$$- \quad - \quad -$$
$$2x - 2y = -2000$$

Dividing both sides by 2,

$$\frac{2}{2}x - \frac{2}{2}y = \frac{-2000}{2}$$

$$x - y = -1000 \ldots\ldots \text{(IV)}$$

Adding equations (III) and (IV)

$$x + y = 4000$$
$$x - y = -1000$$
$$2x + 0 = 3000$$
$$2x + 0 = 3000$$

$$x = \frac{3000}{2}$$

$$\boxed{x = 1500}$$

Substituting $x = 1500$ in equation (III)

$$1500 + y = 4000$$

$$y = 4000 - 1500$$

$$y = 2500$$

$\therefore$ Cost of one Ring x = Rs. 1500

Cost of one Bracelet y = Rs. 2500

∴ Cost of 2 Rings $= 2 \times 1500 = 3000$ Rupees and cost of of 4 Bracelets $= 4 \times 2500 = 10,000$ Rupees

∴ Total cost of 2 Rings and 4 Bracelets $= 3000 + 10,000 =$ Rs. 13, 000

Q. 35) By equating coefficients of variables solve the following equations. (3 Mark)

x – 2y = -10; 3x – 5y = -12

Ans : x – 2y = -10 …… (i)

3x – 5y = -12 ……(ii)

Multiplying equation (i) by 3,

3x – 6y = -30 ……(iii)

Subtracting equation (iii) from equation (ii),

$$\begin{array}{rrrr} 3x - 5y = & -12 \ldots\ldots(ii) \\ 3x - 6y = & -30 \ldots\ldots(iii) \\ - \quad + & + & \\ \hline y = & 18 \end{array}$$

Substituting y = 18 in equation (i),

X x – 2 (18) = -10

$\therefore x - 36 = -10 \qquad \therefore x = -10 + 36$

$\therefore x = 26$

(26, 18) is the solution of the given equations.

Q. 36 The ratio of incomes of Amruta and Nikhil is 5 : 4. The ratio of their expenses is 3 : 2. If every one's savings are 26, 000 . Find the income of each.

Ans : Let ,

Income of Amruta be Rs. x, Income of Nikhil be Rs. y

From first condition, $\frac{x}{y} = \frac{5}{4}$

$$\therefore 4x = 5y$$

$$\therefore 4x - 5y = 0 \quad \ldots\ldots (I)$$

Expenses of Amruta = Income $-$ saving

$$\text{Rs.} = x - 26,000$$

Expenses of Nikhil = Income $-$ saving

$$\text{Rs.} = y - 26,000$$

From second condition, $\frac{x - 26,000}{y - 26,000} = \frac{3}{2}$

$$\therefore 2(x - 26{,}000) = 3\,(y - 26{,}000)$$

$$\therefore 2x - 52{,}000 = 3y - 78{,}000$$

$$\therefore 2x - 3y = -78{,}000 + 52{,}000$$

$$\therefore 2x - 3y = -26{,}000 \ldots\ldots \text{(II)}$$

To eliminate x, multiply equation (II) by 2,

$$4x - 6y = -52{,}000 \qquad \ldots\ldots \text{(III)}$$

Subtracting equation (I) and (III),

$$\begin{array}{rrrr} & 4x & -5y & = 0 \\ & 4x & -6y & = -52{,}000 \\ - & - & + & \\ \hline & 0 & +y & = 52{,}000 \end{array}$$

$$Y = 52{,}000$$

Substituting y = 52, 000 in equation (I)

$$4x - 5y = 0$$

$$4x - 5\,(52{,}000) = 0$$

$$4x - 2{,}60{,}000 = 0$$

$$4x = 2{,}60{,}000$$

$$x = \frac{2{,}60{,}000}{4}$$

$\therefore \boxed{x = 65,000}$

$\therefore$ Income of Amruta x = Rs. 65, 000

Income of Nikhil y = Rs. 52, 000

Q. 37) If denominator of fraction is increased by 2 then the resulting fraction is $\frac{1}{2}$. If numerator of fraction is decreased by 5 then the resulting fraction is $\frac{1}{3}$. Find the given fraction.

Ans : Let the numerator of fraction be x and denominator be y.

$\therefore$ Given fraction = $\frac{x}{y}$ …… (I)

From first condition, $\frac{x}{y+2} = \frac{1}{2}$

$\therefore 2x = y + 2$

$\therefore 2x - y = 2$ ….. (II)

From second condition, $\frac{x-5}{y} = \frac{1}{3}$

$\therefore 3(x - 5) = y$

$3x - 15 = y$

$\therefore 3x - y = 15$ …… (III)

Subtracting equation (II) from (III)

$$\begin{array}{rrr} 3x & - y & = 15 \\ 2x & - y & = 2 \\ - & - & - \\ \hline x & + 0 & = 13 \end{array}$$

Substituting $x = 13$ in equation (II)

$\therefore 2\,(13) - y = 2$

$\therefore 26 - y = 2$

$\therefore -y = 2 - 26$

$\therefore -y = -24$

$\therefore \boxed{y = 24}$

From equation (I), fraction $= \frac{x}{y} = \frac{13}{24}$

Q. 38). Sum of ages of mother and daughter is 60. After 15 years, mother's age will be twice as that of her daughter's at that time. Find their present ages. (3 marks)

Let age of mother be x and age of daughter be y.

From first condition, $x + y = \square$ ….. (I)

From second condition $\square = 15$ …… (II)

Subtracting equation (I) and (II),

$$\begin{array}{rrl} x + y & = & \square \\ \square & = & 15 \\ - \quad - & & - \\ \hline x & = & 45 \end{array}$$

Substituting $x = 45$ in equation (I)

$45 + y = \square$

$y = 60 - 45$

$y = \square$

Age of mother = $\square$, Age of daughter = $\square$

Ans :

Let age of mother be x and age of daughter be y.

From first condition, $x + y = \boxed{60}$ ….. (I)

From second condition $\boxed{2x + y} = 15$ …… (II)

Subtracting equation (I) and (II),

$$\begin{array}{rrl} x + y & = & \boxed{60} \\ \boxed{2x + y} & = & 15 \\ - \quad - & & - \\ \hline x + 0 & = & 45 \end{array}$$

Substituting $x = 45$ in equation (I)

$45 + y = \boxed{60}$

$y = 60 - 45$

$y = \boxed{15}$

Age of mother = $\boxed{45 \text{ years}}$, Age of daughter = $\boxed{15 \text{ years}}$

Q. 39) Solve the following simultaneous equations : (4 Mark)

$\frac{x}{3} + 5y = 13;\ 2x + \frac{y}{2} = 19$

Ans : $\frac{x}{3} + 5y = 13$ …… (i)

$2x + \frac{y}{2} = 19$ …… (ii)

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

$X\ x + 15y = 39$ …….. (iii)

$4x + y = 38$ ……..(iv)

Multiplying equation (iii) by 4,

$$4x + 60y = 156 \ldots\ldots\ldots\ldots (v)$$
$$4x + y = 38 \quad \ldots\ldots\ldots\ldots (iv)$$
$$- \quad - \quad = \quad -$$
$$59y = 118$$

…… [Subtracting equation (iv) from equation (v)]

$\therefore y = \frac{118}{59}$ $\therefore y = 4$

Substituting y = 2 in eqation (iii),

x + 15 (2) = 39

$\therefore$ x + 30 = 39 $\therefore$ x = 39 – 30

$\therefore$ x = 9

$\therefore$ (9, 2) is the solution of the given equations.

Q. 40) The total number of tiger and duck in a certain zoo is 70. The total number of their legs is 180. Then find the number of tiger's and duck's in the zoo. (3 marks)

Ans : Let there be x tiger's and y ducks in the zoo

from first condition, $x + y = 70$ ….. (I)

A tiger has 4 legs.

$\therefore$ Total number of legs of tigers $= 4x$

A duck has 2 legs.

$\therefore$ Total number of legs of ducks = 2y

From the second condition,

$4x + 2y = 180$

Dividing equation by 2.

$\therefore \frac{4x}{2} + \frac{2y}{2} = \frac{180}{2}$

$\therefore 2x + y = 90$ …… (II)

Subtracting equation (I) from (II)

$$\begin{array}{rrr} 2x & + y & = 90 \\ x & + y & = 70 \\ - & - & - \\ \hline x & + 0 & = 20 \end{array}$$

$\therefore \boxed{x = 20}$

Substituting $x = 20$ in equation (I)

$x + y = 70$

$20 + y = 70$

$y = 70 - 20$

$\boxed{y = 50}$

$\therefore$ number of tigers $x = 20$

and number of duck $y = 50$

Q. 41) In a competitive examination, there were, 100 questions. The correct answer would carry 2 marks, and for

incorrect answer 1 mark would be subtracted Prakash had attempted all the questions and he got total 80 marks. Then how many questions he got wrong ? (4 marks)

Ans : Suppose Prakash got x correct answers and y wrong answers.

From the first condition, $x + y = 100$ ….. (I)

From x correct answers he got $2 \times x = 2x$ marks

For y wrong answers $y \times (-1) = -y$

∴ y marks were deducted.

So he got $2x - y$ marks.

From second condition, $2x - y = 80$ ….. (II)

Adding equations (I) and (II),

$$\begin{array}{rl} & x + y = 100 \\ + & 2x - y = 80 \\ \hline & 3x + 0 = 180 \end{array}$$

$$3x = 180$$

$$x = \frac{180}{3}$$

$$\therefore x = 60$$

Substituting $x = 60$ in equation (I),

$$x + y = 100$$

$$60 + y = 100$$

$$y = 100 - 60$$

$$y = 40$$

∴ Prakash got 60 correct answers and 40 wrong answers.

Q. 42) Divide a rope of length 540 cm into 2 parts such that twice the length of the smaller part is equal to $\frac{1}{4}$ of the larger part. Then find the length of larger part. (4 marks)

Ans : Let the length of larger part be x cm and that of the smaller part be y cm.

From first condition, $x + y = 540$ …. (I)

From second condition, $2y = \frac{x}{4}$

$$8y = x$$

$$-x + 8y = 0 \quad \text{….. (II)}$$

Adding equations (I) and (II)

$$\begin{array}{r} x + y = 540 \\ -\ x + 8y = 0 \\ \hline 0 + 9y = 540 \end{array}$$

$\therefore 9y = 540$

$y = \frac{540}{9}$

$\boxed{y = 60}$

Substituting y = 60 in equation (I)

$x + y = 540$

$\therefore x + 60 = 540$

$\therefore x = 540 - 60$

$\therefore x = 480$

∴ Length of larger part = 480 cm.

Q. 43 Sum of two numbers is 60. One number is 7 larger than twice it's second number. Then find two numbers.

Ans : Let larger number be x and smaller number be y.

From first condition, $x + y = 70$ ….. (I)

From second condition, $x = 2y + 7$

$\therefore x - 2y = 7$ ….. (II)

To eliminate y, multiply equation (I) by 2,

$2x + 2y = 140$ ….. (III)

Adding equations (II) and (III)

$$\begin{array}{rl} & x - 2y = 7 \\ + & 2x + 2y = 140 \\ \hline & 3x + 0 = 147 \end{array}$$

$$3x = 147$$

$$x = \frac{147}{3}$$

$$\boxed{x = 49}$$

Substituting $x = 49$ in equation (I)

$$x + y = 70$$

$$\therefore 49 + y = 70$$

$$\therefore y = 70 - 49$$

$$\therefore \boxed{y = 21}$$

∴ Given two numbers are 49 and 21.

Q. 44 The population of a certain town was 50,000. In a year, male population was increased by 5 % and female population was increased by 8 % . Now the population become 53,220.

Then what was the number of males and females in the previous year ?

Ans : Let the number of males in previous year be x,

Number of females be y.

From first condition, x + y = 50,000 ….. (I)

Male population increased by 5 %

∴ Number of males = x + 5 % of x

$$= x + x \times \frac{5}{100}$$

$$= \frac{100x + 5x}{100}$$

$$= \frac{105x}{100}$$

Female population increased by 8 %

∴ Number of females = y + 8 % of y

$$= y + y \times \frac{8}{100}$$

$$= \frac{100y + 8y}{100}$$

$$= \frac{108y}{100}$$

According to the second condition,

In a year population became 53, 220

$\therefore \frac{105}{100}x + \frac{108}{100}y = 53,220$

$\therefore 105x + 18y = 53,22,000$ ….. (II)

(∵ multiply both sides by 100)

Multiply equation (I) by 108

$108x + 108y = 54,00,000$ ….. (III)

Subtracting equations (III) from (II)

$$\begin{array}{rll} & 108x + 108y & = 54,00,000 \\ - & 105x + 108y & = 53,22,000 \\ \hline & 3x & = 78000 \end{array}$$

$x = \frac{78000}{3}$

$x = 26,000$

Substituting this value in equation (I)

$x + y = 50,000$

$26,000 + y = 50,000$

$y = 50{,}000 - 26{,}000$

$y = 24{,}000$

∴ number of males in previous year = 26, 000

Number of females in previous year = 24,000

Q. 45 The sum of ages of Advita and Monali is 29 years. The difference of ages of Advita and Monali is 25 years. Then find their today's ages.

Ans : Let age of Advita be x years and age of Monali be y years

From first condition, $x + y = 29$ ….. (I)

From second condition, $x - y = 25$ ….. (II)

Adding equations (I) & (II)

$$\begin{array}{r} x + y = 29 \\ x - y = 25 \\ \hline 2x + 0 = 4 \end{array}$$

$2x = 4$

$\therefore x = \frac{4}{2}$

$\therefore \boxed{x = 2}$

Substituting this value in equation (I)

$$2 + y = 29$$

$$y = 29 - 2$$

$$\boxed{y = 27}$$

∴ Age of Advita = 2 years and Age of Monali = 27 years.

Q. 46 The price of 5 kg sugar and 2 kg Rice is Rs. 330 and the price of 2 kg sugar and 1 kg Rice is Rs. 145. Find the price of 6 kg sugar and 7 kg Rice. (4 marks)

Ans : Let price of 1 kg sugar be Rs x

And price of 1 kg Rice be Rs. y

From first condition, $5x + 2y = 330$ ….. (I)

From second condition, $2x + y = 145$ ….. (II)

Multiply equation (II) by 2,

$$\therefore 4x + 2y = 290 \quad \ldots\ldots \text{(III)}$$

Subtracting equation (II) from (I)

$$\begin{array}{r} 5x + 2y = 330 \\ \underline{-\ 4x + 2y = 290} \\ x + 0 = 40 \end{array}$$

$\boxed{x = 40}$

Substituting $x = 40$ in equation (II)

$2x + y = 145$

$2(40) + y = 145$

$80 + y = 145$

$y = 145 - 80$

$\therefore \boxed{y = 65}$

$\therefore$ Price of 1 kg sugar x Rs. 40

Price of 1 kg Rice y Rs. 65

$\therefore$ Total price of 6 kg sugar and 7 kg rice

$= 6(40) + 7(65)$

$= 240 + 455$

$=$ Rs. 695

Q. 47 Two numbers are in the ratio 4 : 5. If 7 is added from one number and 16 is subtracted from second number then the ratio becomes 5 : 4. Find the numbers. (4 marks)

Ans : Let one number be x and second number be y.

From first condition, $\frac{x}{y} = \frac{4}{5}$

$$\therefore 5x = 4y$$

$$\therefore 5x - 4y = 0 \quad \ldots\ldots (I)$$

From second condition,

$$\frac{x+7}{y-16} = \frac{5}{4}$$

$$\therefore 4(x + 7) = 5(y - 16)$$

$$\therefore 4x + 28 = 5y - 80$$

$$\therefore 4x - 5y = -80 - 28$$

$$\therefore 4x - 5y = -108 \ldots. (II)$$

Multiply equation (I) by 5

$$\therefore 25x - 20y = 0 \quad \ldots\ldots (III)$$

Multiply equation (II) by 4

$$16x - 20y = -432 \quad \ldots\ldots (IV)$$

Subtracting equation (IV) from (III)

$$\begin{array}{rrr} 25x - 20y & = & 0 \\ \underline{16x - 20y} & = & \underline{-432} \\ 9x & = & 432 \end{array}$$

$$x = \frac{432}{9}$$

$$\boxed{x = 48}$$

Substituting this value in equation (I)

$$5x - 4y = 0$$

$$\therefore 5(48) - 4y = 0$$

$$\therefore 240 - 4y = 0$$

$$\therefore -4y = -240$$

$$\therefore 4y = 240$$

$$\therefore y = \frac{240}{4}$$

$$\therefore \boxed{y = 60}$$

∴ Given two numbers are 48 and 60.

Q. 48) Sangram gets fixed monthly income. Every year there is a certain increment in his salary. After 4 years his monthly salary was Rs. 3500 and after 10 years his monthly salary became 4,400 rupees then find his original salary and yearly increment. (4 marks)

Ans : Let Samgram's fixed monthly salary be Rs. x

And the yearly increment be Rs. y.

From first condition, then in 4 years his salary

$\therefore x + 4y = 3500$ …… (I)

From second condition, then in 10 years

$\therefore x + 10y = 4400$ ….. (II)

Subtracting equation (I) from (II)

$$\begin{aligned} \therefore x + 4y &= 3500 \\ -x + 10y &= 4400 \\ \hline -6y &= -900 \end{aligned}$$

$$6y = 900$$

$$y = \frac{900}{6}$$

$$\boxed{y = 150}$$

Substituting this value in equation (I)

$$x + 4y = 3500$$

$$\therefore x + 4(150) = 3500$$

$$\therefore x = 3500 - 600$$

$$\therefore \boxed{x = \text{Rs. } 2900}$$

∴ Sangram's monthly salary is Rs. 2900 and yearly increment is Rs. 150

Q. 49) $5x + 7y = 17$, $7x + 5y = 19$ (4 *marks*)

Ans : $5x + 7y = 17$ ….. (I)

$7x + 5y = 19$ ….. (II)

Adding equations (I) and (II)

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

$x + y = 3$ …… (III) …. (dividing both sides by 12)

Subtracting equation (I) and (II)

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

$-x + y = -1$ ….. (IV) …. (dividing both sides by 2)

Adding equations (III) and (IV)

$$\begin{array}{rrl} & x + y & = 3 \\ - & x + y & = -1 \\ \hline & 2y & = 2 \end{array}$$

$$y = \frac{2}{2}$$

$$\boxed{y = 1}$$

Substituting this value in equation (III)

$$x + y = 3$$

$$x + 1 = 3$$

$$x = 3 - 1$$

$$\boxed{x = 2}$$

∴ (2, 1) is the solution of given equation.

Q. 50) $12x + 17y = 53$, $17x + 12y = 63$ (4 marks)

Ans : $12x + 17y = 53$ ….. (I)

$17x + 12y = 63$ …… (II)

Adding equations (I) and (II)

$$\begin{array}{rl} & 12x + 17y = 53 \\ + & 17x + 12y = 63 \\ \hline & 29x + 29y = 116 \end{array}$$

Dividing both sides by 29

$x + y = 4$ …… (III)

Subtracting equations (I) and (II)

$$\begin{array}{rl} 12x + 17y & = 53 \\ 17x + 12y & = 63 \\ \hline -5x + 5y & = -10 \end{array}$$

Dividing both sides by 5

$$-x + y = -2 \quad \ldots\ldots \text{(IV)}$$

Adding equations (III) and (IV)

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

$$\boxed{y = 1}$$

Substituting this value in equation (III)

$$x + 1 = 4$$

$$x = 4 - 1$$

$$\boxed{x = 3}$$

$\therefore (3, 1)$ is the solution of given equation.

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