4 Simple Equations

Learn and Remember

1. A combination of constants and variables connected by the sign of fundamental operations of addition, subtraction, multiplication and division is called the algebraic expression.
2. An equation is a condition on variable such that two expressions in the variable should have equal value.
3. Solution of equation is the value of the variable for which satisfied the equation.
4. An equation remains same when the expression on the left and on the right are interchanged.
5. For balancing or solving the equation, we can:
   (*i*) Add same number to both sides.
   (*ii*) Subtract same number from both sides.
   (*iii*) Multiply and divide both sides by same non-zero numbers.
6. We can transpose any term from one side of an equation to other side of the equation by changing the sign.

TEXTBOOK QUESTIONS SOLVED

Exercise 4.1 *(Page No. 81-82)*

Q1. Complete the last column of the table.

Sol.

S.No.	Equation	Value	Say, whether the Equation is satisfied. (Yes/No)
(*i*)	$x + 3 = 0$	$x = 3$	No
(*ii*)	$x + 3 = 0$	$x = 0$	No
(*iii*)	$x + 3 = 0$	$x = -3$	Yes
(*iv*)	$x - 7 = 1$	$x = 7$	No
(*v*)	$x - 7 = 1$	$x = 8$	Yes
(*vi*)	$5x = 25$	$x = 0$	No
(*vii*)	$5x = 25$	$x = 5$	Yes

(viii)	$5x = 25$	$x = -5$	No
(ix)	$\frac{m}{3} = 2$	$x = -6$	No
(x)	$\frac{m}{3} = 2$	$m = 0$	No
(xi)	$\frac{m}{3} = 2$	$m = 6$	Yes

Q2. Check whether the value given in the brackets is a solution to the given equation or not:

(a) $n + 5 = 19$ $(n = 1)$ **(b) $7n + 5 = 19$ $(n = -2)$**

(c) $7n + 5 = 19$ $(n = 2)$ **(d) $4p - 3 = 13$ $(p = 1)$**

(e) $4p - 3 = 13$ $(p = -4)$ **(f) $4p - 3 = 13$ $(p = 0)$**

Sol. (a) $n + 5 = 19$ $(n = 1)$

Putting $n = 1$ in L.H.S. of the given equation,

L.H.S. $= 1 + 5$

$\Rightarrow \quad 6 \neq 19 =$ R.H.S.

$\Rightarrow$ L.H.S. $\neq$ R.H.S.

Thus, $n = 1$ is not the solution of the given equation.

(b) $7n + 5 = 19$ $(n = -2)$

Putting $n = -2$ in L.H.S. of the given equation,

L.H.S. $= 7(-2) + 5$

$\Rightarrow \quad -14 + 5$

$\Rightarrow \quad -9 \neq 19 =$ R.H.S.

$\Rightarrow$ L.H.S. $\neq$ R.H.S.

Thus, $n = (-2)$ is not the solution of the given equation.

(c) $7n + 5 = 19$ $(n = 2)$

Putting $n = 2$ in L.H.S. of the given equation,

L.H.S. $= 7(2) + 5$

$\Rightarrow \quad 14 + 5$

$\Rightarrow \quad 19 = 19 =$ R.H.S.

$\Rightarrow$ L.H.S. $=$ R.H.S.

Thus, $n = 2$ is the solution of the given equation.

(d) $4p - 3 = 13$ $(p = 1)$

Putting $p = 1$ in L.H.S. of the given equation,

L.H.S. $= 4(1) - 3$

$\Rightarrow \quad 4 - 3$

$\Rightarrow \quad 1 \neq 13 =$ R.H.S.

$\Rightarrow$ L.H.S. $\neq$ R.H.S.

Thus, $p = 1$ is not the solution of the given equation.

(e) $4p - 3 = 13$ $(p = -4)$

Putting $p = (-4)$ in L.H.S. of the given equation,

L.H.S. $= 4(-4) - 3$

$\Rightarrow \quad -16 - 3$

$\Rightarrow \quad -19 \neq 13 =$ R.H.S.

$\Rightarrow$ L.H.S. $\neq$ R.H.S.

Thus, $p = (-4)$ is not the solution of the given equation.

(f) $4p - 3 = 13$ $(p = 0)$

Putting $p = 0$ in L.H.S. of the given equation,

L.H.S. $= 4(0) - 3$

$\Rightarrow \quad 0 - 3$

$\Rightarrow \quad -3 \neq 13 =$ R.H.S.

$\Rightarrow$ L.H.S. $\neq$ R.H.S.

Thus, $p = 0$ is not the solution of the given equation.

Q3. Solve the following equations by trial and error method:

(i) $5p + 2 = 17$ **(ii) $3m - 14 = 4$**

Sol. (i) We have, $5p + 2 = 17$

(a) **Trial method:**

$5p + 2 = 17$

Putting $p = -3$, $5(-3) + 2 = 17 \Rightarrow -15 + 2 = 17$

$\Rightarrow -13 \neq 17$

Putting $p = -2$, $5(-2) + 2 = 17 \Rightarrow -10 + 2 = 17$

$\Rightarrow -8 \neq 17$

Putting $p = -1$, $5(-1) + 2 = 17 \Rightarrow -5 + 2 = 17$

$\Rightarrow -3 \neq 17$

Putting $p = 0$, $5(0) + 2 = 17 \Rightarrow 0 + 2 = 17$

$\Rightarrow 2 \neq 17$

Putting $p = 1$, $5(1) + 2 = 17 \Rightarrow 5 + 2 = 17$

$\Rightarrow 7 \neq 17$

Putting $p = 2$, $5(2) + 2 = 17 \Rightarrow 10 + 2 = 17$
$\Rightarrow 12 \neq 17$

Putting $p = 3$, $5(3) + 2 = 17 \Rightarrow 15 + 2 = 17$
$\Rightarrow 17 = 17$

Thus, $p = 3$ is the required solution of the given equation.

(*b*) **Error method:**

$5p + 2 = 17$

$\Rightarrow \quad 5p = 17 - 2 \quad \Rightarrow \quad 5p = 15$

Therefore, $p = \frac{15}{5} = 3$

Thus, $p = 3$ is the required solution of the given equation.

(*ii*) We have, $3m - 14 = 4$

(*a*) **Trial method:**

$3m - 14 = 4$

Putting $m = -2$, $3(-2) - 14 = 4 \Rightarrow -6 - 14 = 4$
$\Rightarrow -20 \neq 4$

Putting $m = -1$, $3(-1) - 14 = 4 \Rightarrow -3 - 14 = 4$
$\Rightarrow -17 \neq 4$

Putting $m = 0$, $3(0) - 14 = 14 \Rightarrow 0 - 14 = 14$
$\Rightarrow -14 \neq 14$

Putting $m = 1$, $3(1) - 14 = 4 \Rightarrow 3 - 14 = 14$
$\Rightarrow -11 \neq 4$

Putting $m = 2$, $3(2) - 14 = 4 \Rightarrow 6 - 14 = 4$
$\Rightarrow -8 \neq 4$

Putting $m = 3$, $3(3) - 14 = 4 \Rightarrow 9 - 14 = 4$
$\Rightarrow -5 \neq 4$

Putting $m = 4$, $3(4) - 14 = 4 \Rightarrow 12 - 14 = 4$
$\Rightarrow -2 \neq 4$

Putting $m = 5$, $3(5) - 14 = 4 \Rightarrow 15 - 14 = 4$
$\Rightarrow 1 \neq 4$

Putting $m = 6$, $3(6) - 14 = 4 \Rightarrow 18 - 14 = 4$
$\Rightarrow 4 = 4$

Thus, $m = 6$ is the required solution of the given equation.

(*b*) **Error method:**

$3m - 14 = 4$

$\Rightarrow \quad 3m = 4 + 14 \quad \Rightarrow \quad 3m = 18$

Therefore, $m = \frac{18}{3} = 6$

Thus, $m = 6$ is the required solution of the given equation.

Q4. Write equations for the following statements:

(*i*) The sum of numbers x and 4 is 9.

(*ii*) 2 subtracted from y is 8.

(*iii*) Ten times a is 70.

(*iv*) The number b divided by 5 gives 6.

(*v*) Three-fourth of t is 15.

(*vi*) Seven times m plus 7 gets you 77.

(*vii*) One-fourth of a number x minus 4 gives 4.

(*viii*) If you take away 6 from 6 times y, you get 60.

(*ix*) If you add 3 to one-third of z, you get 30.

Sol. (*i*) The sum of number x and $4 = x + 4$

According to condition, $\Rightarrow x + 4 = 9.$

(*ii*) 2 is subtracted from $y = y - 2$

According to condition, $\Rightarrow y - 2 = 8.$

(*iii*) Ten times $a = 10a$

According to condition, $\Rightarrow 10a = 70.$

(*iv*) The number b divided by $5 = b \div 5 = \frac{b}{5}$

According to condition, $\Rightarrow \frac{b}{5} = 6.$

(*v*) Three-fourth of $t = \frac{3}{4}t$

According to condition, $\Rightarrow \frac{3}{4}t = 15.$

(*vi*) Seven times of $m = 7m \Rightarrow 7m$ plus $7 = 7m + 7$

According to condition, $\Rightarrow 7m + 7 = 77.$

(*vii*) One-fourth of a number $x = \frac{x}{4}$ minus $4 = \frac{x}{4} - 4$

According to condition, $\Rightarrow \frac{x}{4} - 4 = 4.$

(*viii*) 6 times $y = 6y$

Take away 6 from $6y = 6y - 6$

According to condition, $\Rightarrow$ $6y - 6 = 60$.

(*ix*) One-third of $z = \frac{z}{3}$

Add 3 to $\frac{z}{3} = \frac{z}{3} + 3$

According to condition, $\Rightarrow$ $\frac{z}{3} + 3 = 30$.

Q5. Write the following equations in statement forms:

(*i*) $p + 4 = 15$ **(*ii*)** $m - 7 = 3$ **(*iii*)** $2m = 7$

(*iv*) $\frac{m}{5} = 3$ **(*v*)** $\frac{3m}{5} = 6$ **(*vi*)** $3p + 4 = 25$

(*vii*) $4p - 2 = 18$ **(*viii*)** $\frac{p}{2} + 2 = 8$

Sol. (*i*) The sum of numbers p and 4 is 15.

(*ii*) 7 subtracted from m is 3.

(*iii*) Two times m is 7.

(*iv*) The number m is divided by 5 gives 3.

(*v*) Three-fifth of the number m is 6.

(*vi*) Three times p plus 4 gets 25.

(*vii*) If you take away 2 from 4 times p, you get 18.

(*viii*) If you added 2 to half of p, you get 8.

Q6. Set up an equation in the following cases:

(*i*) Irfan says that he has 7 marbles more than five times the marbles Parmit has. Irfan has 37 marbles. (Take m to be the number of Parmit's marbles.)

(*ii*) Laxmi's father is 49 years old. He is 4 years older than three times Laxmi's age. (Take Laxmi's age to be y years.)

(*iii*) The teacher tells the class that the highest marks obtained by a student in her class is twice the lowest marks plus 7. The highest score is 87. (Take the lowest score to be l.)

(*iv*) In an isosceles triangle, the vertex angle is twice either base angle. (Let the base angle be b in degrees. Remember that the sum of angles of a triangle is 180 degrees.)

Sol. (*i*) Let m be the number of Parmit's marble.

According to the given conditions,

five times of Parmit's marble and add 7 marbles.

$\Rightarrow$ $5m + 7 = 37$.

(*ii*) Let the age of Laxmi be y years.

According to the given conditions,

three times of Laxmi's age and add 4 years.

$\Rightarrow$ $3y + 4 = 49$.

(*iii*) Let the lowest marks be l.

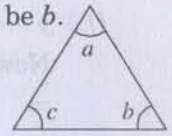
According to given conditions,

the twice the lowest marks plus 7 get 87.

$\Rightarrow$ $2l + 7 = 87$.

(*iv*) Let the base angle of the isosceles triangle be b.

According to given conditions, the vertex angle is twice either base angle $= 2b$.



We know that, $a + b + c = 180°$

(By angle sum property of triangle)

$2b + b + b = 180°$ $(\because \angle b = \angle c)$

$4b = 180°$.

Exercise 4.2 *(Page No. 86)*

Q1. Give first the step you will use to separate the variable and then solve the equation:

(*a*) $x - 1 = 0$ **(*b*)** $x + 1 = 0$ **(*c*)** $x - 1 = 5$

(*d*) $x + 6 = 2$ **(*e*)** $y - 4 = -7$ **(*f*)** $y - 4 = 4$

(*g*) $y + 4 = 4$ **(*h*)** $y + 4 = -4$

Sol. (*a*) $x - 1 = 0$

Now, adding 1 to both sides, we get

$\Rightarrow$ $x - 1 + 1 = 0 + 1$

or $x = 1$, which is the required solution.

(*b*) $x + 1 = 0$

Now, subtracting 1 from both sides, we get

$\Rightarrow$ $x + 1 - 1 = 0 - 1$

or $x = -1$, which is the required solution.

(c) $x - 1 = 5$

Now, adding 1 to both sides, we get

$\Rightarrow \quad x - 1 + 1 = 5 + 1$

or $\quad x = 6$, which is the required solution.

(d) $x + 6 = 2$

Now, subtracting 6 from both sides, we get

$\Rightarrow \quad x + 6 - 6 = 2 - 6$

or $\quad x = -4$, which is the required solution.

(e) $y - 4 = -7$

Now, adding 4 to both sides, we get

$\Rightarrow \quad y - 4 + 4 = -7 + 4$

or $\quad y = -3$, which is the required solution.

(f) $y - 4 = 4$

Now, adding 4 to both sides, we get

$\Rightarrow \quad y - 4 + 4 = 4 + 4$

or $\quad y = 8$, which is the required solution.

(g) $y + 4 = 4$

Now, subtracting 4 from both sides, we get

$y + 4 - 4 = 4 - 4$

or $\quad y = 0$, which is the required solution.

(h) $y + 4 = -4$

Now, subtracting 4 from both sides, we get

$y + 4 - 4 = -4 - 4$

or $\quad y = -8$, which is the required solution.

Q2. Give first the step you will use to separate the variable and then solve the equation:

(a) $3l = 42$ **(b)** $\frac{b}{2} = 6$ **(c)** $\frac{p}{7} = 4$

(d) $4x = 25$ **(e)** $8y = 36$ **(f)** $\frac{z}{3} = \frac{5}{4}$

(g) $\frac{a}{5} = \frac{7}{15}$ **(h)** $20t = -10$.

Sol. (a) $3l = 42$

Now, dividing by 3 on both sides, we get

$\Rightarrow \quad \frac{3l}{3} = \frac{42}{3}$

or $\quad l = 14$, which is the required solution.

(b) $\frac{b}{2} = 6$

Now, multiplying by 2 on both sides, we get

$\Rightarrow \quad \frac{b}{2} \times 2 = 6 \times 2$

or $\quad b = 12$, which is the required solution.

(c) $\frac{p}{7} = 4$

Now, multiplying both sides by 7, we get

$\Rightarrow \quad \frac{p}{7} \times 7 = 4 \times 7$

or $\quad p = 28$, which is the required solution.

(d) $4x = 25$

Now, dividing both sides by 4, we get

$\Rightarrow \quad \frac{4x}{4} = \frac{25}{4}$

or $\quad x = \frac{25}{4}$, which is the required solution.

(e) $8y = 36$

Now, dividing both sides by 8, we get

$\Rightarrow \quad \frac{8y}{8} = \frac{36}{8}$

or $\quad y = \frac{9}{2}$, which is the required solution.

(f) $\frac{z}{3} = \frac{5}{4}$

Now, multiplying both sides by 3, we get

$\Rightarrow \quad \frac{z}{3} \times 3 = \frac{5}{4} \times 3$

or $\quad z = \frac{15}{4}$, which is the required solution.

(g) $\frac{a}{5} = \frac{7}{15}$

Now, multiplying both sides by 5, we get

$\Rightarrow \quad \frac{a}{5} \times 5 = \frac{7}{15} \times 5$

or $\quad a = \frac{7}{3}$, which is the required solution.

(h) $20t = -10$

Now, dividing both sides by 20, we get

$\Rightarrow \quad \frac{20t}{20} = \frac{-10}{20}$

or $\quad t = \frac{-1}{2}$, which is the required solution.

Q3. Give the steps you will use to separate the variable and then solve the equation:

(a) $3n - 2 = 46$ **(b) $5m + 7 = 17$**

(c) $\frac{20p}{3} = 40$ **(d) $\frac{3p}{10} = 6$.**

Sol. (a) $3n - 2 = 46$

Step I. Adding 2 to both sides, we get

$\Rightarrow \quad 3n - 2 + 2 = 46 + 2$

$\Rightarrow \quad 3n = 48$

Step II. Dividing both sides by 3, we get

$\Rightarrow \quad \frac{3n}{3} = \frac{48}{3}$

or $\quad n = 16$, which is the required solution.

(b) $5m + 7 = 17$

Step I. Subtracting 7 from both sides, we get

$\Rightarrow \quad 5m + 7 - 7 = 17 - 7$

$\Rightarrow \quad 5m = 10$

Step II. Dividing both sides by 5, we get

$\Rightarrow \quad \frac{5m}{5} = \frac{10}{5}$

or $\quad m = 2$, which is the required solution.

(c) $\frac{20p}{3} = 40$

Step I. Multiplying both sides by 3, we get

$\Rightarrow \quad \frac{20p}{3} \times 3 = 40 \times 3$

$20p = 120$

Step II. Dividing both sides by 20, we get

$\Rightarrow \quad \frac{20p}{20} = \frac{120}{20}$

or $\quad p = 6$, which is the required solution.

(d) $\frac{3p}{10} = 6$

Step I. Multiplying both sides by 10, we get

$\Rightarrow \quad \frac{3p}{10} \times 10 = 6 \times 10$

$\Rightarrow \quad 3p = 60$

Step II. Dividing both sides by 3, we get

$\Rightarrow \quad \frac{3p}{3} = \frac{60}{3}$

or $\quad p = 20$, which is the required solution.

Q4. Solve the following equations:

(a) $10p = 100$ **(b) $10p + 10 = 100$** **(c) $\frac{p}{4} = 5$**

(d) $\frac{-p}{3} = 5$ **(e) $\frac{3p}{4} = 6$** **(f) $3s = -9$**

(g) $3s + 12 = 0$ **(h) $3s = 0$** **(i) $2q = 6$**

(j) $2q - 6 = 0$ **(k) $2q + 6 = 0$** **(l) $2q + 6 = 12$.**

Sol. (a) $10p = 100$

Now, dividing both sides by 10, we get

$\Rightarrow \quad \frac{10p}{10} = \frac{100}{10}$

or $\quad p = 10$, which is the required solution.

(b) $10p + 10 = 100$

Now, subtracting 10 from both sides, we get

$\Rightarrow \quad 10p + 10 - 10 = 100 - 10$

$\Rightarrow \quad 10p = 90$

Then, dividing both sides by 10, we get

$$\Rightarrow \quad \frac{10p}{10} = \frac{90}{10}$$

or $p = 9$, which is the required solution.

(c) $\frac{p}{4} = 5$

Now, multiplying both sides by 4, we get

$$\Rightarrow \quad \frac{p}{4} \times 4 = 5 \times 4$$

or $p = 20$, which is the required solution.

(d) $\frac{-p}{3} = 5$

Now, multiplying both sides by (-3), we get

$$\Rightarrow \quad \frac{-p}{3} \times (-3) = 5 \times (-3)$$

or $p = -15$, which is the required solution.

(e) $\frac{3p}{4} = 6$

Now, multiplying by 4 and divided by 3 on both sides, we get

$$\Rightarrow \quad \frac{3p}{4} \times \frac{4}{3} = \frac{6 \times 4}{3}$$

$$\Rightarrow \quad p = 2 \times 4$$

or $p = 8$, which is the required solution.

(f) $3s = -9$

Now, dividing both sides by 3, we get

$$\Rightarrow \quad \frac{3s}{3} = \frac{-9}{3}$$

or $s = -3$, which is the required solution.

(g) $3s + 12 = 0$

Now, subtracting 12 from both sides, we get

$$\Rightarrow \quad 3s + 12 - 12 = 0 - 12$$

$$\Rightarrow \quad 3s = -12,$$

Then, dividing both sides by 3, we get

$$\Rightarrow \quad \frac{3s}{3} = \frac{-12}{3}$$

or $s = -4$, which is the required solution.

(h) $3s = 0$

Now, dividing both sides by 3, we get

$$\Rightarrow \quad \frac{3s}{3} = \frac{0}{3}$$

or $s = 0$, which is the required solution.

(i) $2q = 6$

Now, dividing both sides by 2, we get

$$\Rightarrow \quad \frac{2q}{2} = \frac{6}{2}$$

or $q = 3$, which is the required solution.

(j) $2q - 6 = 0$

Now, adding 6 to both sides, we get

$$\Rightarrow \quad 2q - 6 + 6 = 0 + 6$$

$$\Rightarrow \quad 2q = 6$$

Then, dividing both sides by 2, we get

$$\Rightarrow \quad \frac{2q}{2} = \frac{6}{2}$$

or $q = 3$, which is the required solution.

(k) $2q + 6 = 0$

Now, subtracting 6 from both sides, we get

$$\Rightarrow \quad 2q + 6 - 6 = 0 - 6$$

$$\Rightarrow \quad 2q = -6$$

Then, dividing both sides by 2, we get

$$\Rightarrow \quad \frac{2q}{2} = \frac{-6}{2}$$

or $q = -3$, which is the required solution.

(l) $2q + 6 = 12$

Now, subtracting 6 from both sides, we get

$$\Rightarrow \quad 2q + 6 - 6 = 12 - 6$$

$$\Rightarrow \quad 2q = 6$$

Then, dividing both sides by 2, we get

$$\Rightarrow \quad \frac{2q}{2} = \frac{6}{2}$$

or $q = 3$, which is the required solution.

Exercise 4.3 *(Page No. 89)*

Q1. Solve the following equations:

(a) $2y + \frac{5}{2} = \frac{37}{2}$ **(b)** $5t + 28 = 10$ **(c)** $\frac{a}{5} + 3 = 2$

(d) $\frac{q}{4} + 7 = 5$ **(e)** $\frac{5}{2}x = 10$ **(f)** $\frac{5}{2}x = \frac{25}{4}$

(g) $7m + \frac{19}{2} = 13$ **(h)** $6z + 10 = -2$ **(i)** $\frac{3l}{2} = \frac{2}{3}$

(j) $\frac{2b}{3} - 5 = 3.$

Sol. (a) $2y + \frac{5}{2} = \frac{37}{2}$

$\Rightarrow \quad 2y = \frac{37}{2} - \frac{5}{2}$ (Transposing $\frac{5}{2}$ to R.H.S.)

$\Rightarrow \quad 2y = \frac{37-5}{2} \quad \Rightarrow \quad 2y = \frac{32}{2} \quad \Rightarrow \quad 2y = 16$

$\Rightarrow \quad y = \frac{16}{2}$ (Dividing both sides by 2.)

or $\quad y = 8$, which is the required solution.

(b) $5t + 28 = 10$

$\Rightarrow \quad 5t = 10 - 28$ (Transposing 28 to R.H.S.)

$\Rightarrow \quad 5t = -18 \quad \Rightarrow \quad t = \frac{-18}{5}$ (Dividing both sides by 5.)

or $\quad t = \frac{-18}{5}$, which is the required solution.

(c) $\frac{a}{5} + 3 = 2$

$\Rightarrow \quad \frac{a}{5} = 2 - 3$ (Transposing 3 to R.H.S.)

$\Rightarrow \quad \frac{a}{5} = -1 \quad \Rightarrow \quad a = -1 \times 5$

(Multiplying both sides by 5.)

or $\quad a = -5$, which is the required solution.

(d) $\frac{q}{4} + 7 = 5$

$\Rightarrow \quad \frac{q}{4} = 5 - 7$ (Transposing 7 to R.H.S.)

$\Rightarrow \quad \frac{q}{4} = -2 \quad \Rightarrow \quad q = -2 \times 4$

(Multiplying both sides by 4.)

or $\quad q = -8$, which is the required solution.

(e) $\frac{5}{2}x = 10$

$\Rightarrow \quad 5x = 10 \times 2$ (Multiplying both sides by 2.)

$\Rightarrow \quad 5x = 20 \quad \Rightarrow \quad x = \frac{20}{5}$ (Dividing both sides by 5.)

or $\quad x = 4$, which is the required solution.

(f) $\frac{5}{2}x = \frac{25}{4}$

$\Rightarrow \quad 5x = \frac{25 \times 2}{4}$ (Multiplying both sides by 2.)

$\Rightarrow \quad 5x = \frac{25}{2} \quad \Rightarrow \quad x = \frac{25}{2} \times \frac{1}{5}$

(Dividing both sides by 5.)

or $\quad x = \frac{5}{2}$, which is the required solution.

(g) $7m + \frac{19}{2} = 13$

$\Rightarrow \quad 7m = 13 - \frac{19}{2}$ (Transposing $\frac{19}{2}$ to R.H.S.)

$\Rightarrow \quad 7m = \frac{26-19}{2} \quad \Rightarrow \quad 7m = \frac{7}{2}$

$\Rightarrow \quad m = \frac{7}{2} \times \frac{1}{7}$ (Dividing both sides by 7.)

or $\quad m = \frac{1}{2}$, which is the required solution.

(h) $6z + 10 = -2$

$\Rightarrow \quad 6z = -2 - 10$ (Transposing 10 to R.H.S.)

$\Rightarrow \quad 6z = -12 \quad \Rightarrow \quad z = \frac{-12}{6}$

(Dividing both sides by 6.)

or $\quad z = -2$, which is the required solution.

(i) $\frac{3l}{2} = \frac{2}{3}$

$\Rightarrow \quad 3l = \frac{2}{3} \times 2$ (Multiplying both sides by 2.)

$\Rightarrow \quad 3l = \frac{4}{3} \quad \Rightarrow \quad l = \frac{4}{3} \times \frac{1}{3}$

(Dividing both sides by 3.)

or $\quad l = \frac{4}{9}$, which is the required solution.

(*j*) $\frac{2b}{3} - 5 = 3$

$\Rightarrow \quad \frac{2b}{3} = 3 + 5$ (Transposing 5 to R.H.S.)

$\Rightarrow \quad \frac{2b}{3} = 8 \quad \Rightarrow \quad 2b = 8 \times 3$

(Multiplying both sides by 3.)

$\Rightarrow \quad 2b = 24 \quad \Rightarrow \quad b = \frac{24}{2} = 12$

(Dividing both sides by 2.)

or $\quad b = 12$, which is the required solution.

Q2. Solve the following equations:

(*a*) $2(x + 4) = 12$ (*b*) $3(n - 5) = 21$ (*c*) $3(n - 5) = -21$

(*d*) $3 - 2(2 - y) = 7$ (*e*) $-4(2 - x) = 9$ (*f*) $4(2 - x) = 9$

(*g*) $4 + 5(p - 1) = 34$ (*h*) $34 - 5(p - 1) = 4$.

Sol. (*a*) $2(x + 4) = 12$

$\Rightarrow \quad (x + 4) = \frac{12}{2}$ (Dividing both sides by 2.)

$\Rightarrow \quad x + 4 = 6$

$\Rightarrow \quad x = 6 - 4$ (Transposing 4 to R.H.S.)

or $\quad x = 2$, which is the required solution.

(*b*) $3(n - 5) = 21$

$\Rightarrow \quad (n - 5) = \frac{21}{3}$ (Dividing both sides by 3.)

$\Rightarrow \quad n - 5 = 7$

$\Rightarrow \quad n = 7 + 5$ (Transposing 5 to R.H.S.)

or $\quad n = 12$, which is the required solution.

(*c*) $3(n - 5) = -21$

$\Rightarrow \quad n - 5 = \frac{-21}{3}$ (Dividing both sides by 3.)

$\Rightarrow \quad n - 5 = -7$

$\Rightarrow \quad n = -7 + 5$ (Transposing 5 to R.H.S.)

or $\quad n = -2$, which is the required solution.

(*d*) $3 - 2(2 - y) = 7$

$\Rightarrow \quad -2(2 - y) = 7 - 3$ (Transposing 3 to R.H.S.)

$\Rightarrow \quad -2(2 - y) = 4 \quad \Rightarrow \quad -(2 - y) = \frac{4}{2}$

(Dividing both sides by 2.)

$\Rightarrow \quad -2 + y = 2$

$\Rightarrow \quad y = 2 + 2$ (Transposing 2 to R.H.S.)

or $\quad y = 4$, which is the required solution.

(*e*) $-4(2 - x) = 9$

$\Rightarrow \quad -(2 - x) = \frac{9}{4}$ (Multiplying both sides by 4.)

$\Rightarrow \quad x - 2 = \frac{9}{4} \quad \Rightarrow \quad x = \frac{9}{4} + 2$

(Transposing 2 to R.H.S.)

$\Rightarrow \quad x = \frac{9 + 8}{4}$

or $\quad x = \frac{17}{4}$, which is the required solution.

(*f*) $4(2 - x) = 9$

$\Rightarrow \quad (2 - x) = \frac{9}{4}$ (Multiplying both sides by 4.)

$\Rightarrow \quad -x = \frac{9}{4} - 2$ (Transposing 2 to R.H.S.)

$\Rightarrow \quad -x = \frac{9 - 8}{4} \quad \Rightarrow \quad -x = \frac{1}{4}$

or $\quad x = \frac{-1}{4}$, which is the required solution.

(*g*) $4 + 5(p - 1) = 34$

$\Rightarrow \quad 5(p - 1) = 34 - 4$ (Transposing 4 to R.H.S.)

$\Rightarrow \quad 5(p - 1) = 30$

$\Rightarrow \quad (p-1) = \frac{30}{5} = 6$ (Dividing both sides by 5.)

$\Rightarrow \quad p - 1 = 6$

$\Rightarrow \quad p = 6 + 1$ (Transposing 1 to R.H.S.)

or $p = 7$, which is the required solution.

(*h*) $34 - 5(p-1) = 4$

$\Rightarrow \quad -5(p-1) = 4 - 34$ (Transposing 34 to R.H.S.)

$\Rightarrow \quad -5(p-1) = -30$

$\Rightarrow \quad 5(p-1) = 30$ (Multiplying both sides by (– 1).)

$\Rightarrow \quad (p-1) = \frac{30}{5}$ (Dividing both sides by 5.)

$\Rightarrow \quad p - 1 = 6 \quad \Rightarrow \quad p = 6 + 1$ (Transposing 1 to R.H.S.)

or $p = 7$, which is the required solution.

Q3. Solve the following equations:

(*a*) $4 = 5(p-2)$ (*b*) $-4 = 5(p-2)$

(*c*) $-16 = -5(2-p)$ (*d*) $10 = 4 + 3(t+2)$

(*e*) $28 = 4 + 3(t+5)$ (*f*) $0 = 16 + 4(m-6)$.

Sol. (*a*) $4 = 5(p-2)$

$\Rightarrow \quad \frac{4}{5} = p - 2$ (Dividing both sides by 5.)

$\Rightarrow \quad \frac{4}{5} + 2 = p$ (Transposing 2 to L.H.S.)

$\Rightarrow \quad p = \frac{4}{5} + 2$ (Interchanging sides.)

$\Rightarrow \quad p = \frac{4+10}{5}$

or $p = \frac{14}{5}$, which is the required solution.

(*b*) $-4 = 5(p-2)$

$\Rightarrow \quad \frac{-4}{5} = (p-2)$ (Dividing both sides by 5.)

$\Rightarrow \quad \frac{-4}{5} + 2 = p$ (Transposing 2 to L.H.S.)

$\Rightarrow \quad p = \frac{-4}{5} + 2$ (Interchanging sides.)

$\Rightarrow \quad p = \frac{-4+10}{5}$

or $p = \frac{6}{5}$, which is the required solution.

(*c*) $-16 = -5(2-p)$

$\Rightarrow \quad -5(2-p) = -16$ (Interchanging sides.)

$\Rightarrow \quad 2 - p = \frac{-16}{-5}$ (Multiplying both sides by (– 5).)

$\Rightarrow \quad -p = \frac{16}{5} - 2$ (Transposing 2 to R.H.S.)

$\Rightarrow \quad -p = \frac{16-10}{5}$

$\Rightarrow \quad -p = \frac{6}{5}$

or $p = \frac{-6}{5}$, which is the required solution.

(*d*) $10 = 4 + 3(t+2)$

$\Rightarrow \quad 4 + 3(t+2) = 10$ (Interchanging sides.)

$\Rightarrow \quad 3(t+2) = 10 - 4$ (Transposing 4 to R.H.S.)

$\Rightarrow \quad 3(t+2) = 6 \quad \Rightarrow \quad t + 2 = \frac{6}{3}$ (Dividing both sides by 3.)

$\Rightarrow \quad t + 2 = 2$

$\Rightarrow \quad t = 2 - 2$ (Transposing 2 to R.H.S.)

or $t = 0$, which is the required solution.

(*e*) $28 = 4 + 3(t+5)$

$\Rightarrow \quad 4 + 3(t+5) = 28$ (Interchanging sides.)

$\Rightarrow \quad 3(t+5) = 28 - 4$ (Transposing 4 to R.H.S.)

$\Rightarrow \quad 3(t+5) = 24$

$\Rightarrow \quad t + 5 = \frac{24}{3}$ (Dividing both sides by 3.)

$\Rightarrow \quad t + 5 = 8$

$\Rightarrow \quad t = 8 - 5$ (Transposing 5 to R.H.S.)

or $\quad t = 3$, which is required solution.

(*f*) $0 = 16 + 4(m - 6)$

$\Rightarrow \quad 16 + 4(m - 6) = 0$ (Interchanging sides.)

$\Rightarrow \quad 4(m - 6) = -16$ (Transposing 16 to R.H.S.)

$\Rightarrow \quad m - 6 = \frac{-16}{4}$ (Dividing both sides by 4.)

$\Rightarrow \quad m - 6 = -4$

$\Rightarrow \quad m = -4 + 6$ (Transposing 6 to R.H.S.)

or $\quad m = 2$, which is the required solution.

***Q4. (*a*) Construct 3 equations starting with $x = 2$.**

(*b*) Construct 3 equations starting with $x = -2$.

Sol. (*a*) Equations are

(*i*) $x = 2$

Multiplying both sides by 10, $\quad 10x = 20$

Adding 2 to both sides, $\quad 10x + 2 = 20 + 2$

or $\quad 10x + 2 = 22 \quad ...(i)$

(*ii*) $x = 2$

Dividing both sides by 5, $\Rightarrow \quad \frac{x}{5} = \frac{2}{5} \quad ...(ii)$

(*iii*) $x = 2$

Multiplying both sides by 5, $\quad 5x = 5 \times 2 = 10$

Subtracting 3 from both sides, $\quad 5x - 3 = 10 - 7$

or $\quad 5x - 3 = 7 \quad ...(iii)$

Thus, equations (*i*), (*ii*) and (*iii*) may required equations.

(*b*) Given $x = -2$

(*i*) $x = -2$

Multiplying both sides by 3, $\quad 3x = -2 \times 3$

or $\quad 3x = -6 \quad ...(i)$

(*ii*) $x = -2$

Multiplying both sides by 3, $\quad 3x = -2 \times 3$

$3x = -6$

Adding 7 to both sides, $\quad 3x + 7 = -6 + 7$

or $\quad 3x + 7 = 1 \quad ...(ii)$

(*iii*) $x = -2$

Multiplying both sides by 3, $\quad 3x = -2 \times 3$

$3x = -6$

Adding 10 to both sides, $\quad 3x + 10 = -6 + 10$

or $\quad 3x + 10 = 4 \quad ...(iii)$

Thus, equations (*i*), (*ii*) and (*iii*) may required equations.

Exercise 4.4 *(Page No. 91)*

Q1. Set up equations and solve them to find the unknown numbers in the following cases:

(*a*) Add 4 to eight times a number; you get 60.

(*b*) One-fifth of a number minus 4 gives 3.

(*c*) If I take three-fourth of a number and add 3 to it, I get 21.

(*d*) When I subtracted 11 from twice a number, the result was 15.

(*e*) Munna subtracts thrice the number of notebooks he has from 50, he finds the result to be 8.

(*f*) Ibenhal thinks of a number. If she adds 19 to it and divides the sum by 5, she will get 8.

(*g*) Anwar thinks of a number. If he takes away 7 from $\frac{5}{2}$ of the number, the result is $\frac{11}{2}$.

Sol. (*a*) Let the number be x.

According to the given conditions,

$8x + 4 = 60$

$\Rightarrow \quad 8x = 60 - 4$ (Transposing 4 to R.H.S.)

$\Rightarrow \quad 8x = 56 \quad \Rightarrow \quad x = \frac{56}{8}$

(Multiplying both sides by 8.)

or $\quad x = 7$

Thus, the required number is 7.

(*b*) Let the number be y.

According to the given conditions,

$\frac{y}{5} - 4 = 3$

$\Rightarrow \quad \frac{y}{5} = 3 + 4$ (Transposing 4 to R.H.S.)

$\Rightarrow \quad \frac{y}{5} = 7$

$\Rightarrow \quad y = 7 \times 5$ (Multiplying both sides by 5.)

or $\quad y = 35$

Thus, the required number is 35.

(c) Let the number be z.

According to the given conditions,

$$\frac{3}{4}z + 3 = 21$$

$\Rightarrow \quad \frac{3}{4}z = 21 - 3$ (Transposing 3 to R.H.S.)

$\Rightarrow \quad \frac{3}{4}z = 18$

$\Rightarrow \quad 3z = 18 \times 4$ (Multiplying both sides by 4.)

$\Rightarrow \quad 3z = 72$

$\Rightarrow \quad z = \frac{72}{3}$ (Dividing both sides by 3.)

or $\quad z = 24$

Thus, the required number is 24.

(d) Let the number be x.

According to the given conditions,

$$2x - 11 = 15$$

$\Rightarrow \quad 2x = 15 + 11$

$\Rightarrow \quad 2x = 26$ (Transposing 11 to R.H.S.)

$\Rightarrow \quad x = \frac{26}{2}$ (Dividing both sides by 2.)

or $\quad x = 13$

Thus, the required number is 13.

(e) Let the number be m.

According to the given conditions,

$$50 - 3m = 8$$

$\Rightarrow \quad -3m = 8 - 50$ (Transposing 50 to R.H.S.)

$\Rightarrow \quad -3m = -42$

$\Rightarrow \quad m = \frac{42}{3}$

[Dividing both sides by 3 and multiplying both sides by (– 1).]

or $\quad m = 14$

Thus, the required number is 14.

(f) Let the number be n.

According to the given conditions,

$$\frac{n+19}{5} = 8$$

$\Rightarrow \quad n + 19 = 8 \times 5$ (Multiplying both sides by 5.)

$\Rightarrow \quad n + 19 = 40$

$\Rightarrow \quad n = 40 - 19$ (Transposing 19 to R.H.S.)

or $\quad n = 21$

Thus, the required number is 21.

(g) Let the number be x.

According to the given conditions,

$$\frac{5}{2}x - 7 = \frac{11}{2}$$

$\Rightarrow \quad \frac{5}{2}x = \frac{11}{2} + 7$ (Transposing 7 to R.H.S.)

$\Rightarrow \quad \frac{5x}{2} = \frac{11+14}{2} \qquad \Rightarrow \quad \frac{5x}{2} = \frac{25}{2}$

$\Rightarrow \quad 5x = 25$ (Multiplying both sides by 2.)

$\Rightarrow \quad x = \frac{25}{5}$ (Dividing both sides by 5.)

or $\quad x = 5$

Thus, the required number is 5.

Q2. Solve the following:

(a) The teacher tells the class that the highest marks obtained by a student in her class is twice the lowest marks plus 7. The highest score is 87. What is the lowest score?

(b) In an isosceles triangle, the base angles are equal. The vertex angle is 40°. What are the base angles of the triangle? (Remember, the sum of three angles of a triangle is 180°).

(c) Sachin scored twice as many runs as Rahul. Together, their runs fell two short of a double century. How many runs did each one score?

Sol. (a) Let the lowest marks be y.

Given, twice the lowest marks $= 2y$

and add $7 = 2y + 7$

According to the given conditions,

$$2y + 7 = 87$$

$\Rightarrow$ $2y = 87 - 7$ (Transposing 7 to R.H.S.)

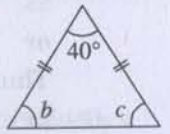
$\Rightarrow$ $2y = 80$

$\Rightarrow$ $y = \frac{80}{2}$ (Dividing both sides by 2.)

or $y = 40$

Thus, the required lowest marks is 40.

(b) Let the base angle of the triangle be b.



Given, $a = 40°$, $b = c$ in isosceles triangle.

We know that, $a + b + c = 180°$

(By angle sum property of a triangle.)

$\Rightarrow$ $40° + b + b = 180°$

$\Rightarrow$ $40° + 2b = 180°$

$\Rightarrow$ $2b = 180° - 40°$ (Transposing 40 to R.H.S.)

$\Rightarrow$ $2b = 140°$

$\Rightarrow$ $b = \frac{140°}{2}$ (Dividing both sides by 2.)

or $b = 70°$

Thus, the base angles of the isosceles triangle is 70° each.

(c) Let the score of Rahul be x runs and Sachin's scores $2x$.

Given, two short of a double century = 198.

According to the given conditions,

$$x + 2x = 198$$

$\Rightarrow$ $3x = 198$

$\Rightarrow$ $x = \frac{198}{3}$ (Dividing both sides by 3.)

or $x = 66$

Thus, Rahul's score = 66 runs

and Sachin's score = $2 \times 66 = 132$ runs.

Q3. Solve the following:

(i) Irfan says that he has 7 marbles more than five times the marbles Parmit has. Irfan has 37 marbles. How many marbles does Parmit have?

(ii) Laxmi's father is 49 years old. He is 4 years older than three times Laxmi's age. What is Laxmi's age?

(iii) People of Sundargram planted a total of 102 trees in the village garden. Some of the trees were fruit trees. The number of non-fruit trees were two more than three times the number of fruit trees. What was the number of fruit trees planted?

Sol. (i) Let the number of marbles Parmit has be m.

According to the given conditions,

$$5m + 7 = 37$$

$\Rightarrow$ $5m = 37 - 7$ (Transposing 7 to R.H.S.)

$\Rightarrow$ $5m = 30$

$\Rightarrow$ $m = \frac{30}{5}$ (Dividing both sides by 5.)

or $m = 6$

Thus, Parmit has 6 marbles.

(ii) Let the age of Laxmi be y years.

Given, her father 4 years older than three times Laxmi's age $= 3y + 4$

According to the given conditions,

$$y + 4 = 49$$

$\Rightarrow$ $3y = 49 - 4$ (Transposing 4 to R.H.S.)

$\Rightarrow$ $3y = 45$

$\Rightarrow$ $y = \frac{45}{3}$ (Dividing both sides by 3.)

or $y = 15$

Thus, the age of the Laxmi is 15 years.

(iii) Let the number of fruit trees be t.

The number of non-fruits tree be $3t + 2$

According to the given conditions,

$$t + 3t + 2 = 102$$

$\Rightarrow$ $4t + 2 = 102$

$\Rightarrow \quad 4t = 102 - 2$ (Transposing 2 to R.H.S.)

$\Rightarrow \quad 4t = 100$

$\Rightarrow \quad t = \frac{100}{4}$ (Dividing both sides by 4.)

or $\quad t = 25$

Thus, the number of fruit trees are 25.

Q4. Solve the following riddle:

I am a number, Tell my identity!

Take me seven times over, And add a fifty!

To reach a triple century, You still need forty!

Sol. Let the number be n.

Given, seven time a number and add a fifty = $7n + 50$.

Then need forty to reach triple century *i.e.,* 300.

According to the given conditions,

$7n + 50) + 40 = 300$

$\Rightarrow \quad 7n + 90 = 300$

$\Rightarrow \quad 7n = 300 - 90$ (Transposing 90 to R.H.S.)

$\Rightarrow \quad 7n = 210$

$\Rightarrow \quad n = \frac{210}{7}$ (Dividing both sides by 7.)

or $\quad n = 30$

Thus, the required number is 30.

□□