12 Equations in one variable

Practice Set 12.1

1. Each equation is followed by the values of the variable. Decide whether these values are the solutions of that equation.

(1) $x - 4 = 3$, $x = -1, 7, -7$ (2) $9m = 81$, $m = 3, 9, -3$

(3) $2a + 4 = 0$, $a = 2, -2, 1$ (4) $3 - y = 4$, $y = -1, 1, 2$

Soln:-

(1) $x - 4 = 3$, $x = -1, 7, -7$

For $x = -1$,

$LHS = x - 4$

$= -1 - 4$

$= -5$

$\neq$ RHS

$\therefore$ $x = -1$ is not the solution of the given equation.

For $x = 7$,

$LHS = x - 4$

$= 7 - 4$

$= 3$

$=$ RHS

$\therefore$ $x = 7$ is the solution of the given equation.

For $x = -7$,

$$\begin{aligned} LHS &= x - 4 \\ &= -7 - 4 \\ &= -11 \\ &\neq RHS \end{aligned}$$

$\therefore$ $x = -7$ is not the solution of the given equation.

② $9m = 81$, $m = 3, 9, -3$

For $m = 3$,

$$\begin{aligned} LHS &= 9m \\ &= 9 \times 3 \\ &= 27 \\ &\neq RHS \end{aligned}$$

$\therefore$ $m = 3$ is not the solution of the given equation.

For $m = 9$,

$$\text{LHS} = 9m$$
$$= 9 \times 9$$
$$= 81$$
$$= \text{RHS}$$

$\therefore m = 9$ is the solution of the given equation.

For $m = -3$,

$$\text{LHS} = 9m$$
$$= 9 \times -3$$
$$= -27$$
$$\neq \text{RHS}$$

$\therefore m = -3$ is not the solution of the given equation.

③ $2a + 4 = 0$, $a = 2, -2, 1$

For $a = 2$,

$$\text{LHS} = 2a + 4$$
$$= (2 \times 2) + 4$$
$$= 4 + 4$$

$= 8$

$\neq$ RHS

$\therefore a = 2$ is not the solution of the given equation.

For $a = -2$

$$\begin{aligned} LHS &= 2a + 4 \\ &= (2x-2) + 4 \\ &= -4 + 4 \\ &= 0 \\ &= RHS \end{aligned}$$

$\therefore a = -2$ is the solution of the given equation.

For $a = 1$

$$\begin{aligned} LHS &= 2a + 4 \\ &= (2 \times 1) + 4 \\ &= 2 + 4 \\ &= 6 \\ &\neq RHS \end{aligned}$$

$\therefore a = 1$, is not the solution of the given equation.

④ $3 - y = 4$, $y = -1, 1, 2$

For $y = -1$,

$$\text{LHS} = 3 - y$$
$$= 3 - (-1)$$
$$= 3 + 1$$
$$= 4$$
$$= \text{RHS}$$

$\therefore$ $y = -1$ is the solution of the given equation.

For $y = 1$,

$$\text{LHS} = 3 - y$$
$$= 3 - (1)$$
$$= 3 - 1$$
$$= 2$$
$$\neq \text{RHS}$$

$\therefore$ $y = 1$, is not the solution of the given equation.

For $y = 2$,

$$\text{LHS} = 3 - y$$

$$= 3 - 2$$

$$= 3 - 2$$

$$= 1$$

$$\neq \text{RHS}$$

$\therefore$ $y = 2$, is not the solution of the given equation.

2. Solve the following equations.

(1) $17p - 2 = 49$ (2) $2m + 7 = 9$ (3) $3x + 12 = 2x - 4$

(4) $5(x - 3) = 3(x + 2)$ (5) $\frac{9x}{8} + 1 = 10$ (6) $\frac{y}{7} + \frac{y-4}{3} = 2$

(7) $13x - 5 = \frac{3}{2}$ (8) $3(y + 8) = 10(y - 4) + 8$ (9) $\frac{x-9}{x-5} = \frac{5}{7}$

(10) $\frac{y-4}{3} + 3y = 4$ (11) $\frac{b+(b+1)+(b+2)}{4} = 21$

Soln:-

(1) $17p - 2 = 49$

Add 2 on both sides,

$$17p - 2 + 2 = 49 + 2$$

$$17p = 51$$

Divide by 17, on both sides,

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

$$\boxed{p = 3}$$

② $2m + 7 = 9$

Subtract 7 from both sides,

$$2m + 7 - 7 = 9 - 7$$

$$2m = 2$$

Divide by 2, on both sides,

$$\frac{2m}{2} = \frac{2}{2}$$

$$\boxed{m = 1}$$

③ $3x + 12 = 2x - 4$

Subtract $2x$ from both sides,

$$3x + 12 - 2x = 2x - 4 - 2x$$

$$x + 12 = -4$$

Subtract 12 from both sides,

$$x + 12 - 12 = -4 - 12$$

$$x = -16$$

④ $5(x-3) = 3(x+2)$

$$5x - 15 = 3x + 6$$

Subtract $3x$ from both sides,

$$5x - 15 - 3x = 3x + 6 - 3x$$

$$2x - 15 = 6$$

Add 15 on both sides,

$$2x - 15 + 15 = 6 + 15$$

$$2x = 21$$

Divide by 2, on both sides,

$$\frac{2x}{2} = \frac{21}{2}$$

$$x = \frac{21}{2}$$

$$x = 10.5$$

⑤ $\frac{9x}{8} + 1 = 10$

Subtract 1 from both sides,

$$\frac{9x}{8} + 1 - 1 = 10 - 1$$

$$\therefore \quad \frac{9x}{8} = 9$$

Multiply both sides by 8,

$$\frac{9x}{8} \times 8 = 9 \times 8$$

$$9x = 72$$

Divide by 9 on both sides,

$$\frac{9x}{9} = \frac{72}{9}$$

$$\boxed{x = 8}$$

⑥ $$\frac{y}{7} + \frac{y-4}{3} = 2$$

Multiply both sides by 21,

$$\frac{y}{7} \times 21^{3} + \frac{y-4}{3} \times 21^{7} = 2 \times 21$$

$$3y + 7(y-4) = 42$$

$$\therefore \quad 3y + 7y - 28 = 42$$

$\therefore \quad 10y - 28 = 42$

Add 28 on both sides,

$10y - 28 + 28 = 42 + 28$

$10y = 70$

Divide by 10 on both sides,

$\frac{10y}{10} = \frac{70}{10}$

$$\boxed{y = 7}$$

(7) $13x - 5 = \frac{3}{2}$

Add 5 on both sides,

$13x - 5 + 5 = \frac{3}{2} + 5$

$13x = \frac{13}{2}$

Divide by 13 , on both sides,

$\frac{13x}{13} = \frac{13}{2} \div 13$

$x = \frac{13}{2} \times \frac{1}{13}$

$\therefore \quad \boxed{x = \frac{1}{2}}$

(8) $3(y+8) = 10(y-4) + 8$

$3y + 24 = 10y - 40 + 8$

$3y + 24 = 10y - 32$

Subtract $3y$ from both sides,

$3y + 24 - 3y = 10y - 32 - 3y$

$24 = 7y - 32$

$7y - 32 = 24$

Add 32 on both sides,

$7y - 32 + 32 = 24 + 32$

$7y = 56$

Divide by 7, on both sides,

$\frac{7y}{7} = \frac{56}{7}$

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

(9) $\frac{x-9}{x-5} = \frac{5}{7}$

$7(x-9) = 5(x-5)$

$7x - 63 = 5x - 25$

Subtract $5x$ from both sides,

$7x - 63 - 5x = 5x - 25 - 5x$

$2x - 63 = -25$

Add 63 on both sides,

$2x - 63 + 63 = -25 + 63$

$2x = 38$

Divide by 2, on both sides,

$\frac{2x}{2} = \frac{38}{2}$

$$x = 19$$

(10) $\frac{y-4}{3} + 3y = 4$

Multiply both sides by 3,

$$\therefore \quad \frac{y-4}{3} \times 3 + 3y \times 3 = 4 \times 3$$

$$y - 4 + 9y = 12$$

$$10y - 4 = 12$$

Add 4 on both sides,

$$\therefore \quad 10y - 4 + 4 = 12 + 4$$

$$\therefore \quad 10y = 16$$

Divide by 10, on both sides,

$$\frac{10y}{10} = \frac{16}{10}$$

$$\therefore \quad y = \frac{16}{10}$$

$$\therefore \quad \boxed{y = \frac{8}{5}}$$

(11) $$\frac{b + (b+1) + (b+2)}{4} = 21$$

$$\frac{b + b+1 + b+2}{4} = 21$$

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

Multiply both sides by 4,

$$\frac{3b+3}{4} \times 4 = 21 \times 4$$

$$3b + 3 = 84$$

Substract 3 from both sides,

$$3b+3 - 3 = 84 - 3$$

$$3b = 81$$

Divide by 3, on both sides,

$$\frac{3b}{3} = \frac{81}{3}$$

$$\boxed{b = 27}$$