Equations in One Variable

Exercise 38:

Solution 1(1):

y – 2 = 9
[Addition Property of Equality: If the same number is added to both sides of the equality, the sums so obtained are equal.]
∴ y – 2 + 2 = 9 + 2
∴ y = 11

Solution 1(2):

p + 3 = 12
[Subtraction Property of Equality: If the same number is subtracted from both sides of an equality the sums so obtained are equal]
∴ p + 3 – 3 = 12 – 3
∴ p = 9

Solution 1(3):

$3x = 18$
[Division Property of Equality : If two sides of equality are divided by the same number, then the quotients so obtained are equal.]
$$\therefore \frac{3x}{3} = \frac{18}{3}$$
$$\therefore x = 6$$

Solution 1(4):

$$\frac{m}{4} = 8$$
[Multiplication property of an Equality: If two sides of a given equality are multiplied by the same number, the products so obtained are equal.]
$$\therefore \frac{m}{4} \times 4 = 8 \times 4$$
$$\therefore m = 32$$

Solution 1(5):

$11y - 4 = 7$

[Addition Property of Equality: If the same number is added to both sides of an equality the sums so obtained are equal.]

$\therefore 11y - 4 + 4 = 7 + 4$

$\therefore 11y = 11$

[Division Property of Equality: If two sides of an equality are divided by the same number, then the quotients so obtained are equal.]

$\therefore \dfrac{11y}{11} = \dfrac{11}{11}$

$\therefore y = 1$

Solution 1(6):

$7n + 5 = 19$

[Subtraction Property of Equality: If the same number is subtracted from both sides of an equality the sums so obtained are equal.]

$\therefore 7n + 5 - 5 = 19 - 5$

$\therefore 7n = 14$

[Division Property of Equality: If two sides of an equality are divided by the same number, then the quotients so obtained are equal.]

$\therefore \dfrac{7n}{7} = \dfrac{14}{7}$

$\therefore n = 2$

Solution 1(7):

$13 = 5x - 2$

[Addition Property of Equality: If the same number is added to both sides of an equality, the sums so obtained are equal.]

$\therefore 13 + 2 = 5x - 2 + 2$

$\therefore 15 = 5x$

$\therefore 5x = 15$

[Division Property of Equality: If two sides of an equality are divided by the same number, then the quotients so obtained are equal.]

$\therefore \dfrac{5x}{5} = \dfrac{15}{5}$

$\therefore x = 3$

Solution 1(8):

$6 = 3 + \dfrac{y}{8}$

[Subtraction Property of Equality: If the same number is subtracted from both sides of an equality, the sums so obtained are equal.]

$\therefore 6 - 3 = 3 - 3 + \dfrac{y}{8}$

$\therefore 3 = \dfrac{y}{8}$

[Multiplication property of an Equality: If two sides of a given equality are multiplied by the same number, the products so obtained are equal.]

$\therefore 3 \times 8 = \dfrac{y}{8} \times 8$

$\therefore y = 24$

Solution 1(9):

$41 = 5q + 11$

[Subtraction Property of Equality: If the same number is subtracted from both sides of an equality the sums so obtained are equal.]

$\therefore 41 - 11 = 5q + 11 - 11$

$\therefore 30 = 5q$

[Division Property of Equality: If two sides of an equality are divided by the same number, then the quotients so obtained are equal.]

$\therefore \dfrac{30}{5} = \dfrac{5q}{5}$

$\therefore q = 6$

Solution 1(10):

$5 = 5q + 5$

[Subtraction Property of Equality : If the same number is subtracted from both sides of an equality, the sums so obtained are equal.]

$\therefore 5 - 5 = 5q + 5 - 5$

$\therefore 0 = 5q$

[Division Property of Equality: If two sides of an equality are divided by the same number, then the quotients so obtained are equal.]

$\therefore \dfrac{0}{5} = \dfrac{5q}{5}$

$\therefore q = 0$

Exercise 39:

Solution 1(1):

2p = p + 7
∴ 2p − p = p + 7 − p
∴ p = 7

Solution 1(2):

8q − 2 = 3q + 18
∴ 8q − 2 − 3q = 3q + 18 − 3q
∴ 5q − 2 = 18
∴ 5q − 2 + 2 = 18 + 2
∴ 5q = 20
∴ $\frac{5q}{5} = \frac{20}{5}$
∴ q = 4

Solution 1(3):

y − 9 = 6y + 16
∴ 6y + 16 = y − 9
∴ 6y + 16 − y = y − 9 − y
∴ 5y + 16 = −9
∴ 5y + 16 − 16 = −9 − 16
∴ 5y = −25
∴ $\frac{5y}{5} = \frac{-25}{5}$
∴ y = −5

Solution 1(4):

4x − 5 = 3(x + 2)
∴ 4x − 5 = 3x + 6
∴ 4x − 5 − 3x = 3x + 6 − 3x
∴ x − 5 = 6
∴ x − 5 + 5 = 6 + 5
∴ x = 11

Solution 1(5):

$7a + 2 = 26 + 3a$

$\therefore 7a + 2 - 3a = 26 + 3a - 3a$

$\therefore 4a + 2 = 26$

$\therefore 4a + 2 - 2 = 26 - 2$

$\therefore 4a = 24$

$\therefore \dfrac{4a}{4} = \dfrac{24}{4}$

$\therefore a = 6$

Solution 1(6):

$5 - 5p = 2p + 9$

$\therefore 2p + 9 = 5 - 5p$

$\therefore 2p + 9 + 5p = 5 - 5p + 5p$

$\therefore 7p + 9 = 5$

$\therefore 7p + 9 - 9 = 5 - 9$

$\therefore 7p = -4$

$\therefore \dfrac{7p}{7} = \dfrac{-4}{7}$

$\therefore p = -\dfrac{4}{7}$

Solution 1(7):

$6y - 8 = 2 - 5y$

$\therefore 6y - 8 + 5y = 2 - 5y + 5y$

$\therefore 11y - 8 = 2$

$\therefore 11y - 8 + 8 = 2 + 8$

$\therefore 11y = 10$

$\therefore \dfrac{11y}{11} = \dfrac{10}{11}$

$\therefore y = \dfrac{10}{11}$

Solution 1(8):

$12 + a = 4a + 6$

$\therefore 4a + 6 = 12 + a$

$\therefore 4a + 6 - a = 12 + a - a$

$\therefore 3a + 6 = 12$

$\therefore 3a + 6 - 6 = 12 - 6$

$\therefore 3a = 6$

$\therefore \dfrac{3a}{3} = \dfrac{6}{3}$

$\therefore a = 2$

Solution 1(9):

$6(x - 1) = x + 11$

$\therefore 6x - 6 = x + 11$

$\therefore 6x - 6 - x = x + 11 - x$

$\therefore 5x - 6 = 11$

$\therefore 5x - 6 + 6 = 11 + 6$

$\therefore 5x = 17$

$\therefore \dfrac{5x}{5} = \dfrac{17}{5}$

$\therefore x = \dfrac{17}{5}$

Solution 1(10):

$3b + 5 = 5(b + 1)$

$\therefore 3b + 5 = 5b + 5$

$\therefore 5b + 5 = 3b + 5$

$\therefore 5b + 5 - 3b = 3b + 5 - 3b$

$\therefore 2b + 5 = 5$

$\therefore 2b + 5 - 5 = 5 - 5$

$\therefore 2b = 0$

$\therefore \dfrac{2b}{2} = \dfrac{0}{2}$

$\therefore b = 0$

Solution 1(11):

$10 - 2x = 17 - 7x$

$\therefore 10 - 2x + 7x = 17 - 7x + 7x$

$\therefore 10 + 5x = 17$

$\therefore 10 + 5x - 10 = 17 - 10$

$\therefore 5x = 7$

$\therefore \dfrac{5x}{5} = \dfrac{7}{5}$

$\therefore x = \dfrac{7}{5}$

Solution 1(12):

$5(8 - y) = 3y + 13$

$\therefore 40 - 5y = 3y + 13$

$\therefore 3y + 13 = 40 - 5y$

$\therefore 3y + 13 + 5y = 40 - 5y + 5y$

$\therefore 8y + 13 = 40$

$\therefore 8y + 13 - 13 = 40 - 13$

$\therefore 8y = 27$

$\therefore \dfrac{8y}{8} = \dfrac{27}{8}$

$\therefore y = \dfrac{27}{8}$

Exercise 40:

Solution 1(1):

Let x be the given number.
4 less than another number = x – 4
It is given that 4 less than one number is equal to 11.
∴ x – 4 = 11

Solution 1(2):

Let Soham's age be x years.
Sagar is 2 years younger than Soham.
∴ Sagar's age = (x – 2) years
It is given that the sum of their ages is 38.
∴ x + (x – 2) = 38

Solution 1(3):

Let x be the given number.
Now, twice the number = 2x
9 less than twice the number = 2x – 9
It is given that, 9 less than twice the number is 15.
∴ 2x – 9 = 15

Solution 1(4):

Let the breadth of the given rectangle be x cm.
So the length of the rectangle = (x + 3) cm
Perimeter of the rectangle = 2(Length + Breadth)
∴ Perimeter of the rectangle = 2(x + 3 + x)
It is given that the perimeter of the rectangle is 30 cm.
∴ 2(x + 3 + x) = 30

Solution 1(5):

Let x be the amount with Kiran.
∴ Amount with Sultana = x – 5
It is given that the two of them together have Rs. 51.
∴ (x – 5) + x = 51

Exercise 41:

Solution 1:

Let Rakesh's age be x years.
∴ Kasim's age = (x + 6) years
The sum of their age is 54 years.
∴ x + (x + 6) = 54
∴ x + x + 6 = 54
∴ 2x + 6 = 54
∴ 2x + 6 – 6 = 54 – 6
∴ 2x = 48
∴ $\dfrac{2x}{2} = \dfrac{48}{2}$
∴ x = 24
∴ Rakesh's age = 24 years.
And, Kasim's age = (x + 6) = (24 + 6) = 30 years

Solution 2:

Let salman have Rs. x.
Supriya has Rs. (x – 6).
Together they have Rs. 44.
∴ x + (x – 6) = 44
∴ x + x – 6 = 44
∴ 2x – 6 = 44
∴ 2x – 6 + 6 = 44 + 6
∴ 2x = 50
∴ $\frac{2x}{2} = \frac{50}{2}$
∴ x = 25
∴ Salman has Rs. 25.
And, Supriya has Rs. (25 – 6) = Rs. 19.

Solution 3:

Let x be the number of mango trees in the garden.
Then, the number of coconut trees = x
Total number of trees = x + x = 2x
If there are 50 trees altogether, then
2x = 50
∴ $\frac{2x}{2} = \frac{50}{2}$
∴ x = 25
The number of mango trees in the garden = 25
The number of coconut trees in the garden = 25

Solution 4:

Let x be the natural number.

∴ Number following x = x + 1

Sum of a natural number and the number following it is 69.

∴ x + (x + 1) = 69

∴ x + x + 1 = 69

∴ 2x + 1 = 69

∴ 2x + 1 − 1 = 69 − 1

∴ 2x = 68

∴ $\dfrac{2x}{2} = \dfrac{68}{2}$

∴ x = 34

The required natural number is 34 and number following it is (34 + 1) = 35.

Solution 5:

Let x be the length of side of an equilateral triangle.

∴ Perimeter of an equilateral triangle = 3 × side = 3 × x = 3x

It is given that the perimeter of the equilateral triangle is 57 cm.

3x = 57

$\dfrac{3x}{3} = \dfrac{57}{3}$

x = 19

The length of side of an equilateral triangle is 19 cm.

Solution 6:

Let Khanduji have x buffaloes.

∴ Khanduji has 2x cows.

The total number of cows and buffaloes = x + 2x

If the total number of cows and buffaloes he has is 15, then

x + 2x = 15

∴ 3x = 15

∴ $\dfrac{3x}{3} = \dfrac{15}{3}$

∴ x = 5

∴ 2x = 2 × 5 = 10

Khanduji has 5 buffaloes and 10 cows.

Solution 7:

Let us assume that John gets x litres of milk.

Then, Saurabh gets $(x + 2)$ litres of milk.

Ten litres of milk was shared between John and Saurabh.

$\therefore x + (x + 2) = 10$

$\therefore x + x + 2 = 10$

$\therefore 2x + 2 = 10$

$\therefore 2x + 2 - 2 = 10 - 2$

$\therefore 2x = 8$

$\therefore \dfrac{2x}{2} = \dfrac{8}{2}$

$\therefore x = 4$

$\therefore x + 2 = 4 + 2 = 6$

John gets 4 litres of milk and Saurabh get 6 litres of milk.