Exercise 2.1

1. Solve the following equations: x - 2 = 7

Answer: An equation is a mathematical statement with an 'equal to' symbol between two algebraic expressions that have equal values. The two sides of an equation is always balanced.

We perform mathematical operations so that the balance is not disturbed.

x - 2 = 7

We know that while transposing any term from LHS to RHS or RHS to LHS, the sign of the term gets changed.

Transposing - 2 to RHS, we get

x = 7 + 2

Therefore, x = 9

2. Solve the following equation: y + 3 = 10

Answer: We know that while transposing any term from LHS to RHS or RHS to LHS, the sign of the term gets changed.

- + changes to -
- - changes to +
- × changes to ÷
- ÷ changes to ×

y + 3 = 10

Transposing 3 to RHS, we get

y = 10 - 3

Therefore, y = 7

3. Solve the following equation: 6 = z + 2

Answer: We know that while transposing any term from LHS to RHS or RHS to LHS, the sign of the term gets changed.

6 = z + 2

Transposing 2 to LHS, we get

6 - 2 = z

Therefore, z = 4

4. Solve the following equation: 3/7 + x = 17/7

Answer: $\frac{3}{7} + x = \frac{17}{7}$

Transposing $\frac{3}{7}$ to RHS, we get

$x = \frac{17}{7} - \frac{3}{7}$

$x = \frac{14}{7}$

Therefore, x = 2

5. Solve the following equation: 6x = 12

Answer: 6x = 12

Dividing by 6 on both the sides, we get

➔ $\frac{6x}{6} = \frac{12}{6}$

Therefore, x = 2

6. Solve the following equation: $\frac{t}{5} = 10$

Answer: Multiplying by 5 on both sides, we get

➔ $\frac{t}{5} \times 10 = 10 \times 10$

➔ 2t = 100

➔ $t = \frac{100}{52} = 50$

7. Solve the following equation: $\frac{2x}{3} = 8$

Answer: Multiplying by 3/2 on both sides, we get

➔ $\frac{2x}{3} \times \frac{3}{2} = 18 \times \frac{3}{2}$

➔ $\frac{2x}{2} = 27$

➔ $2x = 54$

➔ $x = \frac{54}{2} = 27$

8. Solve the following equation: 1.6 = $\frac{y}{1.5}$

Answer: Multiplying by 1.5 on both sides, we get

1.6 × 1.5 = $\frac{y}{1.5}$ x 1.5

Therefore, y = 1.6 × 1.5

Y = 2.4

9. Solve the following equation: 7x - 9 = 16

Answer: Transposing -9 to RHS, we get

7x = 16 + 9

➔ 7x = 25

Now dividing both sides by 7, we get

➔ $\frac{7x}{7} = \frac{25}{7}$

➔ 7*x* = 25

x = $\frac{25}{7}$

Therefore, x = 25/7

10. Solve the following equation: 14y - 8 = 13

Answer: Transposing -8 to RHS, we get

14y = 13 + 8

➔14y = 21

Now dividing both sides by 14, we get

➔ $\frac{14y}{14} = \frac{21}{14}$

➔ 14y = 21

➔ y = $\frac{21}{14}$

y = $\frac{3}{2}$ [Simplifying it to lowest form]

Therefore, y = $\frac{3}{2}$

11. Solve the following equation: 17 + 6p = 9

Answer: 17 + 6p = 9

Transposing 17 to RHS, we get

6p = 9 - 17

➔ 6p = -8

Now dividing both sides by 6, we get

➔ $\frac{6p}{6} = \frac{-8}{6}$

➔ 6p = - 8

➔ p = $\frac{-8}{6}$

➔ $\frac{-4}{3}$ [Simplifying it to lowest form]

Therefore, p = $\frac{-4}{3}$

12. Solve the following equation: $\frac{x}{3} + 1 = \frac{7}{15}$

Answer:

$\frac{x}{3} + 1 = \frac{7}{15}$

Transposing 1 to RHS, we get

$\frac{x}{3} = \frac{7}{15} - 1$

➔ $\frac{x}{3} = \frac{7-15}{15}$

➔ $\frac{x}{3} = \frac{-8}{15}$

Now multiplying both sides by 3, we get

➔ $\frac{x}{3} \; x \; 3 = \frac{-8}{15} \; x \; 3$

➔ x $= \frac{-8}{5}$

Therefore, x = $\frac{-8}{5}$

Exercise 2.2

1. If you subtract ½ from a number and multiply the result by ½, you get 1/8. What is the number?

Answer: An equation is a mathematical statement with an 'equal to' symbol between two algebraic expressions that have equal values.

Let's form a linear equation for the given problem statement.

Given,

- 1/2 is subtracted from a number
- Result is multiplied by 1/2
- Answer is 1/8

Let the number be x

Following the steps given in the question,

(i) x - $\frac{1}{2}$

(ii) $\frac{1}{2}$ x (x – $\frac{1}{2}$) = $\frac{1}{8}$

➔ $\frac{1}{2}$ x $\frac{x}{2}$ - $\frac{1}{2} = \frac{1}{8}$

➔ $\frac{x}{2}$ x- $\frac{1}{4} = \frac{1}{8}$

➔ $\frac{x}{2} = \frac{1}{8} + \frac{1}{4}$

➔ $\frac{x}{2} = \frac{3}{8}$

➔ $\frac{x}{2} = \frac{3}{8}$

➔ **x =** $\frac{3}{8}\ x\ 2$

X = $\frac{3}{4}$

2. The perimeter of a rectangular swimming pool is 154 m. Its length is 2 m, more than twice its breadth. What are the length and breadth of the pool?

Answer: Let's form a linear equation for the given problem statement.

Let the breadth(b) of the swimming pool be x m.

Therefore, the length(l) of the swimming pool will be (2x + 2) m

The perimeter of rectangular swimming pool = 2(l + b)

By substituting the values of l and b in the perimeter 2(l + b) we get,

2(x + 2x + 2) = 154 [Since, perimeter of the swimming pool is 154 m]

➔ 6x + 4 = 154

➔ 6x = 150

➔ x = 150/6 = 25

Thus breadth(b) = x = 25 m,

length = 2x + 2 = 2(25) + 2 = 52 m

Thus, the length and breadth of the swimming pool are 52 m and 25 m respectively.

3. The base of an isosceles triangle is 4/3 cm. The perimeter of the triangle is $4\frac{2}{15}$ **cm. What is the length of either of the remaining equal sides?**

Answer: In an isosceles triangle, two sides of the triangle are equal.

The perimeter of a triangle = Sum of the lengths of all three sides

Let's form a linear equation for the given problem statement.

Base of an isosceles triangle = 4/3 cm

Let the equal sides measure as x cm each

Therefore, Perimeter of the triangle = x + x + $\frac{4}{3}$ = $4\frac{2}{15}$

Solving the above equation

➔ 2x + $\frac{4}{3}$ = $4\frac{2}{15}$

➔ $2x + \frac{4}{3} = \frac{62}{15}$

➔ $2x = \frac{62}{15} - \frac{4}{3}$

➔ $2x = \frac{62-20}{15}$

➔ $2x = \frac{42}{15}$

➔ $x = \frac{42}{15\ x\ 2} = \frac{21}{15}$

4. Sum of two numbers is 95. If one exceeds the other by 15, find the numbers.

Answer: Assume any one number to be a variable and form a linear equation by using the relationships between the two numbers mentioned in the problem statement.

Let one of the numbers be = x.

Then, the other number becomes x + 15. According to the question,

x + x + 15 = 95

➔ 2x + 15 = 95

➔ 2x = 95 – 15

➔ 2x = 80

➔ $x = \frac{80}{2}$

➔ x = 40

First number = x = 40

And, other number = x + 15 = 40 + 15 = 55

5. Two numbers are in the ratio 5:3. If they differ by 18, what are the numbers?

Answer: Let's form a linear equation for the given problem statement.

Two number are in ratio 5:3

Therefore, the numbers are 5x and 3x respectively.

The two numbers differ by 18

➔ 5x - 3x = 18

➔ 2x = 18

➔ x = 9

First number is 5x = 5 × 9 = 45

Second number is 3x = 3 × 9 = 27

The numbers will be 45 and 27.

6. Three consecutive integers add up to 51. What are these integers?

Answer:

Let's form a linear equation for the given problem statement.

Let the first integer be x.

Then the next consecutive two integers will be x + 1 and x + 2

x + (x + 1) + (x + 2) = 51 [Sum of the 3 consecutive integers is 51]

➔ 3x + 3 = 51

➔ 3x = 51 - 3

➔ 3x = 48

➔ x = 48/3

➔ x = 16,

Thus, x + 1 = 17, x + 2 = 18

Thus, the three consecutive integers are 16, 17, and 18.

7. The sum of three consecutive multiples of 8 is 888. Find the multiples

Answer:

Let's form a linear equation for the given problem statement.

Let the first multiple be x

Then second consecutive multiple of 8 will be x + 8

Third consecutive multiple of 8 will be x + 8 + 8 = x + 16

Sum of three consecutive multiples is 888.

➔ x + x + 8 + x + 16 = 888

➔ 3x + 24 = 888

➔ 3x = 888 - 24

➔ 3x = 864

➔ $x = \frac{864}{3}$

➔ x = 288

Therefore,

x + 8 = 296, x + 16 = 304

Thus, the multiples are 288, 296 and 304.

8. Three consecutive integers are such that when they are taken in increasing order and multiplied by 2, 3 and 4 respectively, they add up to 74. Find these numbers

Answer: Let the first integer be x.

Next two consecutive integers are x + 1 and x + 2

They are taken in increasing order and multiplied by 2, 3, and 4 respectively.

(x) × (2) = 2x

(x + 1) × 3 = 3x + 3

(x + 2) × 4 = 4x + 8

These 3 integers add up to 74,

➔2x + 3x + 3 + 4x + 8 = 74

➔ 9x + 11 = 74

➔9x = 74 - 11

➔9x = 63

➔ $x = \frac{63}{9} = 7$

➔ x + 1 = 8 , x + 2 = 9

Thus, the three integers are 7, 8 and 9

9. The ages of Rahul and Haroon are in the ratio 5:7. Four years later the sum of their ages will be 56 years. What are their present ages?

Answer: The ages of Rahul and Haroon are in ratio 5:7

Thus, the present ages of Rahul and Haroon are 5x and 7x respectively.

Four years later, the sum of their ages will be 56 years.

Four years later,

Age of Rahul = 5x + 4

Age of Haroon = 7x + 4

Since, sum of their ages is 56,

➔ 5x + 4 + 7x + 4 = 56

➔ 12x + 8 = 56

➔ 12x = 56 - 8

➔ 12x = 48

➔ x = $\frac{48}{12}$

➔ x = 4

Present age of Rahul = 5x = 5 × 4 = 20

Present age of Haroon = 7x = 7 × 4 = 28

Thus, the present age of Rahul and Haroon are 20 and 28 years respectively.

10. The number of boys and girls in a class are in the ratio 7:5. The number of boys is 8 more than the number of girls. What is the total class strength?

Answer:

The number of boys to girls is in the ratio of 7:5

So, we can infer that

Number of boys in class = 7x

Number of girls in class = 5x

Since the number of boys is 8 more than the number of girls,

➔ 7x = 5x + 8

➔ 7x - 5x = 8

➔ 2x = 8

➔ **x =** $\frac{8}{2}$

➔ x = 4

Therefore,

Number of boys in class = 7x = 7 x 4 = 28

Number of girls in class = 5x = 5 x 4 = 20

Total class strength = Number of boys + Number of girls = 28 + 20 = 48

Thus, the total strength of the class is 48 students.

11. Baichung's father is 26 years younger than Baichung's grandfather and 29 years older than Baichung. The sum of the ages of all the three is 135 years. What is the age of each one of them?

Answer:

Let the age of Baichung be x years.

Age of Baichung's father = x + 29

Age of Baichung's grandfather = Age of Baichung's father + 26 = x + 29 + 26 = x + 55

Sum of ages of all the three is 135 years (Given)

Banichung's age + Baichung's father's age + Baichung's granfather's age = 135

➔ x + (x + 29) + (x + 55) = 135

➔ 3x + 84 = 135

➔ 3x = 135 - 84

➔ 3x = 51

➔ $x = \frac{51}{3}$

➔ x = 17

Thus, we get the ages of each of them as

Age of Baichung = 17 years

Age of Baichung's father = x + 29 = 17 + 29 = 46 years

Age of Baichung's grandfather = x + 55 = 17 + 55 = 72 years

12. Fifteen years from now Ravi's age will be four times his present age. What is Ravi's present age?

Answer: Let's form a linear equation for the given problem statement.

Let the present age of Ravi be x years.

According to the question, 15 years from now, Ravi's age will be 4 times his present age

x + 15 = 4x

x - 4x = -15

-3x = -15

$x = \frac{-15}{-3}$

x = 5

Thus, Ravi's present age is 5 years.

13. A rational number is such that when you multiply it by 5/2 and add 2/3 to the product, you get -7/12. What is the number?

Answer: Let's form a linear equation for the given problem statement.

Let the rational number be x.

Multiply x by 5/2 and add 2/3 to it to get the result as -7/12.

$\frac{5x}{2} + \frac{-7}{12}$

Multiply by 12 on both sides to get rid of denominator

➔ $\frac{5x}{2}$ x 12 + $\frac{2}{3}$ x 12 = $\frac{-7}{12}$ x 12

5x × 6 + 2 × 4 = -7

30x + 8 = -7

30x = -15

$x = \frac{-15}{30} = \frac{-1}{2}$

Thus, the number is $\frac{-1}{2}$

14. Lakshmi is a cashier in a bank. She has currency notes of denominations ₹100, ₹50 and ₹10, respectively. The ratio of the number of these notes is 2:3:5. The total cash with Lakshmi is ₹4,00,000. How many notes of each denomination does she have?

Solution: Let's form a linear equation for the given problem statement.

Let's tabulate the given conditions according to the question.

Denomination	Number of notes	Total Amount
₹100	2x	200x
₹50	3x	150x
₹10	5x	50x

From the table, we can see that the total value of all denominations is,

200x + 150x + 50x = 400x

We know that the total cash she has is Rs.4,00,000

Therefore,

400x = 400000

$x = \frac{400000}{400} = 1000$

Thus the number of denominations of each note is

Denomination	Number of notes
₹100	2x = 2 × 1000 = 2000
₹50	3x = 3 × 1000 = 3000
₹10	5x = 5 × 1000 = 5000

15. I have a total of ₹300 in coins of denomination ₹1, ₹2 and ₹5. The number of ₹2 coins is 3 times the number of ₹5 coins. The total number of coins is 160. How many coins of each denomination are with me?

Answer: According to the question,

Let the number of ₹5 coins be x.

Then the number of ₹2 coins is 3x.

Number of ₹1 coin is = 160 - (x + 3x)

Let's tabulate the data as shown below,

Denomination	Number of notes	Total Amount
₹1	160 - 4x	160 - 4x
₹2	3x	6x
₹5	x	5x

From the table, we can see that the total value of all denominations is

160 - 4x + 6x + 5x = 160 + 7x

The total coin value is ₹300

Therefore, we shall equate the two to get the number of each denomination

160 - 4x + 6x + 5x = 300

160 + 7x = 300

7x = 140

x = $\frac{140}{7}$ = 20

Thus, the number of denominations of each note is:

Denomination	Number of notes
₹1	160 - 4x = 160 - 80 = 80
₹2	3x = 3 × 20 = 60
₹5	x = 20

16. The organisers of an essay competition decide that a winner in the competition gets a prize of ₹100 and a participant who does not win gets a prize of ₹25. The total prize money distributed is ₹3,000. Find the number of winners, if the total number of participants is 63

Answer: Let's use the given conditions in the question to form a linear equation.

Let the number of winners(W) = x

Then the number of participants who do not win(L) = 63 - x

Total prize money = ₹3000

[W × 100] + [L × 25] = 3000

100x + (63 - x)25 = 3000

100x + 1575 - 25x = 3000

75x + 1575 = 3000

75x = 3000 - 1575

x = $\frac{1425}{75}$

x = 19

Therefore, the number of winners of the essay competition is 19.

Exercise 2.3

1. Solve the following equation and check your result: 3x = 2x + 18

Answer: A mathematical equation that represents the relationship between two expressions on either side of the equal sign (=) is a Simple Equation. An equation consists of variables and numerical constants.

3x = 2x + 18

Subtracting 2x from both the sides,

3x - 2x = 2x - 2x + 18

x = 18

Therefore, the value of x = 18.

2. Solve the following equation and check your result: 5t - 3 = 3t - 5

Answer:

5t - 3 = 3t - 5

Subtracting 3t from both sides,

⇒ 5t - 3 - 3t = 3t - 3t - 5

⇒ 2t - 3 = -5

Simplifying further,

➔ 2t = - 5 + 3

➔ $t = \frac{-2}{2}$

➔ t = - 1

Therefore, the value of t = - 1

3. Solve the following equation and check your result: 5x + 9 = 5 + 3x

Answer: 5x + 9 = 5 + 3x

Subtracting 3x from both sides,

5x - 3x + 9 = 5 + 3x - 3x

➔ 2x + 9 = 5

Simplifying further,

2x = 5 - 9

➔ 2x = - 4

➔ x = $\frac{-4}{2}$

Therefore, the value of x = - 2

4. Solve the following equation and check your result: 4z + 3 = 6 + 2z

Answer: 4z + 3 = 6 + 2z

Subtracting 2z from both sides,

4z - 2z + 3 = 6 + 2z - 2z

➔2z + 3 = 6

Simplifying further,

➔ 2z = 6 - 3

➔ 2z = 3

➔ z = $\frac{3}{2}$

Therefore, the value of z = $\frac{3}{2}$

5.Solve the following equation and check your result: 2x - 1 = 14 - x

Answer: 2x - 1 = 14 - x

Adding x on both the sides,

2x + x - 1 = 14 - x + x

Simplifying further,

3x - 1 = 14

➔ 3x = 15

➔ x = $\frac{15}{3}$

➔ x = 5

Therefore, the value of x = 5

6. Solve the following equation and check your result: 8x + 4 = 3(x - 1) + 7

Answer: 8x + 4 = 3(x - 1) + 7

➔ 8x + 4 = 3x + 3(-1) + 7 [Using distributive property on RHS]

➔ 8x + 4 = 3x - 3 + 7

➔ 8x + 4 = 3x + 4

Simplifying further,

8x = 3x + 4 - 4

➔ 8x = 3x

➔ 5x = 0

Therefore, the value of x = 0

Putting the value of x in RHS and LHS, we get, (8×0) + 4 = 3 (0 – 1) + 7

➔ 0 + 4 = 0 – 3 + 7

➔ 4 = 4

➔ LHS = RHS

7. Solve the following equation and check your result: x = 4/5 (x + 10)

Answer: $x = \frac{4}{5}(x + 10)$

Multiplying both sides by 5,

5x = 4(x + 10)

➔ 5x = 4x + 40 [Using distributive property on RHS]

Simplifying further,

5x - 4x = 40

Therefore, x = 40

Putting the value of x in RHS and LHS, we get,

40 = 4/5 (40 + 10)

➔ $40 = \frac{4}{5} \times 50$

➔ 40 = 200/5

➔ 40 = 40

➔ LHS = RHS

8. 2x/3 + 1 = 7x/15

Answer: $\frac{2x}{3}$ + 1 = $\frac{7x}{15}$ + 3

➔ $\frac{2x}{3}$ - $\frac{7x}{15}$ = 3 - 1

➔ $\frac{10\,x - 7x}{15}$ = 2

By Cross-multiplying we get,

➔ 3x = 30

➔ x = $\frac{30}{3}$ = 10

Therefore, the value of x = 10

9. Solve the following equation and check your result: 2y + 5/3 = 26/3 - y

Solution:

2y + $\frac{5}{3}$ = $\frac{26}{3}$ - y

➔ 2y + y = $\frac{26}{3}$ - $\frac{5}{3}$

➔ 3y = $\frac{21}{3}$

➔ 3y = 7

➔ y = $\frac{7}{3}$

Therefore, the value of y = 7/3

10. Solve the following equation and check your result: 3m = 5m - 8/5

Answer: 3m = 5m - $\frac{8}{5}$

➔ 5m - 3m = $\frac{8}{5}$

➔ 2m = $\frac{8}{5}$

➔ m = $\frac{8}{5\,x\,2}$ = $\frac{4}{5}$

Therefore, the value of m = $\frac{4}{5}$

Exercise 2.4

1. Amina thinks of a number and subtracts 5/2 from it. She multiplies the result by 8. The result now obtained is 3 times the same number she thought of. What is the number?

Answer: Let the number be x.

According to the given question,

$8\left(x - \frac{5}{2}\right) = 3x$

➔ $8 \times x - \frac{5}{2} \times 8 = 3x$

$8x - 20 = 3x$

Transposing 3x to LHS and -20 to RHS, we obtain

$8x - 3x = 20$

$5x = 20$

Dividing both sides by 5, we obtain

➔ $\frac{5x}{5} = \frac{20}{5}$

→ $5x = 20$

➔ $x = \frac{20}{5}$

$x = 4$

Hence, the number is 4.

2. A positive number is 5 times another number. If 21 is added to both the numbers, then one of the new numbers becomes twice the other new number. What are the numbers?

Answer: Let the numbers be x and 5x.

Since x + 21 is smaller than 5x + 21, therefore according to the question,

$21 + 5x = 2(x + 21)$

$21 + 5x = 2x + 42$

Transposing 2x to LHS and 21 to RHS, we obtain

$5x - 2x = 42 - 21$

$3x = 21$

Dividing both sides by 3, we obtain

x = 7

First number is x = 7

Second number is 5x = 5 × 7 = 35

Hence, the numbers are 7 and 35 respectively.

3. Sum of the digits of a two-digit number is 9. When we interchange the digits, it is found that the resulting new number is greater than the original number by 27. What is the two-digit number?

Answer: Let the digits at tens place and ones place be x and 9 - x

Therefore, original number = 10x + (9 - x) = 9x + 9

On interchanging the digits, the digits at ones place and tens place will be x and 9 - x respectively.

Therefore, the new number after interchanging the digits = 10(9 - x) + x = 90 - 9x

New number = Original number + 27

90 - 9x = 9x + 9 + 27

90 - 9x = 9x + 36

Transposing 9x to RHS and 36 to LHS, we obtain

90 - 36 = 18x

54 = 18x

$x = \frac{54}{18}$

Dividing both sides by 18, we obtain

x = 3

Hence, 9 - x = 6

Hence, the digits at tens place and one's place of the number are 3 and 6 respectively. The number is 36.

4. One of the two digits of a two-digit number is three times the other digit. If you interchange the digits of this two-digit number and add the resulting number to the original number, you get 88. What is the original number?

Answer: Let the digit at tens place be x.

Then the digit at ones place will be 3x.

Original two-digit number = 10x + 3x

After interchanging the digits, the new number = 10(3x) + x = 30x + x

According to the question,

New number + Original number = 88

(30x + x) + (10x + 3x) = 88

➔ 31x + 13x = 88

➔ 44x = 88

Dividing both sides by 44, we obtain

➔ $\frac{44x}{44} = \frac{88}{44}$

➔ 44 x = 88

➔ x = $\frac{88}{44}$

x = 2

Therefore, original number = 10x + 3x = 10 x 2 + 3 x 2 = 26

5. Shobo's mother's present age is six times Shobo's present age. Shobo's age five years from now will be one third of his mother's present age. What are their present ages?

Answer: Let's form a linear equation for the given problem statement.

Let Shobo's age be x years. Therefore, his mother's age will be 6x years.

After 5 years, Shobo will be x + 5 years

According to the question,

x + 5 = 6x x $\frac{1}{3}$

➔ x + 5 = 2x

➔ x – 2x = -5

➔ - x = - 5

x = 5 and 6x = 30

Thus, Shobo's age is 5 years and his mother's age is 30 years.

6. There is a narrow rectangular plot, reserved for a school, in Mahuli village. The length and breadth of the plot are in the ratio 11:4. At the rate ₹100 per metre it will cost the village panchayat ₹ 75000 to fence the plot. What are the dimensions of the plot?

Answer: Let the common ratio between the length and breadth of the rectangular plot be x.

Hence, the length and breadth of the rectangular plot will be 11x and 4x respectively.

Perimeter of the plot = 2(Length + Breadth)

= 2(11x + 4x)

= 30x

It is given that the cost of fencing the plot at the rate of ₹100 per metre is ₹75,000.

100 × Perimeter = 75000

100 × 30x = 75000

3000x = 75000

Dividing both sides by 3000, we obtain

$\rightarrow \frac{3000\,x}{3000} = \frac{75000}{3000}$

x = 25

Length = 11x

= (11 × 25) m

= 275 m

Breadth = 4x

= (4 × 25) m

= 100 m

Hence, the dimensions of the plot are 275 m and 100 m respectively.

7. Hasan buys two kinds of cloth materials for school uniforms, shirt material that costs him ₹50 per metre and trouser material that costs him ₹90 per metre. For every 3 meters of the shirt material he buys 2 metres of the trouser material. He sells the materials at 12% and 10% profit respectively. His total sale is ₹36,600. How much trouser material did he buy?

Answer: According to the question, Trouser material and shirt material are purchased in the ratio of 2:3 by Hasan.

Let 2x m of trouser material and 3x m of shirt material be purchased by him.

Given that,

Cost price of the shirt per metre = ₹50 and Profit % = 12%

Cost price of the trouser per metre = ₹90 and Profit % = 10%

We know that,

Selling price = Cost Price + Profit

where, Profit = Profit% × Cost Price

Thus, per metre selling price of trouser material

= ₹ [90 + (90 × 10/100)]

= ₹99

Per metre selling price of shirt material

= ₹ [50 + (50 × 12/100)]

= ₹56

Since the total sales made is ₹36,660, we get

Total selling price of trousers + Total selling price of shirt = 36660

99 × (2x) + 56 × (3x) = 36660 [Since the number of trousers and shirts are 2x and 3x respectively]

198x + 168x = 36660

366x = 36660

x = 100 (approx.)

Thus, trouser material = 2x m

= (2 × 100) m

= 200 m

Therefore, the trouser material that Hasan bought was 200 m

8. Half of a herd of deer are grazing in the field and three fourths of the remaining are playing nearby. The rest 9 are drinking water from the pond. Find the number of deer in the herd.

Answer: Let's form a linear equation for the given problem statement.

Let the number of deer be x

Number of deer grazing in the field = $\frac{x}{2}$

Number of deer playing nearby

= $\left(\frac{3}{4}\right)$ × [Number of remaining deer]

= $\left(\frac{3}{4}\right) \times \left[x - \frac{x}{2}\right]$

= $\left(\frac{3}{4}\right) \times \left(\frac{x}{2}\right)$

= $\left(\frac{3x}{8}\right)$

Number of deer drinking water from the pond = 9

➔ x - $\left(\frac{x}{2} + \frac{3x}{8}\right)$ = 9

➔ x - $\frac{4x + 3x}{8}$ = 9

➔ x - $\frac{7x}{8}$ = 9

➔ $\frac{x}{8}$ = 9

Hence, x = 72

Hence, the total number of deer in the herd is 72.

9. A grandfather is ten times older than his granddaughter. He is also 54 years older than her. Find their present ages.

Answer: Let's form a linear equation for the given problem statement.

Let the granddaughter's age be x years.

Therefore, grandfather's age will be 10x years.

According to the question,

Grandfather's age = Granddaughter's age + 54 years

10x = x + 54

Transposing x to LHS, we obtain

10x - x = 54

9x = 54

x = $\frac{54}{9}$

x = 6

Hence, 10x = 60

Therefore, granddaughter's age is 6 years and her grandfather's age are 60 years.

10. Aman's age is three times his son's age. Ten years ago he was five times his son's age. Find their present ages

Answer: Let's form a linear equation for the given problem statement.

Let Aman's son's age be x years.

Therefore, Aman's age will be 3x years.

Ten years ago, their age was (x - 10) years and (3x - 10) years respectively.

According to the question,10 years ago,

Aman's age = 5 × Aman's son's age 10 years ago

3x - 10 = 5(x - 10)

3x - 10 = 5x - 50

2x = 40

X = $\frac{40}{2}$

x = 20 and 3x = 60

Therefore, Aman and his son's age are 60 and 20 years respectively.

Exercise 2.5

1. Solve the linear equation: x/2 - 1/5 = x/3 + 1/4

Answer: $\frac{x}{2} - \frac{1}{5} = \frac{x}{3} + \frac{1}{4}$

Multiply both sides by the LCM of the denominators to get rid of fractional denominator.

Now transpose variables to one side and constants to another side to form a linear equation.

$\frac{x}{2} - \frac{1}{5} = \frac{x}{3} + \frac{1}{4}$

LCM of the denominators is 60

Multiply the LCM on both sides

➔ $60\left(\frac{x}{2} - \frac{1}{5}\right) = 60\left(\frac{x}{3} + \frac{1}{4}\right)$

➔ $\left(\frac{x}{2} \text{x } 60 - \frac{1}{5} \text{ x } 60\right) = 60\left(\frac{x}{3} \text{ x } 60 + \frac{1}{4} \text{ x } 60\right)$

➔ 30x – 12 = 20 x + 15

➔ 30 x – 20x = 15 + 12

➔ 10 x = 27

➔ x = $\frac{27}{10}$

2. Solve the linear equation: n/2 - 3n/4 + 5n/6 = 21

Answer: $\frac{n}{2} - \frac{3n}{4} + \frac{5n}{6} = 21$

Multiply both sides by the LCM of the denominators to get rid of fractional denominator.

Now transpose variables to one side and constants to another side to form a linear equation.

LCM of the denominators is 12

Multiply the LCM on both sides

= $\frac{n}{2} - \frac{3n}{4} + \frac{5n}{6} = 21$

➔ $\frac{n}{2} \; x \; 12 - \frac{3n}{4} \; x \; 12 + \frac{5n}{6} \; x \; 12 = 21 \text{ x } 12$

➔ 6n – 9n + 10n = 21 x 12

➔ 7 n = 21 x 12

➔ n = $\frac{21 \; x \; 12}{7} = 36$

3. Solve the linear equation: x + 7 - 8x/3 = 17/6 - 5x/2

Answer: x + 7 - $\frac{8x}{3} = \frac{17}{6} - \frac{5x}{2}$

Multiply both sides by the LCM of the denominators to get rid of fractional denominator.

Now transpose variables to one side and constants to another side to form a linear equation.

x + 7 - $\frac{8x}{3} = \frac{17}{6} - \frac{5x}{2}$

LCM of the denominators is 6

Multiply the LCM on both sides

➔ $6\left(x + 7 - \frac{8x}{3}\right) = 6\left(\frac{17}{6} - \frac{5x}{2}\right)$

➔ 6(x + 7) - $\frac{8x}{3} \; x \; 6 = \frac{17}{6} \; x \; 6 - \frac{5x}{2}$ x 6

➔ 6x + 42 – 16x = 17 – 15x

➔ 6x – 16 x + 15 x = 17 – 42

➔ 5x = -25

➔ x = $\frac{-25}{5}$

➔ x= -5

4. Solve the linear equation: (x - 5)/3 = (x - 3)/5

Answer: $\frac{x-5}{3} = \frac{x-3}{5}$

Multiply both sides by the LCM of the denominators to get rid of fractional denominator.

Now transpose variables to one side and constants to another side to form a linear equation.

➔ $\frac{x-5}{3} = \frac{x-3}{5}$

LCM of the denominators is 15

Multiply the LCM on both sides

➔ $15\left[\frac{x-5}{3}\right] = 15\left[\frac{x-3}{5}\right]$

➔ 5 (x - 5) = 3 (x - 3)

5x – 25 = 3x – 9

5x – 3x = -9 + 25

2x = 16

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

x = 8

5. Solve the linear equation: (3t - 2)/4 - (2t + 3)/3 = 2/3 - t

Answer: $\frac{(3t-2)}{4} - \frac{(2t+3)}{3} = \frac{2}{3} - t$

Multiply both sides by the LCM of the denominators to get rid of fractional denominator.

Now transpose variables to one side and constants to another side to form a linear equation.

➔ $\frac{(3t-2)}{4} - \frac{(2t+3)}{3} = \frac{2}{3} - t$

LCM of the denominators is 12

Multiply the LCM on both sides

➔ $12\ x\ \frac{(3t-2)}{4}$ - $12\ x\ \frac{(2t+3)}{3} = \frac{2}{3}\ x\ 12 - t \times 12$

➔ 3(3t - 2) – 4(2t + 3) = 8 – 12t

➔ 9t – 6 – 8t - 12 = 8 – 12t

➔ 9t – 8t + 12t = 8 + 6 + 12

➔ 13 t = 26

➔ t = $\frac{26}{13} = 2$

Hence t = 2

6. Solve the linear equation: m - (m - 1)/2 = 1 - (m - 2)/3

Answer: m - $\frac{(m-1)}{2} = 1 - \frac{(m-2)}{3}$

Multiply both sides by the LCM of the denominators to get rid of fractional denominator.

Now transpose variables to one side and constants to another side to form a linear equation.

m – $\frac{(m-1)}{2} = 1 - \frac{(m-2)}{3}$

LCM of the denominators is 6

Multiply the LCM on both sides

➔ 6 x m – $\mathbf{6}\ \boldsymbol{x}\ \frac{(m-1)}{2} = 1 \times 6 - 6\ x\ \frac{(m-2)}{3}$

➔ 6m – 3(m-1) = 6 – 2(m-2)

➔ 6m – 3m + 3 = 6 – 2m + 4

➔ 6m – 3m + 2m = 6 + 4 – 3

➔ 5m = 7

➔ m = $\frac{7}{5}$

Alternative solution:

m – (m – 1)/2 = 1 – (m – 2)/3

➔ m – m/2 – 1/2 = 1 – (m/3 – 2/3)

➔m – m/2 + ½ = 1 – m/3 + 2/3

➔ m – m/2 + m/3 = 1 + 2/3 – ½

➔ m/2 + m/3 = ½ + 2/3

➔ (3m + 2m)/6 = (3 + 4)/6

➔ 5m/6 = 7/6

➔ m = 7/6 × 6/5

➔ m = 7/5

7. Simplify and solve the linear equations: 3(t - 3) = 5(2t + 1)

Answer: We will be applying distributive property and then transpose variables to one side and constants to another side to form a linear equation.

3(t - 3) = 5(2t + 1)

➔ 3t - 9 = 10t + 5 [Using distributive property]

➔ **3t – 10t = 5 + 9**

➔ -7t = 14

➔ 7t = -14

Hence,

t = $\frac{-14}{7}$

t = - 2

8. Simplify and solve the linear equation: 15(y - 4) - 2(y - 9) + 5(y + 6) = 0

Answer: We will be applying distributive property and then transpose variables to one side and constants to another side to form a linear equation.

15(y - 4) - 2(y - 9) + 5(y + 6) = 0

➔ 15y - 60 - 2y + 18 + 5y + 30 = 0 [Using distributive property]

➔ 15 y – 2y + 5y – 60 + 18 + 30

➔ 18y - 12 = 0

➔ 18y = 12

Hence,

y = $\frac{12}{18}$ = $\frac{2}{3}$

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

9. Simplify and solve the linear equation: 3(5z – 7) – 2(9z – 11) = 4(8z – 13) – 17

Answer: We will be applying distributive property and then transpose variables to one side and constants to another side to form a linear equation.

3(5z - 7) - 2(9z - 11) = 4(8z - 13) - 17

➔ 15z - 21 - 18z + 22 = 32z - 52 - 17 [Using distributive property]

➔ 15z – 18z – 21 + 22 = 32 z – 52 - 17

➔ -3z + 1 = 32z - 69

➔ -3z - 32z = -69 - 1

➔ -35z = -70

Hence,

z = $\frac{70}{35}$ = 2

10. Simplify and solve the linear equation: 0.25(4f - 3) = 0.05(10f - 9)

Answer: We will be applying distributive property and then transpose variables to one side and constants to another side to form a linear equation.

0.25(4f - 3) = 0.05(10f - 9)

➔ f - 0.75 = 0.5f - 0.45 [Using distributive property]

➔ f - 0.5f = 0.75 - 0.45

➔ 0.5f = 0.3

➔ f = $\frac{0.3}{0.5}$ = $\frac{3}{5}$

Hence, f = $\frac{3}{5}$

Exercise 2.6

1. Solve the following equation: (8x - 3)/3x = 2

Answer: An equation is a mathematical statement with an 'equal to' symbol between two algebraic expressions that have equal values.

➔ $\frac{(8x-3)}{3x}$ = 2

On multiplying both sides by 3x, we obtain

8x - 3 = 2 x 3x

8x - 3 = 6x

➔ 8x - 6x = 3

➔ 2x = 3

Hence, x = $\frac{3}{2}$

2. Solve the following equation: 9x / (7 - 6x) = 15

Answer: $\frac{9x}{(7-6x)}$ = 15

On multiplying both sides by 7 - 6x, we obtain

$\frac{9x}{(7-6x)}$ x 7 – 6x = 15 (7 – 6x)

9x = 15(7 - 6x)

➔ 9x = 105 - 90x

➔ 9x + 90x = 105

➔ 99x = 105

Hence,

x = $\frac{105}{99}$ = $\frac{35}{33}$

3. Solve the following equation: z/(z + 15) = 4/9

Answer: $\frac{z}{(z+15)}$ = $\frac{4}{9}$

On multiplying both sides by 9(z + 15), we obtain

$\frac{z}{(z+15)}$ x (z + 15) = $\frac{4}{9}$ x (z + 15)

9z = 4(z + 15)

➔ 9z = 4z + 60 [Using distributive property on RHS]

➔ 9z - 4z = 60

➔ 5z = 60

➔ z = $\frac{60}{5}$ = 12

Hence, z = 12.

Alternative solution:

z / (z + 15) = 4/9

➔ z = 4/9 (z + 15)

➔ 9z = 4(z + 15)

➔ 9z = 4z + 60

➔ 9z – 4z = 60

➔ 5z = 60

➔ z = 12

4. Solve the following equations: 3y + 4 / 2 - 6y = - 2/5

Answer: $\frac{3y+4}{2-6y}$ = $\frac{-2}{5}$

On multiplying both sides by 5(2 - 6y), we obtain

$\frac{3y+4}{2-6y}$ x 5(2 - 6y) = $\frac{-2}{5}$ x 5(2 - 6y),

➔ 5 (3y + 4) = -2 (2 – 6y)

➔ 15 y + 20 = -4 + 12y [Using distributive property]

➔ 15 y – 12 y = - 4 – 20

➔ 3y = -24

Y = $\frac{-24}{3}$ = -8

Hence, y = -8

Alternative solution:

(3y + 4)/(2 – 6y) = -2/5

⇒ 3y + 4 = -2/5 (2 – 6y)

⇒ 5(3y + 4) = -2(2 – 6y)

⇒ 15y + 20 = -4 + 12y

⇒ 15y – 12y = -4 – 20

⇒ 3y = -24

⇒ y = -8

5. Solve the following equations: 7y + 4 / y + 2 = -4/3

Answer: $\frac{7y+4}{y+2} = \frac{-4}{3}$

On multiplying both sides by 3(y + 2), we obtain

➔ $\frac{7y+4}{y+2}$ x 3(y + 2) = $\frac{-4}{3}$ X 3(y + 2)

➔ 3 (7y + 4) = -4 (y + 2)

➔ 21 y + 12 = -4y – 8 [Using distributive property]

➔ 21 y + 4y = - 8 – 12

➔ 25y = -20

Y = $\frac{-20}{25} = \frac{-4}{5}$

Hence, y = $\frac{-4}{5}$

Alternative solution:

(7y + 4)/(y + 2) = -4/3

➔ 7y + 4 = -4/3 (y + 2)

➔ 3(7y + 4) = -4(y + 2)

➔ 21y + 12 = -4y – 8

➔ 21y + 4y = -8 – 12

➔ 25y = -20

➔ y = -20/25 = -4/5

6. The ages of Hari and Harry are in the ratio 5:7. Four years from now the ratio of their ages will be 3:4. Find their present ages

Answer: Let the common ratio between their ages be x.

Therefore, Hari's age and Harry's age will be 5x years and 7x years respectively

Four years later, their ages will be (5x + 4) years and (7x + 4) years respectively

Let's form a linear equation for the given problem statement.

According to the situation given in the question,

➔ $\frac{(5x+4)}{(7x+4)} = \frac{3}{4}$

➔ 4(5x + 4) = 3(7x + 4)

20x + 16 = 21x + 12

16 -12 = 21x - 20x

x = 4

This gives us 5x = 20, and 7x = 28

Thus, Hari's present age is 20 years, and Harry's present age is 28 years.

7. The denominator of a rational number is greater than its numerator by 8. If the numerator is increased by 17 and the denominator is decreased by 1, the number obtained is 3/2. Find the rational number

Answer: Let the numerator of the rational number be x.

Therefore, its denominator will be x + 8.

The rational number will be $\frac{x}{x+8}$

Thus, according to the question we get

➔ $\frac{(x+17)}{(x+8-1)} = \frac{3}{2}$

➔ $\frac{(x+17)}{(x+7)} = \frac{3}{2}$

Cross-multiplying, we get

➔ $2\ (x + 17) = 3\ (x + 7)$

➔ 2x + 34 = 3x + 21

➔ 3x - 2x = 34 - 21

➔ x = 13

X = 13

Hence x + 8 = 13 + 8 = 21

Thus, the numerator is 13 and the denominator = 21. Therefore, the rational number is equal to $\frac{13}{21}$