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Chapter-2: Linear equations

Exercise 2.1 (Page 23 of Grade 8 NCERT)

Q1. Solve the following equations:

(i) $x - 2 = 7$

(ii) $y + 3 = 10$

(iii) $6 = z + 2$

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

(v) $(6x = 12)$

(vii) $\frac{t}{5} = 10$

(vii) $\frac{2x}{3} = 18$

(viii) $1.6 = \frac{y}{1.5}$

(ix) $7x - 9 = 16$

(x) $14y - 8 = 13$

(xi) $17 + 6p = 9$

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

Difficulty level: Easy

What is known:

Equations

What is unknown:

Value of the variable

Reasoning:

In an equation values of left-hand side (LHS) and right-hand side (RHS) are equal. The two sides of the equation are balanced. We perform mathematical operations so that the balance is not disturbed.

Difficulty Level: Easy

Solution:

(i) $x - 2 = 7$

Transposing (-2) to RHS we get:

$$x = 7 + 2$$

$$x = 9$$

(ii) $y + 3 = 10$

Difficulty Level: Easy

Solution:

$$y + 3 = 10$$

Transposing 3 to RHS we get,

$$y = 10 - 3$$

$$y = 7$$

(iii) $6 = z + 2$

Difficulty Level: Easy

Solution:

$$6 = z + 2$$

Transposing 2 to LHS we get,

$$6 - 2 = z$$

$$z = 4$$

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

Difficulty Level: Easy

Solution:

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

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

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

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

$$x = 2$$

(v) $(6x = 12)$

Difficulty Level: Easy

Solution:

We have $6x = 12$, dividing expressions with 6 both sides

$$\frac{6x}{6} = \frac{12}{6}$$

$$x = 2$$

(vii) $\frac{t}{5} = 10$

Difficulty Level: Easy

Solution:

We have $\frac{t}{5} = 10$, multiplying expressions with 5 both sides

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

We get $t = 50$

$$(vii) \frac{2x}{3} = 18$$

Difficulty Level: Easy

Solution:

By multiplying with $\frac{3}{2}$ in both sides,

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

We get $x = 27$

$$(viii) 1.6 = \frac{y}{1.5}$$

Difficulty Level: Easy

Solution:

Multiplying with 1.5 both sides

$$\frac{y}{1.5} \times 1.5 = 1.6 \times 1.5$$

We get $y = 2.4$

$$(ix) 7x - 9 = 16$$

Difficulty Level: Easy

Solution:

Transposing (-9) to RHS, we get

$$7x = 16 + 9$$

$$7x = 25$$

Now dividing both sides by 7:

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

We get $x = 3.57$

$$(x) 14y - 8 = 13$$

Transposing (-8) to RHS, we get

$$14y = 13 + 8$$

$$14y = 21$$

Now dividing both sides by 14:

$$\frac{14y}{14} = \frac{21}{14}$$

We get $y = 1.5$

(xi) $17 + 6p = 9$

Difficulty Level: Easy

Solution:

Transposing 17 to RHS, we get:

$$6p = 9 - 17$$

$$6p = -8$$

Now dividing both sides by 6.

$$\frac{6p}{6} = \frac{-8}{6}$$

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

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

Difficulty Level: Easy

Solution:

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

$$\frac{x}{3} \times 3 = -\frac{8}{15} \times 3$$

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

Chapter-2: Linear equations

Exercise 2.2 (Page 28 of Grade 8 NCERT)

Q1. If you subtract $\frac{1}{2}$ from a number and multiply the result by $\frac{1}{2}$, you get $\frac{1}{8}$.
What is the number?

Difficulty Level: Medium

What is the known/given?

- (i) $\frac{1}{2}$ is subtracted from a number.
- (ii) Result is multiplied by $\frac{1}{2}$
- (iii) Answer is $\frac{1}{8}$

What is the unknown?

The number

Reasoning:

Forming a linear equation for the given problem statement and solving it will lead to the solution.

Solution:

Let the number be x

Then,

- (i) $\frac{1}{2}$ is subtracted from a number $\rightarrow x - \frac{1}{2}$
- (ii) Result is multiplied by $\frac{1}{2} \rightarrow \frac{1}{2}(x - \frac{1}{2})$
- (iii) Answer is $\frac{1}{8} \rightarrow \frac{1}{2}(x - \frac{1}{2}) = \frac{1}{8}$

Solving:

$$\frac{1}{2}\left(x - \frac{1}{2}\right) = \frac{1}{8} \text{ (Multiplying with 2 on both sides)}$$

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

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

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

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

The number is $\frac{3}{4}$

Q2. 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 the breadth of the pool?

Difficulty Level: Medium

What is the known/given?

- (i) Perimeter of a rectangular swimming pool is 154m.
- (ii) Its length is 2m more than twice its breadth.

What is the unknown?

Length and breadth of the pool.

Reasoning:

Form a linear equation by using the formula for the perimeter of a rectangle. Assume either the breadth or the length to be a variable

Solution:

Let the breadth of swimming pool be x m.

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

Perimeter of rectangular swimming pool: $2(\text{Length} + \text{Breadth})$

Therefore, $2(x + 2x + 2) = 154$

$$3x + 2 = \frac{154}{2}$$

$$3x + 2 = 77$$

$$3x = 77 - 2$$

$$3x = 75$$

$$x = \frac{75}{3}$$

$$x = 25$$

$$\text{breadth} = 25m$$

$$\begin{aligned}\text{length} &= 2x + 2 \\ &= 2(25) + 2 \\ &= 52m\end{aligned}$$

Length of the pool = $52m$

Breadth of the pool = $25m$

Q3. The base of an isosceles triangle is $\frac{4}{3}$ cm. The perimeter of the triangle is $4\frac{2}{15}$ cm. What is the length of either of the remaining equal sides?

Difficulty Level: Medium

What is the known/given?

- (i) Base of an isosceles triangle = $\frac{4}{3} \text{ cm}$
- (ii) Perimeter of the triangle = $4\frac{2}{15} \text{ cm}$

What is the unknown?

Length of sides of the equal sides of isosceles triangle.

Reasoning:

In an isosceles triangle, two sides of the triangle are equal. The value of one side is given. We can assume any one of the two sides to be a variable and form a linear equation using the following formula for the perimeter of any triangle:

Perimeter of a Triangle = Sum of the Lengths of all Three Sides

Solution:

Let the length of either of equal sides be x cm.

(i) Base of an isosceles triangle = $\frac{4}{3}$ cm

(ii) Perimeter of the triangle $\rightarrow x + x + \frac{4}{3} = 4\frac{2}{15}$ (adding all these sides)

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

$$2x = \frac{62}{15} - \frac{4}{3}$$

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

$$x = \frac{42}{15} \times \frac{1}{2}$$

$$x = \frac{21}{15}$$

$$x = \frac{7}{5}$$

Length of either of the equal side of isosceles triangle is $\frac{7}{5}$ cm

Q4. Sum of two numbers is 95. If one exceeds the other by 15, find the numbers.

Difficulty Level: Medium

What is the known/given?

- (i) Sum of two numbers is 95.
- (ii) One exceeds the other by 15.

What is the unknown?

Numbers

Reasoning:

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.

Solution:

Let one of the numbers be x .

Then the other number $\rightarrow 95 - x$ (as sum of them is 95).

If we assume x to be larger among two of them.

$$x - (95 - x) = 15 \text{ (as one exceeds other by 15)}$$

$$x - 95 + x = 15$$

$$2x = 110$$

$$x = \frac{110}{2}$$

$$x = 55$$

Then other number $\rightarrow 95 - x = 95 - 55 = 40$

The numbers are 40 and 55.

Q5. Two numbers are in the ratio 5:3. If they differ by 18, what are the numbers?

Difficulty Level: Medium

What is the known/given?

- (i) Two number are in ratio 5:3.
- (ii) They differ by 18.

What is the unknown?

Number

Reasoning:

Assume any one number to be a variable and form a linear equation by using the relationships between the two numbers as mentioned in the problem statement. Any one relationship will allow you to express one number in terms of the other number (assumed to be a variable first). Then, the second relationship will allow you to form a linear equation.

Solution:

Two number are in ratio 5:3

\therefore The number are $5x$ and $3x$.

The two numbers differ by 18:

$$5x - 3x = 18$$

$$2x = 18$$

$$x = 9$$

First number is $5x = 5 \times 9 = 45$

Second number is $3x = 3 \times 9 = 27$

The numbers will be 45 and 27.

Q6. Three consecutive integers add up to 51. What are these integers?

Difficulty Level: Medium

What is the known/given?

(i) Three consecutive integers add up to 51.

What is the unknown?

Integers.

Reasoning:

Assume one integer to be a variable. Then use the property of consecutive integers and the given condition to form a linear equation.

Solution:

Let the first integer be x .

Then next consecutive two integers are $x + 1$ and $x + 2$

$$x + (x + 1) + (x + 2) = 51 \quad [\because \text{sum of the 3 consecutive integers is 51}]$$

$$3x + 3 = 51$$

$$3x = 51 - 3$$

$$3x = 48$$

$$x = \frac{48}{3}$$

$$x = 16$$

$$x + 1 = 17$$

$$x + 2 = 18$$

Three consecutive integers are 16, 17 and 18.

Q7. The sum of three consecutive multiples of 8 is 888. Find the multiples.

Difficulty Level: Medium

What is the known/given?

Sum of three consecutive multiples of 8 is 888.

What is the unknown?

Multiples.

Reasoning:

Assume one multiple to be a variable. Then use the property of consecutive multiples to form a linear equation.

Solution:

Let the first multiple be x

Then second consecutive multiple of 8 $\rightarrow x + 8$

Third consecutive multiple of 8 $\rightarrow x + 8 + 8 = x + 16$

Sum of three consecutive multiples is 888.

$$\therefore x + (x + 8) + (x + 16) = 888$$

$$3x + 24 = 888$$

$$3x = 888 - 24$$

$$3x = 864$$

$$x = \frac{864}{3}$$

$$x = 288$$

$$x + 8 = 296$$

$$x + 16 = 304$$

The multiples are 288, 296 and 304.

Q8. 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.

Difficulty Level: Hard**What is the known/given?**

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.

What is the unknown?

Number.

Reasoning:

Assume one integer to be a variable. Then use the property of consecutive integers and the given condition to form a linear equation.

Solution:

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.

$$\therefore x \times 2 = 2x$$

$$(x+1) \times 3 = 3x + 3$$

$$(x+2) \times 4 = 4x + 8$$

They add up to 74

$$\therefore 2x + 3x + 3 + 4x + 8 = 74$$

$$9x + 11 = 74$$

$$9x = 74 - 11$$

$$9x = 63$$

$$x = \frac{63}{9}$$

$$x = 7$$

Then $x + 1 = 8$

$$x + 2 = 9$$

The numbers are 7, 8 and 9.

Q9. 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?

Difficulty Level: Medium

What is the known/given?

- (i) Ages of Rahul and Haroon are in ratio 5 : 7
- (ii) Four years later, sum of their ages will be 56 years.

What is the unknown?

Present ages of Rahul and Haroon.

Reasoning:

Assume the age of either Rahul or Haroon as a variable. Use the first condition to express the ages in terms of the variable. Then use the second condition to form a linear equation.

Solution:

Ages of Rahul and Haroon are in ratio 5 : 7

Present ages of Rahul and Haroon are $5x$ and $7x$ respectively.

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

Four years later, age of Rahul = $5x + 4$

Four years later, age of Haroon = $7x + 4$

$$\begin{aligned}\text{Sum} &\rightarrow 5x + 4 + 7x + 4 = 56 \\ 12x + 8 &= 56 \\ 12x &= 56 - 8 \\ 12x &= 48 \\ x &= \frac{48}{12} \\ x &= 4\end{aligned}$$

$$\text{Present age of Rahul} = 5x = 5 \times 4 = 20$$

$$\text{Present age of Haroon} = 7x = 7 \times 4 = 28$$

Present age of Rahul and Haroon are 20 and 28 years respectively.

Q10. 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?

Difficulty Level: Medium

What is the known/given?

- (i) Number of boys and girls in a class are in ratio 7:5
- (ii) Number of boys is 8 more than the number of girls.

What is the unknown?

Total class strength.

Reasoning:

Use the first condition to express the numbers in terms of the variable. Use the second condition to form a linear equation.

Solution:

Number of boys and girls in a class are in ratio 7:5

$$\therefore \text{Number of boys in class} = 7x$$

$$\text{Number of girls in class} = 5x$$

Number of boys is 8 more than number of girls.

$$\therefore 7x = 5x + 8$$

$$7x - 5x = 8$$

$$2x = 8$$

$$x = 4$$

$$\text{Number of boys in class} = 7x = 7 \times 4 = 28$$

$$\text{Number of girls in class} = 5x = 5 \times 4 = 20$$

$$\begin{aligned}\text{Total class strength} &= \text{number of boys} + \text{number of girls} \\ &= 28 + 20 \\ &= 48\end{aligned}$$

Total class strength is 48 students.

Q11. 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?

Difficulty Level: Hard

What is the known/given?

- (i) Baichung's father is 26 years younger than Baichung's grandfather and 29 years older than Baichung
- (ii) Sum of the ages of all the three is 135 years.

What is the unknown?

Ages of Baichung, Baichung's father and Baichung's grandfather.

Reasoning:

Assume Baichung's age to be a variable. Then use the first condition to express the ages of Baichung's father and grandfather. Finally, use the last second condition to form a linear equation.

Solution:

Let the age of Baichung be x years.

\therefore Age of Baichung's father = $x + 29$ years as he is 29 years older than Baichung.

Age of Baichung's grandfather = age of Baichung father + 26 years

[\therefore since Baichung's father is 26 years younger than Baichung's grandfather]

$$\rightarrow x + 29 + 26$$

$$= x + 55 \text{ Years}$$

Sum of ages of all the three is 135 years.

$$\therefore x + x + 29 + x + 55 = 135$$

Ages: Baichung father grandfathers.

$$3x + 84 = 135$$

$$3x = 135 - 84$$

$$3x = 51$$

$$x = \frac{51}{3}$$

$$x = 17$$

Age of Baichung is 17 years

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

Age of Baichung's grandfathers is $x + 55 = 17 + 55 = 72$ years

Q12. Fifteen years from now Ravi's age will be four times his present age. What is Ravi's present age?

Difficulty Level: Medium

What is the known/given?

Fifteen years from now Ravi's age will be four times his present age.

What is the unknown?

Ravi's present age

Reasoning:

Assume Ravi's age to be a variable. Use the first and second condition to express his age after 15 years in the form of a linear equation.

Solution:

Let the present age of Ravi be x years.

15 years from now, Ravi's age will be 4 times his present age

$$x + 15 = 4x$$

$$x - 4x = -15$$

$$-3x = -15$$

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

$$x = 5$$

\therefore Ravi's present age is 5 years

Q13. A rational number is such that when you multiply it by $\frac{5}{2}$ and add $\frac{2}{3}$ to the product, you get $-\frac{7}{12}$. What is the number?

Difficulty Level: Medium

What is the known/given?

A rational number is such that when multiply it by $\frac{5}{2}$ and add $\frac{2}{3}$ to the product, answer is $-\frac{7}{12}$.

What is the unknown?

Numbers.

Reasoning:

Assume the rational number to be a variable. Apply the conditions sequentially to form a linear equation.

Solution:

Let the rational number be x

$$\text{Multiply by } \frac{5}{2} \rightarrow x \times \frac{5}{2} = \frac{5x}{2}$$

$$\text{Add } \frac{2}{3} \text{ in the product} = \frac{5x}{2} + \frac{2}{3}$$

$$\text{Answer is } \rightarrow \frac{-7}{12}$$

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

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

$$\frac{5x}{2} = \frac{-7-8}{12}$$

$$\frac{5x}{2} = \frac{-15}{12}$$

$$x = \frac{-15}{12} \times \frac{2}{5}$$

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

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

The number is $-\frac{1}{2}$.

Q14. Lakshmi is a cashier in a bank. She has currency notes of denomination Rs.100, Rs.50 and Rs.10, respectively. The ratio of the number of these notes is 2:3:5. The total cash with Lakshmi is Rs.4,00,000. How many notes of each denomination does she have?

Difficulty Level: Hard

Reasoning:

Use the ratio condition and express the number of notes of different denominations in terms of a variable. Use the second condition to form a linear equation.

What is the known/given?

- (i) Cashier Lakshmi has currency notes of denomination Rs. 100, Rs.50, and Rs.10.
- (ii) Ratio of the number of notes is 2:3:5.
- (iii) Total cash with Lakshmi is Rs. 4,00,000

What is the unknown?

How many notes of each denomination.

Reasoning:

Use the ratio condition and express the number of notes of different denominations in terms of a variable. Use the second condition to form a linear equation.

Solution:

- (i) Lakshmi has currency notes of denomination Rs.100, Rs.50, Rs.10.
- (ii) Number of notes are in ratio 2:3:5, therefore number of notes is $2x$, $3x$ and $5x$

Denomination	Number of notes	Total
RS .100	$2x$	$200x$
RS. 50	$3x$	$150x$
RS. 10	$5x$	$50x$

$$200x + 150x + 50x = 400000$$

$$400x = 400000$$

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

$$x = 1000$$

Denomination	Number of notes
RS. 100	$2x = 2 \times 1000 = 2000$
RS. 50	$3x = 3 \times 1000 = 3000$
RS. 10	$5x = 5 \times 1000 = 5000$

Q15. I have a total of Rs. 300 in coins of denomination Rs.1, Rs.2 and Rs.5. The number of Rs. 2 coins is 3 times the number of Rs.5 coins. The total number of coins is 160. How many coins of each denomination are with me?

Difficulty Level: Hard

What is the known/given?

- (i) Total amount = RS. 300
- (ii) Coin denominations are Rs. 1, Rs.2 and Rs. 5
- (iii) Number of Rs.2 coins are 3 times Rs. 5 coins.
- (iv) Total coins \rightarrow 160

What is the unknown?

How many coins of each denominations are there.

Reasoning:

Assume the number of Rs. 5 coin to be a variable. Use the second condition to obtain the number of coins for Rs 2 in terms of the variable. Use the third condition to find the number of coins for Rs 1. Finally, use the first condition to form a linear equation.

Solution:

Let the number of Rs 5 coins be x .

Then the number of Rs.2 coins is $3x$.

Number of Rs.1 coin is $= 160 - (x + 3x)$ [\because as total coins are 160]
 $= 160 - 4x$

Denomination	Number of coins	Amount
RS.1	$160-4x$	$160-4x$
RS.2	$3x$	$6x$
RS.5	x	$5x$

$$\rightarrow 160 - 4x + 6x + 5x = 300$$

$$160 + 7x = 300$$

$$7x = 300 - 160$$

$$7x = 140$$

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

$$x = 20$$

Denomination	Number of coins
RS. 1	$160 - 4x = 160 - 80 = 80$
RS. 2	$3x = 3 \times 20 = 60$
RS. 5	$x = 20$

Q16. The organizers of an essay competition decide that a winner in the competition gets a prize of Rs.100 and a participant who does not win gets a prize of Rs. 25. The total prize money distributed is Rs.3,000. Find the number of winners, if the total number of participants is 63.

Difficulty Level: Hard

What is the known/given?

- (i) Winner of essay competition gets a prize of Rs 100
- (ii) Participant who does not win gets a prize of Rs 25
- (iii) Total prize of money distributed is Rs. 3000
- (iv) Total number of participants is 63.

What is the unknown?

Number of winners.

Reasoning: Assume the total number of winners is x . As total number of participants is 63, number of participants who did not win will be $63 - x$. Now use first, second, and third conditions to form a linear equation.

Solution:

Let the number of number of winners be x

Then the number of participants who do not win $\rightarrow 63 - x$ [as the total participants is 63]

Total prize money = Rs. 3000

[number of winners $\times 100$] + [number of participants who do not win $\times 25$] = 3000

$$x \times 100 + (63 - x)25 = 3000$$

$$100x + 1575 - 25x = 3000$$

$$75x + 1575 = 3000$$

$$75x = 3000 - 1575$$

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

$$x = 19$$

Number of winners is 19

Chapter-2: Linear equations

Exercise 2.3 (Page 30 of Grade 8 NCERT)

Q1. Solve the following equations and check your results:

(i) $3x = 2x + 18$

(ii) $5t - 3 = 3t - 5$

(iii) $5x + 9 = 5 + 3x$

(vi) $4z + 3 = 6 + 2z$

(v) $2x - 1 = 14 - x$

(vi) $8x + 4 = 3(x - 1) + 7$

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

(viii) $\frac{2x}{3} + 1 = \frac{7x}{15} + 3$

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

(x) $3m = 5m - \frac{8}{5}$

Difficulty Level: Easy

What is known:

Equations

What is unknown:

Value of the variable

Reasoning:

In algebraic equations, arithmetic operations can be executed on variables treating them as numbers.

(i) $3x = 2x + 18$

Solution:

Subtracting $2x$ on both sides

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

$$x = 18$$

$$(ii) \quad 5t - 3 = 3t - 5$$

Difficulty Level: Easy

Solution:

Subtracting $3t$ on both sides

$$5t - 3 - 3t = 3t - 3t - 5$$

$$2t - 3 = -5$$

$$2t = -5 + 3 \quad (\text{Transposing '-3' to RHS})$$

$$t = \frac{-2}{2} \quad (\text{Dividing both sides by '2'})$$

$$t = -1$$

$$(iii) \quad 5x + 9 = 5 + 3x$$

Difficulty Level: Easy

Solution:

$$5x - 3x + 9 = 5 + 3x - 3x \quad (\text{Subtracting } 3x \text{ from both sides})$$

$$2x + 9 = 5$$

$$2x = 5 - 9$$

$$2x = -4 \quad (\text{Dividing by 2 on both sides})$$

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

$$x = -2$$

$$(vi) \quad 4z + 3 = 6 + 2z$$

Difficulty Level: Easy

Solution:

$$4z + 3 = 6 + 2z$$

$$4z - 2z + 3 = 6 + 2z - 2z \quad (\text{subtracting '2z' from both sides})$$

$$2z + 3 = 6$$

$$2z = 6 - 3$$

$$2z = 3 \quad (\text{Dividing by 2 on both sides})$$

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

(v) $2x - 1 = 14 - x$

Difficulty Level: Easy

Solution:

$$2x - 1 = 14 - x$$

$$2x + x - 1 = 14 - x + x \quad (\text{Adding 'x' on both sides})$$

$$3x - 1 = 14$$

$$3x = 15$$

$$x = \frac{15}{3} \quad (\text{Dividing '3' on both sides})$$

$$x = 5$$

(vi) $8x + 4 = 3(x - 1) + 7$

Difficulty Level: Easy

Solution:

$$8x + 4 = 3 \times x + 3 \times (-1) + 7 \quad (\text{Applying BODMAS to RHS})$$

$$8x + 4 = 3x - 3 + 7$$

$$8x + 4 = 3x + 4$$

$$8x = 3x + 4 - 4$$

$$8x = 3x$$

$$8x - 3x = 3x - 3x \quad (\text{Subtracting } 3x \text{ both sides})$$

$$5x = 0$$

$$x = 0$$

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

Difficulty Level: Easy

Solution:

$$5 \times x = 5 \times \frac{4}{5}(x + 10) \quad (\text{Multiplying both sides by 5})$$

$$5x = 4(x + 10) \quad (\text{Applying BODMAS on RHS})$$

$$5x = 4x + 40 \quad (\text{Subtracting } 4x \text{ on both sides})$$

$$5x - 4x = 4x - 4x + 40$$

$$x = 40$$

$$(viii) \quad \frac{2x}{3} + 1 = \frac{7x}{15} + 3$$

Difficulty Level: Medium

Solution:

$$\frac{2x}{3} - \frac{7x}{15} = 3 - 1 \quad (\text{Transposing variables on one side and constant on other side})$$

$$\frac{5(2x) - 1(7x)}{15} = 2 \quad (\text{LCM on LHS})$$

We get,

$$\frac{10x - 7x}{15} = 2$$

$$15 \times \frac{(10x - 7x)}{15} = 15 \times 2 \quad (\text{Multiplying 15 on both sides})$$

$$3x = 30$$

$$\text{Ans: } x = 10$$

$$(ix) \quad 2y + \frac{5}{3} = \frac{26}{3} - y$$

Difficulty Level: Easy

Solution:

$$2y + y = \frac{26}{3} - \frac{5}{3} \quad (\text{Transposing variables on one side and constant on other side})$$

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

$$3y = \frac{21}{3}$$

We get $3y = 7$ (Dividing with 3 on both sides)

$$\text{Ans: } y = \frac{7}{3}$$

$$(x) \quad 3m = 5m - \frac{8}{5}$$

Difficulty Level: Easy

Solution:

$$\frac{8}{5} = 5m - 3m \quad (\text{Transporting variable to R.H.S and constants to L.H.S})$$

$$\frac{8}{5} = 2m \quad (\text{Dividing both sides by 2})$$

$$m = \frac{4}{5}$$

$$\text{Ans: } m = \frac{4}{5}$$

Chapter-2: Linear equations

Exercise 2.4 (Page 31 of Grade 8 NCERT)

Q1. Amina thinks of a number and subtracts $\frac{5}{2}$ 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?

Difficulty Level: Medium

What is the known/given?

- i) $\frac{5}{2}$ is subtracted from a number
- ii) Then multiplied by 8
- iii) Result is 3 times the actual number

What is the unknown?

Number thought of by Amina

Reasoning: Assume the number to be a variable. Apply the conditions sequentially to form a linear equation.

Solution:

Let the number be x .

According to the given question,

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

$$8x - 20 = 3x$$

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

$$8x - 3x = 20$$

$$5x = 20$$

Dividing both sides by 5, we obtain

$$x = 4$$

Hence, the number is 4.

Q2. 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?

Difficulty Level: Medium

What is the known/given?

- i) A positive number is 5 times another number
- ii) 21 is added to both the numbers
- iii) Then one of the new numbers becomes twice the other new number

What is the unknown?

Numbers

Reasoning: Assume one positive number to be variable then use the conditions to form a linear equation.

Solution:

Let the numbers be x and $5x$. 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 $5x = 5 \times 7 = 35$

Hence, the numbers are 7 and 35 respectively.

Q3. 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?

Difficulty Level: Hard

What is the known/given?

- i) Sum of the digits of a two-digit number is 9
- ii) Interchanging the digits result in a new number greater than the original number by 27

What is the unknown?

Number

Reasoning: Assume one of the digits of two-digit as variable then use other conditions and form a linear equation.

Solution:

Let the digits at tens place and ones place be x and $9 - x$ respectively.

$$\text{Therefore, original number} = 10x + (9 - x) = 9x + 9$$

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

Therefore, new number after interchanging the digits:

$$\begin{aligned} &= 10(9 - x) + x \\ &= 90 - 10x + x \\ &= 90 - 9x \end{aligned}$$

According to the given question,

$$\begin{aligned} \text{New number} &= \text{Original number} + 27 \\ 90 - 9x &= 9x + 9 + 27 \\ 90 - 9x &= 9x + 36 \end{aligned}$$

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

$$\begin{aligned} 90 - 36 &= 18x \\ 54 &= 18x \end{aligned}$$

Dividing both sides by 18 , we obtain

$$3 = x \text{ and } 9 - x = 6$$

Hence, the digits at tens place and ones place of the number are 3 and 6 respectively.

$$\begin{aligned} \text{Therefore, the two-digit number is } 9x + 9 &= 9 \times 3 + 9 \\ &= 36 \end{aligned}$$

Q4. One of the two digits of a two-digit number is three times the other digit. If you interchange the digit of this two-digit number and add the resulting number to the original number, you get 88 . What is the original number?

Difficulty Level: Medium

What is the known/given?

- i) One of the two digits of a two-digit number is three times the other digit
- ii) Interchanging the digit of this two-digit number and adding the resulting number to the original number results in 88 .

What is the unknown?

Original number

Reasoning: Assume one of the digits of two-digit as variable then use other conditions and form a linear equation.

Solution:

Let the digits at tens place and ones place be x and $3x$ respectively.

Therefore, original number = $10x + 3x = 13x$

On interchanging the digits, the digits at ones place and tens place will be x and $3x$ respectively.

Number after interchanging = $10 \times 3x + x = 30x + x = 31x$

According to the given question,

Original number + New number = 88

$$13x + 31x = 88$$

$$44x = 88$$

Dividing both sides by 44, we obtain

$$x = 2$$

Therefore, original number = $13x = 13 \times 2 = 26$

By considering the tens place and ones place as $3x$ and x respectively, the two-digit number obtained is 62.

Therefore, the two-digit number may be 26 or 62.

Q5. 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?

Difficulty Level: Medium**What is the known/given?**

- i) Shobo's mother's present age is six times Shobo's present age
- ii) Shobo's age five years from now will be one third of his mother's present age

What is the unknown?

Present age of Shobo's and his mother's.

Reasoning:

Assume Shobo's age as variable then his mother's age will be six time of his age. Use second condition and form a linear equation.

Solution:

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

According to the given question,

After 5 years, Shobo's age = $\frac{\text{Shobo's mother's present age}}{3}$

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

$$x + 5 = 2x$$

Transposing x to RHS, we obtain

$$5 = 2x - x$$

$$5 = x$$

Shobo's age is $x = 5$

Shobo's mother's age is $6x = 6 \times 5 = 30$

Therefore, the present ages of Shobo's and Shobo's mother will be 5 years and 30 years respectively.

Q6. 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 Rs 100 per metre it will cost the village panchayat Rs 75,000 to fence the plot. What are the dimensions of the plot?

Difficulty Level: Medium**What is the known/given?**

- The length and breadth of the plot are in the ratio 11:4
- At the rate Rs 100 per metre it will cost Rs 75,000 to fence the plot

What is the unknown?

Dimensions of the plot

Reasoning:

Use the ratio condition and express length and breadth in terms of a variable and form linear equation.

Solution:

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 $11x$ m and $4x$ m respectively.

Perimeter of the plot = $2(\text{Length} + \text{Breadth})$

$$= [2(11x + 4x)]\text{m}$$

$$= 30x\text{m}$$

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

$$\therefore 100 \times \text{Perimeter} = 75000$$

$$100 \times 30x = 75000$$

$$3000x = 75000$$

Dividing both sides by 3000, we obtain

$$x = 25$$

$$\text{Length} = 11x \text{ m}$$

$$= (11 \times 25) \text{ m}$$

$$= 275 \text{ m}$$

$$\text{Breadth} = 4x \text{ m}$$

$$= (4 \times 25) \text{ m}$$

$$= 100 \text{ m}$$

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

Q7. Hasan buys two kinds of cloth materials for school uniforms, shirt material that costs him Rs 50 per meter and trouser material that costs him Rs 90 per meter. For every 2 meters of the trouser material he buys 3 meters of the shirt material. He sells the materials at 12% and 10% profit respectively. His total sale is Rs 36660. How much trouser material did he buy?

Difficulty Level: Hard

What is the known/given?

- i) Shirt material that costs him Rs 50 per meter and trouser material that costs him Rs 90 per meter
- ii) For every 2 meters of the trouser material, 3 meters of the shirt material is purchased.
- iii) Selling of the materials takes place at 12% and 10% profit respectively
- iv) Total sale is Rs 36660

What is the unknown?

How much trouser material is being purchased.

Reasoning: Trouser material and shirt material are purchased in the ratio of 2:3. Use the ratio condition and express clothes material purchased in the form of variable and form the linear equation.

Solution:

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

$$\text{Per metre selling price of trouser material} = \text{Rs} \left(90 + \frac{90 \times 12}{100} \right)$$

$$= \text{Rs } 100.80$$

$$\begin{aligned} \text{Per metre selling price of shirt material} &= \text{Rs} \left(50 + \frac{50 \times 10}{100} \right) \\ &= \text{Rs } 55 \end{aligned}$$

$$\begin{aligned} \text{Given that, total amount of selling} &= \text{Rs } 36660 \\ 100.80 \times (2x) + 55 \times (3x) &= 36660 \\ 201.60x + 165x &= 36660 \\ 366.60x &= 36660 \end{aligned}$$

Dividing both sides by 366.60, we obtain
 $x = 100$

$$\begin{aligned} \text{Trouser material} &= 2x \text{ m} \\ &= (2 \times 100) \text{ m} \\ &= 200 \text{ m} \end{aligned}$$

Q8. 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.

Difficulty Level: Medium

What is the known/given?

- i) Half of the herd of deer are grazing in the field
- ii) Three-fourths of the remaining are playing nearby
- iii) The rest 9 are drinking water from the pond

What is the unknown?

The number of deer in the herd

Reasoning: Assume total number of deer as a variable now use other conditions to form linear equation.

Solution:

Let the number of deer be x .

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

$$\begin{aligned} \text{Number of deer playing nearby} &= \frac{3}{4} \times \text{Number of remaining deer} \\ &= \frac{3}{4} \times \left(x - \frac{x}{2} \right) \\ &= \frac{3}{4} \times \frac{x}{2} \\ &= \frac{3x}{8} \end{aligned}$$

Number of deer drinking water from the pond = 9

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

$$x - \left(\frac{4x + 3x}{8} \right) = 9$$

$$x - \frac{7x}{8} = 9$$

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

Multiplying both sides by 8, we obtain

$$x = 72$$

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

Q9. A grandfather is ten times older than his granddaughter. He is also 54 years older than her. Find their present ages

Difficulty Level: Easy

What is the known/given?

- i) Grandfather is ten times older than his granddaughter
- ii) also 54 years older than her

What is the unknown?

Present age of grandfather and granddaughter.

Reasoning: Assume granddaughter age as a variable then grandfather's age will be 10 times his granddaughter. Use second condition to form linear equation.

Solution:

Let the granddaughter's age be x years. Therefore, grandfather's age will be $10x$ years. According to the question,

$$\begin{aligned} \text{Grandfather's age} &= \text{Granddaughter's age} + 54 \text{ years} \\ 10x &= x + 54 \end{aligned}$$

Transposing x to LHS, we obtain

$$10x - x = 54$$

$$9x = 54$$

$$x = 6$$

$$\text{Granddaughter's age} = x \text{ years}$$

$$= 6 \text{ years}$$

$$\text{Grandfather's age} = 10x \text{ years}$$

$$= (10 \times 6) \text{ years}$$

$$= 60 \text{ years}$$

Q10. 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.

Difficulty Level: Medium

What is the known/given?

- i) Aman's age is three times his son's age
- ii) Ten years ago he was five times his son's age

What is the unknown?

Present age of Aman and his son.

Reasoning: Assume Aman's son's age as a variable now use other conditions and form a linear equation.

Solution:

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 = $5 \times$ Aman's son's age 10 years ago

$$3x - 10 = 5(x - 10)$$

$$3x - 10 = 5x - 50$$

Transposing $3x$ to RHS and 50 to LHS, we obtain

$$50 - 10 = 5x - 3x$$

$$40 = 2x$$

Dividing both sides by 2 , we obtain

$$20 = x$$

Aman's son's age = x years

$$= 20 \text{ years}$$

Aman's age = $3x$ years

$$= (3 \times 20) \text{ years}$$

$$= 60 \text{ years}$$

Chapter-2: Linear equations

Exercise 2.5 (Page 33 of Grade 8 NCERT)

Q1. Solve the linear equation $\frac{x}{2} - \frac{1}{5} = \frac{x}{3} + \frac{1}{4}$

Difficulty Level: Medium

What is known:

Equation

What is unknown:

Value of the variable

Reasoning:

Multiple both sides by the L.C.M of the denominators to get rid of fractional number. Now transpose variables to one side and constant to another side.

Solution:

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

LCM of the denominators, 2, 3, 4, and 5, is 60.

Multiplying both sides by 60, we obtain

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

$$30x - 12 = 20x + 15 \quad (\text{Opening the brackets})$$

$$30x - 20x = 15 + 12$$

$$10x = 27$$

$$x = \frac{27}{10}$$

Q2. Solve the linear equation $\frac{n}{2} - \frac{3n}{4} + \frac{5n}{6} = 21$

Difficulty Level: Medium

What is known:

Equation

What is unknown:

Value of the variable

Reasoning:

Multiple both sides by the L.C.M of the denominators to get rid of fractional number.
Now transpose variables to one side and constant to another side.

Solution:

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

LCM of the denominators, 2, 4, and 6, is 12.

Multiplying both sides by 12, we obtain

$$6n - 9n + 10n = 252$$

$$7n = 252$$

$$n = \frac{252}{7}$$

$$n = 36$$

Q3. Solve the linear equation $x + 7 - \frac{8x}{3} = \frac{17}{6} - \frac{5x}{2}$

Difficulty Level: Medium**What is known:**

Equation

What is unknown:

Value of the variable

Reasoning:

Multiple both sides by the L.C.M of the denominators to get rid of fractional number.
Now transpose variables to one side and constant to another side.

Solution:

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

LCM of the denominators, 2, 3, and 6, is 6.

Multiplying both sides by 6, we obtain

$$6x + 42 - 16x = 17 - 15x$$

$$6x - 16x + 15x = 17 - 42$$

$$5x = -25$$

$$x = \frac{-25}{5}$$

$$x = -5$$

Q4. Solve the linear equation $\frac{x-5}{3} = \frac{x-3}{5}$

Difficulty Level: Medium

What is known:

Equation

What is unknown:

Value of the variable

Reasoning:

Multiple both sides by the L.C.M of the denominators to get rid of fractional number. Now transpose variables to one side and constant to another side.

Solution:

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

LCM of the denominators, 3 and 5, is 15.

Multiplying both sides by 15, we obtain

$$5(x-5) = 3(x-3)$$

$$5x - 25 = 3x - 9$$

(Opening the brackets)

$$5x - 3x = 25 - 9$$

$$2x = 16$$

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

$$x = 8$$

Q5. Solve the linear equation $\frac{3t-2}{4} - \frac{2t+3}{3} = \frac{2}{3} - t$

Difficulty Level: Medium

What is known:

Equation

What is unknown:

Value of the variable

Reasoning:

Multiple both sides by the L.C.M of the denominators to get rid of fractional number. Now transpose variables to one side and constant to another side.

Solution:

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

LCM of the denominators, 3 and 4, is 12.

Multiplying both sides by 12, we obtain

$$3(3t-2) - 4(2t+3) = 8 - 12t$$

$$9t - 6 - 8t - 12 = 8 - 12t \quad \text{(Opening the brackets)}$$

$$9t - 8t + 12t = 8 + 6 + 12$$

$$13t = 26$$

$$t = \frac{26}{13}$$

$$t = 2$$

Q6. Solve the linear equation $m - \frac{m-1}{2} = 1 - \frac{m-2}{3}$

Difficulty Level: Medium

What is known:

Equation

What is unknown:

Value of the variable

Reasoning:

Multiple both sides by the L.C.M of the denominators to get rid of fractional number. Now transpose variables to one side and constant to another side.

Solution:

LCM of the denominators, 2 and 3, is 6.

Multiplying both sides by 6, we obtain

$$6m - 3(m-1) = 6 - 2(m-2)$$

$$6m - 3m + 3 = 6 - 2m + 4 \quad \text{(Opening the brackets)}$$

$$6m - 3m + 2m = 6 + 4 - 3$$

$$5m = 7$$

$$m = \frac{7}{5}$$

Q7. Simplify and solve the linear equation $3(t-3) = 5(2t+1)$

Difficulty Level: Medium

What is known:

Equation

What is unknown:

Value of the variable

Reasoning:

First open the brackets then transpose variable to one side and constant to another side.

Solution:

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

$$3t - 9 = 10t + 5 \quad \text{(Opening the brackets)}$$

$$-9 - 5 = 10t - 3t$$

$$-14 = 7t$$

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

$$t = -2$$

Q8. Simplify and solve the linear equation $15(y - 4) - 2(y - 9) + 5(y + 6) = 0$ **Difficulty Level: Medium****What is known:**

Equation

What is unknown:

Value of the variable

Reasoning:

First open the brackets then transpose variable to one side and constant to another side.

Solution:

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

$$15y - 60 - 2y + 18 + 5y + 30 = 0 \quad \text{(Opening the brackets)}$$

$$18y - 12 = 0$$

$$18y = 12$$

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

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

Q9. Simplify and solve the linear equation $3(5z - 7) - 2(9z - 11) = 4(8z - 13) - 17$

Difficulty Level: Medium

What is known:

Equation

What is unknown:

Value of the variable

Reasoning:

First open the brackets then transpose variable to one side and constant to another side.

Solution:

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

$$15z - 21 - 18z + 22 = 32z - 52 - 17 \quad \text{(Opening the brackets)}$$

$$-3z + 1 = 32z - 69$$

$$-3z - 32z = -69 - 1$$

$$-35z = -70$$

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

$$z = 2$$

Q10. Simplify and solve the linear equation $0.25(4f - 3) = 0.05(10f - 9)$

Difficulty Level: Medium

What is known:

Equation

What is unknown:

Value of the variable

Reasoning:

First open the brackets then transpose variable to one side and constant to another side.

Solution:

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

$$\frac{1}{4}(4f - 3) = \frac{1}{20}(10f - 9)$$

Multiplying both sides by 20, we obtain

$$5(4f - 3) = 10f - 9$$

$$20f - 15 = 10f - 9 \quad \text{(Opening the brackets)}$$

$$20f - 10f = -9 + 15$$

$$10f = 6$$

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

$$= 0.6$$



Chapter-2: Linear equations

Exercise 2.6 (Page 35 of Grade 8 NCERT)

Q1. Solve: $\frac{8x-3}{3x} = 2$

Difficulty Level: Easy

What is known:

Equation

What is unknown:

Value of the variable

Reasoning:

Multiple both sides by the L.C.M of the denominators to get rid of fractional number. Now transpose variables to one side and constant to another side.

Solution:

$$\frac{8x-3}{3x} = 2$$

On multiplying both sides by $3x$, we obtain

$$8x - 3 = 6x$$

$$8x - 6x = 3$$

$$2x = 3$$

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

Q2. Solve: $\frac{9x}{7-6x} = 15$

Difficulty Level: Easy

What is known:

Equation

What is unknown:

Value of the variable

Reasoning:

Multiple both sides by the L.C.M of the denominators to get rid of fractional number. Now transpose variables to one side and constant to another side.

Solution:

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

$$9x = 15(7 - 6x)$$

$$9x = 105 - 90x$$

$$9x + 90x = 105$$

$$99x = 105$$

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

$$= \frac{35}{33}$$

Q3. Solve: $\frac{z}{z+15} = \frac{4}{9}$

Difficulty Level: Easy

What is known:

Equation

What is unknown:

Value of the variable

Reasoning:

Multiple both sides by the L.C.M of the denominators to get rid of fractional number. Now transpose variables to one side and constant to another side.

Solution:

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

$$9z = 4(z+15)$$

$$9z = 4z + 60$$

$$9z - 4z = 60$$

$$5z = 60$$

$$z = 12$$

Q4. Solve: $\frac{3y+4}{2-6y} = \frac{-2}{5}$

Difficulty Level: Medium

What is known:

Equation

What is unknown:

Value of the variable

Reasoning:

Multiple both sides by the L.C.M of the denominators to get rid of fractional number.
Now transpose variables to one side and constant to another side.

Solution:

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

$$5(3y + 4) = -2(2 - 6y)$$

$$15y + 20 = -4 + 12y$$

$$15y - 12y = -4 - 20$$

$$3y = -24$$

$$y = -8$$

Q5. Solve: $\frac{7y + 4}{y + 2} = \frac{-4}{3}$

Difficulty Level: Medium

What is known:

Equation

What is unknown:

Value of the variable

Reasoning:

Multiple both sides by the L.C.M of the denominators to get rid of fractional number.
Now transpose variables to one side and constant to another side.

Solution:

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

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

$$21y + 12 = -4y - 8$$

$$21y + 4y = -8 - 12$$

$$25y = -20$$

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

Q6. 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.

Difficulty Level: Medium

What is the known/given?

- i) Ages of Hari and Harry are in the ratio 5:7
- ii) Four years from now the ratio of their ages will be 3:4

What is the unknown?

Present ages of Hari and Harry.

Reasoning:

Use the ratio condition and express ages of Hari and Harry in the form of variable. Use second condition to form the equation.

Solution:

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

According to the situation given in the question,

$$\begin{aligned}\frac{5x+4}{7x+4} &= \frac{3}{4} \\ 4(5x+4) &= 3(7x+4) \\ 20x+16 &= 21x+12 \\ 16-12 &= 21x-20x \\ 4 &= x\end{aligned}$$

$$\begin{aligned}\text{Hari's age} &= 5x \text{ years} \\ &= (5 \times 4) \text{ years} \\ &= 20 \text{ years}\end{aligned}$$

$$\begin{aligned}\text{Harry's age} &= 7x \text{ years} \\ &= (7 \times 4) \text{ years} \\ &= 28 \text{ years}\end{aligned}$$

Therefore, Hari's age and Harry's age are 20 years and 28 years respectively.

Q7. 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 $\frac{3}{2}$. Find the rational number.

Difficulty Level: Medium**What is the known/given?**

- i) The denominator of a rational number is greater than its numerator by 8
- ii) If the numerator is increased by 17 and the denominator is decreased by 1, the number obtained is $\frac{3}{2}$

What is the unknown?

The rational number

Reasoning:

Assume numerator of the fraction as variable. Use first condition to express denominator in the form of variable and use second condition to form the equation.

Solution:

Let the numerator of the rational number be x . Therefore, its denominator will be $x + 8$.

The rational number will be $\frac{x}{x+8}$. According to the question,

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

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

$$2(x+17) = 3(x+7)$$

$$2x + 34 = 3x + 21$$

$$34 - 21 = 3x - 2x$$

$$13 = x$$

$$\begin{aligned} \text{Numerator of the Rational Number} &= x \\ &= 13 \end{aligned}$$

$$\begin{aligned} \text{Denominator of the Rational Number} &= x + 8 \\ &= 13 + 8 \\ &= 21 \end{aligned}$$

$$\text{Rational Number} = \frac{13}{21}$$

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