

Simple Linear Equation

1. Solve: $\frac{(2x+5)}{(x+4)} = 1$

Ans. $(2x + 5)/(x + 4) = 1$

$$\Rightarrow 2x + 5 = 1(x + 4)$$

$$\Rightarrow 2x + 5 = x + 4$$

$$\Rightarrow 2x - x = 4 - 5 \quad (\text{Transferring positive } x \text{ to the left hand side changes to negative } x \text{ and again, positive } 5 \text{ changes to negative } 5)$$

$$\Rightarrow x = -1$$

Therefore, $x = -1$ is the required solution of the equation $(2x + 5)/(x + 4) = 1$

2. Solve: $6x - 19 = 3x - 10$

Ans. $6x - 19 = 3x - 10$

$$\Rightarrow 6x - 3x = -10 + 19 \quad (\text{Transferring } 3x \text{ to L.H.S changes to negative } 3x \text{ and } -19 \text{ to R.H.S. changes to positive } 19)$$

$$\Rightarrow 3x = 9$$

$$\Rightarrow \frac{3x}{3} = \frac{9}{3} \quad (\text{Dividing both sides by } 3)$$

$$\Rightarrow x = 3$$

3. Solve: $5 - 2(x - 1) = 4(3 - x) - 2x$.

Ans. $5 - 2(x - 1) = 4(3 - x) - 2x$

$$\Rightarrow 5 - 2x + 2 = 12 - 4x - 2x \quad (\text{Removing the brackets and then simplify})$$

$$\Rightarrow 7 - 2x = 12 - 6x \quad (\text{Transferring } -6x \text{ to L.H.S. changes to positive } 6x \text{ and } 7 \text{ to R.H.S. changes to negative } 7)$$

$$\Rightarrow -2x + 6x = 12 - 7$$

$$\Rightarrow 4x = 5$$

$$\Rightarrow \frac{4x}{4} = \frac{5}{4}$$

$$\Rightarrow x = \frac{5}{4}$$

4. $\frac{x}{2} + \frac{x}{3} = x - 7$

Ans. $\frac{x}{2} + \frac{x}{3} = x - 7$

Least common multiple of 2 and 3 is 6

$$\Rightarrow \left(\frac{x}{2} \times \frac{3}{3}\right) + \left(\frac{x}{3} \times \frac{2}{2}\right) = x - 7$$

$$\Rightarrow \frac{(3x+2x)}{6} = x - 7$$

$$\Rightarrow \frac{5x}{6} = x - 7$$

$$\Rightarrow 5x = 6(x - 7)$$

$$\Rightarrow 5x = 6x - 42 \quad (\text{Transferring } 6x \text{ to L.H.S. changes to negative } 6x)$$

$$\Rightarrow 5x - 6x = -42$$

$$\Rightarrow -x = -42$$

$$\Rightarrow x = 42$$

5. $\frac{2}{(x+3)} = \frac{3}{(5-x)}$

Ans. $\frac{2}{(x+3)} = \frac{3}{(5-x)}$

$$\Rightarrow 3(x + 3) = 2(5 - x) \quad (\text{cross multiply and then remove the brackets})$$

$$\Rightarrow 3x + 9 = 10 - 2x \quad (\text{Transferring } -2x \text{ to L.H.S. changes to positive } 2x \text{ and } 9 \text{ to R.H.S. changes to } -9)$$

$$\Rightarrow 3x + 2x = 10 - 9$$

$$\Rightarrow 5x = 1$$

$$\Rightarrow \frac{5x}{5} = \frac{1}{5} \quad (\text{Dividing both sides by } 5)$$

$$\Rightarrow x = \frac{1}{5}$$

6. The sum of three consecutive multiples of 4 is 444. Find these multiples.

Ans. If x is a multiple of 4, the next multiple is $x + 4$, next to this is $x + 8$.

$$\text{Their sum} = 444$$

According to the question,

$$x + (x + 4) + (x + 8) = 444$$

$$\Rightarrow x + x + 4 + x + 8 = 444$$

$$\Rightarrow x + x + x + 4 + 8 = 444$$

$$\Rightarrow 3x + 12 = 444$$

$$\Rightarrow 3x = 444 - 12$$

$$\Rightarrow x = \frac{432}{3}$$

$$\Rightarrow x = 144$$

$$\text{Therefore, } x + 4 = 144 + 4 = 148$$

$$\text{Therefore, } x + 8 = 144 + 8 = 152$$

Therefore, the three consecutive multiples of 4 are 144, 148, 152.

7. The denominator of a rational number is greater than its numerator by 3. If the numerator is increased by 7 and the denominator is decreased by 1, the new number becomes $\frac{3}{2}$. Find the original number.

Ans. Let the numerator of a rational number = x

Then the denominator of a rational number = $x + 3$

When numerator is increased by 7, then new numerator = $x + 7$

When denominator is decreased by 1, then new denominator = $x + 3 - 1$

The new number formed = $\frac{3}{2}$

According to the question,

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

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

$$\Rightarrow 2(x + 7) = 3(x + 2)$$

$$\Rightarrow 2x + 14 = 3x + 6$$

$$\Rightarrow 3x - 2x = 14 - 6$$

$$\Rightarrow x = 8$$

The original number i.e., $\frac{x}{(x+3)} = \frac{8}{(8+3)} = \frac{8}{11}$

8. The sum of the digits of a two digit number is 7. If the number formed by reversing the digits is less than the original number by 27, find the original number.

Ans. Let the units digit of the original number be x .

Then the tens digit of the original number be $7 - x$

Then the number formed = $10(7 - x) + x \times 1$

$$= 70 - 10x + x = 70 - 9x$$

On reversing the digits, the number formed

$$= 10 \times x + (7 - x) \times 1$$

$$= 10x + 7 - x = 9x + 7$$

According to the question,

New number = original number - 27

$$\Rightarrow 9x + 7 = 70 - 9x - 27$$

$$\Rightarrow 9x + 7 = 43 - 9x$$

$$\Rightarrow 9x + 9x = 43 - 7$$

$$\Rightarrow 18x = 36$$

$$\Rightarrow x = \frac{36}{18}$$

$$\Rightarrow x = 2$$

Therefore, $7 - x$

$$= 7 - 2$$

$$= 5$$

The original number is 52

9. A motorboat goes downstream in river and covers a distance between two coastal towns in 5 hours. It covers this distance upstream in 6 hours. If the speed of the stream is 3 km/hr, find the speed of the boat in still water.

Ans. Let the speed of the boat in still water = x km/hr.

Speed of the boat downstream = $(x + 3)$ km/hr.

Time taken to cover the distance = 5 hrs

Therefore, distance covered in 5 hrs = $(x + 3) \times 5$ (D = Speed \times Time)

Speed of the boat upstream = $(x - 3)$ km/hr

Time taken to cover the distance = 6 hrs.

Therefore, distance covered in 6 hrs = $6(x - 3)$

Therefore, the distance between two coastal towns is fixed, i.e., same.

According to the question,

$$5(x + 3) = 6(x - 3)$$

$$\Rightarrow 5x + 15 = 6x - 18$$

$$\Rightarrow 5x - 6x = -18 - 15$$

$$\Rightarrow -x = -33$$

$$\Rightarrow x = 33$$

Required speed of the boat is 33 km/hr.

10. Divide 28 into two parts in such a way that $\frac{6}{5}$ of one part is equal to $\frac{2}{3}$ of the other.

Ans. Let one part be x .

Then other part = $28 - x$

It is given $\frac{6}{5}$ of one part = $\frac{2}{3}$ of the other.

$$\Rightarrow \frac{6}{5}x = \frac{2}{3}(28 - x)$$

$$\Rightarrow \frac{3x}{5} = \frac{1}{3}(28 - x)$$

$$\Rightarrow 9x = 5(28 - x)$$

$$\Rightarrow 9x = 140 - 5x$$

$$\Rightarrow 9x + 5x = 140$$

$$\Rightarrow 14x = 140$$

$$\Rightarrow x = \frac{140}{14}$$

$$\Rightarrow x = 10$$

Then the two parts are 10 and $28 - 10 = 18$.

11. A total of \$10000 is distributed among 150 persons as gift. A gift is either of \$50 or \$100. Find the number of gifts of each type.

Ans. Total number of gifts = 150

Let the number of \$50 is x

Then the number of gifts of \$100 is $(150 - x)$

Amount spent on x gifts of \$50 = \$ 50x

Amount spent on $(150 - x)$ gifts of \$100 = \$100(150 - x)

Total amount spent for prizes = \$10000

According to the question,

$$50x + 100(150 - x) = 10000$$

$$\Rightarrow 50x + 15000 - 100x = 10000$$

$$\Rightarrow -50x = 10000 - 15000$$

$$\Rightarrow -50x = -5000$$

$$\Rightarrow x = 5000/50$$

$$\Rightarrow x = 100$$

$$\Rightarrow 150 - x = 150 - 100 = 50$$

Therefore, gifts of \$50 are 100 and gifts of \$100 are 50.

12. The sum of two numbers is 25. One of the numbers exceeds the other by 9. Find the numbers.

Ans. Then the other number = $x + 9$

Let the number be x.

Sum of two numbers = 25

According to question, $x + x + 9 = 25$

$$\Rightarrow 2x + 9 = 25 \Rightarrow 2x = 25 - 9 \text{ (transposing 9 to the R.H.S changes to -9)}$$

$$\Rightarrow 2x = 16$$

$$\Rightarrow 2x/2 = 16/2 \text{ (divide by 2 on both the sides)}$$

$$\Rightarrow x = 8$$

Therefore, $x + 9 = 8 + 9 = 17$

Therefore, the two numbers are 8 and 17

13. The difference between the two numbers is 48. The ratio of the two numbers is 7:3. What are the two numbers?

Ans. Let the common ratio be x .

Let the common ratio be x .

Their difference = 48

According to the question,

$$7x - 3x = 48$$

$$\Rightarrow 4x = 48$$

$$\Rightarrow x = \frac{48}{4}$$

$$\Rightarrow x = 12$$

Therefore, $7x = 7 \times 12 = 84$

$$3x = 3 \times 12 = 36$$

Therefore, the two numbers are 84 and 36.

14. The length of a rectangle is twice its breadth. If the perimeter is 72 metre, find the length and breadth of the rectangle.

Ans. Let the breadth of the rectangle be x ,

Then the length of the rectangle = $2x$

Perimeter of the rectangle = 72

Therefore, according to the question

$$2(x + 2x) = 72$$

$$\Rightarrow 2 \times 3x = 72$$

$$\Rightarrow 6x = 72$$

$$\Rightarrow x = 72/6$$

$$\Rightarrow x = 12$$

We know, length of the rectangle = $2x$

$$= 2 \times 12 = 24$$

Therefore, length of the rectangle is 24 m and breadth of the rectangle is 12 m.

15. Aaron is 5 years younger than Ron. Four years later, Ron will be twice as old as Aaron. Find their present ages.

Ans. Let Ron's present age be x .

Then Aaron's present age = $x - 5$

After 4 years Ron's age = $x + 4$, Aaron's age $x - 5 + 4$.

According to the question;

Ron will be twice as old as Aaron.

Therefore, $x + 4 = 2(x - 5 + 4)$

$$\Rightarrow x + 4 = 2(x - 1)$$

$$\Rightarrow x + 4 = 2x - 2$$

$$\Rightarrow x + 4 = 2x - 2$$

$$\Rightarrow x - 2x = -2 - 4$$

$$\Rightarrow -x = -6$$

$$\Rightarrow x = 6$$

Therefore, Aaron's present age = $x - 5 = 6 - 5 = 1$

Therefore, present age of Ron = 6 years and present age of Aaron = 1 year.

16. A number is divided into two parts, such that one part is 10 more than the other. If the two parts are in the ratio 5 : 3, find the number and the two parts.

Ans. Let one part of the number be x

Then the other part of the number = $x + 10$

The ratio of the two numbers is 5 : 3

Therefore, $(x + 10)/x = 5/3$

$$\Rightarrow 3(x + 10) = 5x$$

$$\Rightarrow 3x + 30 = 5x$$

$$\Rightarrow 30 = 5x - 3x$$

$$\Rightarrow 30 = 2x$$

$$\Rightarrow x = 30/2$$

$$\Rightarrow x = 15$$

Therefore, $x + 10 = 15 + 10 = 25$

Therefore, the number = $25 + 15 = 40$

The two parts are 15 and 25.

17. Robert's father is 4 times as old as Robert. After 5 years, father will be three times as old as Robert. Find their present ages.

Ans. Let Robert's age be x years.

Then Robert's father's age = $4x$

After 5 years, Robert's age = $x + 5$

Father's age = $4x + 5$

According to the question,

$$4x + 5 = 3(x + 5)$$

$$\Rightarrow 4x + 5 = 3x + 15$$

$$\Rightarrow 4x - 3x = 15 - 5$$

$$\Rightarrow x = 10$$

$$\Rightarrow 4x = 4 \times 10 = 40$$

Robert's present age is 10 years and that of his father's age = 40 years.

18. The sum of two consecutive multiples of 5 is 55. Find these multiples.

Ans. Let the first multiple of 5 be x .

Then the other multiple of 5 will be $x + 5$ and their sum = 55

Therefore, $x + x + 5 = 55$

$$\Rightarrow 2x + 5 = 55$$

$$\Rightarrow 2x = 55 - 5$$

$$\Rightarrow 2x = 50$$

$$\Rightarrow x = \frac{50}{2}$$

$$\Rightarrow x = 25$$

Therefore, the multiples of 5, i.e., $x + 5 = 25 + 5 = 30$

Therefore, the two consecutive multiples of 5 whose sum is 55 are 25 and 30.

19. The difference in the measures of two complementary angles is 12° . Find the measure of the angles.

Ans. Let the angle be x .

Complement of $x = 90 - x$

Given their difference = 12°

Therefore, $(90 - x) - x = 12^\circ$

$$\Rightarrow 90 - 2x = 12$$

$$\Rightarrow -2x = 12 - 90$$

$$\Rightarrow -2x = -78$$

$$\Rightarrow \frac{2x}{2} = \frac{78}{2}$$

$$\Rightarrow x = 39$$

Therefore, $90 - x = 90 - 39 = 51$

Therefore, the two complementary angles are 39° and 51°

20. The cost of two tables and three chairs is \$705. If the table costs \$40 more than the chair, find the cost of the table and the chair.

Ans. The table cost \$ 40 more than the chair.

Let us assume the cost of the chair to be x .

Then the cost of the table = $\$ 40 + x$

The cost of 3 chairs = $3 \times x = 3x$ and the cost of 2 tables $2(40 + x)$

Total cost of 2 tables and 3 chairs = \$705

Therefore, $2(40 + x) + 3x = 705$

$$80 + 2x + 3x = 705$$

$$80 + 5x = 705$$

$$5x = 705 - 80$$

$$5x = \frac{625}{5}$$

$$x = 125 \text{ and } 40 + x = 40 + 125 = 165$$

Therefore, the cost of each chair is \$125 and that of each table is \$165.