



## Applications of Linear Equations to Practical Problems

**The following steps should be followed to solve a word problem:**

**Step—I** Read the problem carefully and note what is given and what is required.

**Step—II** Denote the unknown quantity by some letters, say  $x$ ,  $y$ ,  $z$ , etc.

**Step—III** Translate the statements of the problem into mathematical statements.

**Step—IV** Using the condition(s) given in the problem, form the equation.

**Step—V** Solve the equation for the unknown.

**Step—VI** Check whether the solution satisfies the equation.

**Ex.1** A number is such that it is as much greater than 84 as it is less than 108. Find it.

**Sol.** Let the number be  $x$ . Then, the number is greater than 84 by  $x - 84$  and it is less than 108 by  $108 - x$ . [Given]

$$x - 84 = 108 - x$$

$$= x + x = 108 + 84$$

$$= 2x = 192 = \frac{2x}{2} = \frac{192}{2} = x = 96$$

Hence, the number is 96.

**Ex.2** A number consists of two digits whose sum is 8. If 18 is added to the number, the digits are interchanged. Find the number

**Sol.** Let one's digit be  $x$ .

Since the sum of the digits is 8. Therefore, ten's digit =  $8 - x$ .

$$\text{Number} = 10 \times (8 - x) + x = 80 - 10x + x$$

$$= 80 - 9x \quad \dots (i)$$

Now,

Number obtained by reversing the digit

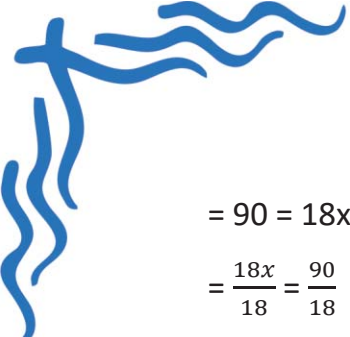
$$= 10 \times x + (8 - x) = 10x + x - x = 9x + 8.$$

It is given that if 18 is added to the number its digits are reversed.

$$\text{Number} + 18 = \text{Number obtained by reversing the digits}$$

$$= 80 - 9x + 18 = 9x + 8$$

$$= 98 - 9x = 9x + 8 = 98 - 8 = 9x + 9x$$


$$= 90 = 18x$$

$$= \frac{18x}{18} = \frac{90}{18}$$

$$= x = 5$$

Putting the value of  $x$  in (i), we get

$$\text{Number} = 80 - 9 \times 5 = 80 - 45 = 35$$

**Ex.3** Divide 34 into two parts in such a way that  $(\frac{4}{7})^{\text{th}}$  of one part is equal to  $(\frac{2}{5})^{\text{th}}$  of the other.

Let one part be  $x$ . Then, other part is  $(34 - x)$ . It is given that

$$(\frac{4}{7})^{\text{th}} \text{ of one part} = (\frac{2}{5})^{\text{th}} \text{ of the other part}$$

$$= \frac{4}{7} x = \frac{2}{5} (34 - x) = 20x = 14(34 - x)$$

[Multiplying both sides by 35, the LCM of 7 and 5]

$$= 20x = 14 \times 34 - 14x$$

$$= 20x + 14x = 14 \times 34$$

$$= 34x = 14 \times 34$$

$$= \frac{34x}{34} = \frac{14 \times 34}{34}$$

[Dividing both sides by 34]

$$= x = 14$$

Hence, the two parts are 14 and  $34 - 14 = 20$