12. Equations in one variable

- Linear equations that contain expressions on both the sides can be solved by transposing the terms or by performing same mathematical operation on both the sides.

  Example:
  Solve: $2x - 4 = 3x - 2$
  Solution:
  Transposing $3x$ from R.H.S to L.H.S., we obtain
  $2x - 4 - 3x = -2$
  Transposing -4 from L.H.S. to R.H.S., we obtain
  $2x - 3x = -2 + 4$
  $\Rightarrow -x = 2$
  $\therefore x = -2$ [Dividing both sides by -1]

- There are certain equations which can be reduced to linear equations.

  Example:
  Reduce the given equation to linear equation: $\dfrac{2-4x}{3x-2} = \dfrac{3}{2}$

  Solution:
  By cross multiplication, we obtain
  $\dfrac{2-4x}{3x-2} \quad\times\quad \dfrac{3}{2}$
  $\Rightarrow (2 - 4x)2 = 3(3x - 2)$
  $\Rightarrow 4 - 8x = 9x - 6$
  This is a linear equation in one variable which can be solved easily.

  Linear equations in one variable can be used to solve many problems.

  Example:
  Meesha's age is 8 years more than twice her daughter's age.
  Four years ago, Meesha's age was $\dfrac{7}{2}$ times her daughter's age. What is her daughter's present age?

  Solution:
  Let Meesha's daughter's age be x years.
  $\therefore$ Meesha's age $= (2x + 8)$ years

  Four years ago, her daughter's age $= (x - 4)$ years
  Four years ago, Meesha's age $= (2x + 8 - 4)$ years $= (2x + 4)$ years

  According to the given information,

$$\left(2x + 4\right) = \frac{7}{2}(x - 4)$$
$$\Rightarrow 2 \times (2x + 4) = 7(x - 4)$$
$$\Rightarrow 4x + 8 = 7x - 28$$
$$\Rightarrow 4x - 7x = -28 - 8$$
$$\Rightarrow -3x = -36$$
$$\Rightarrow x = 12$$

Thus, Meesha's daughter's age is 12 years.

- Linear equations that contain expressions on one side and numbers on the other can be solved by transposing terms from one side to the other or by performing same mathematical operations on both the sides.

Example:
Solve $2x - 7 = 3$

Solution:
$2x - 7 = 3$
Transposing −7 from LHS to RHS, we obtain
$2x = 3 + 7 = 10$
$\Rightarrow x = 5$ 　　　　　[By dividing both sides by 2]