# **QUADRATIC EQUATION**

## Solution of Quadratic Equation by Factorization

#### SOLVING A QUADRATIC EQUATION BY FACTORISATION

Since,  $3x^2 - 5x + 2$  is a quadratic polynomial;  $3x^2 - 5x + 2 = 0$  is a quadratic equation. Also,  $3x^2 - 5x + 2 = 3x^2 - 3x - 2x + 2$  [Factorising] = 3x (x - 1) - 2(x - 1) = (x - 1) (3x - 2)In the same way:  $3x^2 - 5x + 2 = 0$   $\Rightarrow 3x^2 - 3x - 2x + 2 = 0$ [Factorising L.H.S.]  $\Rightarrow (x - 1) (3x - 2) = 0$ i.e., x - 1 = 0 or 3x - 2 = 0 $\Rightarrow x = 1$  or  $x = \frac{2}{3}$ ;

which is the solution of given quadratic equation.

### In order to solve the given Quadratic Equation:

- 1. Clear the fractions and brackets, if given.
- 2. By transfering each term to the left hand side; express the given equation

as;  $ax^2 + bx + c = 0$  or  $a + bx + cx^2 = 0$ 

- 3. Factorise left hand side of the equation obtained (the right hand side being zero).
- 4. By putting each factor equal to zero; solve it.

Ex.1 Solve :

- (i)  $x^2 + 3x 18 = 0$
- (ii) (x-4)(5x+2) = 0
- (iii)  $2x^2 + ax a^2 = 0$ ; where 'a' is a real number.

**Sol.**(i)  $x^2 + 3x - 18 = 0$  $\Rightarrow x^2 + 6x - 3x - 18 = 0$  $\Rightarrow$  x(x + 6) - 3(x + 6) = 0 i.e.,  $(x + 6) (x - 3) = 0 \Rightarrow x + 6 = 0 \text{ or } x - 3 = 0$  $\Rightarrow$  x = -6 or x = 3  $\therefore$  Roots of the given equation are : – 6 and 3 (ii) (x-4)(5x+2) = 0 $\Rightarrow$  x - 4 = 0 or 5x + 2 = 0  $\Rightarrow$  x = 4 or x =  $-\frac{2}{5}$ (iii)  $2x^2 + ax - a^2 = 0$  $\Rightarrow 2x^2 + 2ax - ax - a^2 = 0$  $\Rightarrow 2x(x + a) - a(x + a) = 0$ i.e., (x + a) (2x - a) = 0 $\Rightarrow$  x + a = 0 or 2x - a = 0  $\Rightarrow$  x = -a or x =  $\frac{a}{2}$ **Ex. 2** Solve the following quadratic equations :  $x^2 + 5x = 0$  (ii)  $x^2 = 3x$ (i) **Sol.**(i)  $x^2 + 5x = 0 \Rightarrow x(x + 5) = 0$  $\Rightarrow$  x = 0 or x + 5 = 0  $\Rightarrow$  x = 0 or x = -5 (ii)  $x^2 = 3x$  $\Rightarrow x^2 - 3x = 0$  $\Rightarrow$  x(x - 3) = 0  $\Rightarrow x = 0$  or x = 3

**Ex. 3** Solve the following quadratic equations :

(i)  $7x^2 = 8 - 10x$ (ii)  $3(x^2 - 4) = 5x$ (iii) x(x + 1) + (x + 2) (x + 3) = 42Sol.(i)  $7x^2 = 8 - 10x$  $\Rightarrow 7x^2 + 10x - 8 = 0$ 

$$\Rightarrow 7x^{2} + 14x - 4x - 8 = 0$$
  
$$\Rightarrow 7x(x + 2) - 4(x + 2) = 0$$
  
$$\Rightarrow (x + 2) (7x - 4) = 0$$
  
$$\Rightarrow x + 2 = 0 \text{ or } 7x - 4 = 0$$
  
$$\Rightarrow x = -2 \text{ or } x = \frac{4}{7}$$

(ii) 
$$3(x^2 - 4) = 5x$$
  
 $\Rightarrow 3x^2 - 5x - 12 = 0$   
 $\Rightarrow 3x^2 - 9x + 4x - 12 = 0$   
 $\Rightarrow 3x(x - 3) + 4(x - 3) = 0$   
 $\Rightarrow (x - 3) (3x + 4) = 0$   
 $\Rightarrow x - 3 = 0 \text{ or } 3x + 4 = 0$   
 $\Rightarrow x = 3 \text{ or } x = -\frac{4}{3}$   
(iii)  $x(x + 1) + (x + 2) (x + 3) = 0$ 

$$\Rightarrow x^{2} + x + x^{2} + 3x + 2x + 6 - 42 = 0$$
  

$$\Rightarrow 2x^{2} + 6x - 36 = 0$$
  

$$\Rightarrow x^{2} + 3x - 18 = 0$$
  

$$\Rightarrow x^{2} + 6x - 3x - 18 = 0$$
  

$$\Rightarrow x(x + 6) - 3(x + 6) = 0$$
  

$$\Rightarrow (x + 6) (x - 3) = 0$$
  

$$\Rightarrow x = -6 \text{ or } x = 3$$

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Ex. 4 Solve for x : 12 abx<sup>2</sup> - (9a<sup>2</sup> - 8b<sup>2</sup>) x - 6ab = 0 Sol. Given equation is : 12abx<sup>2</sup> - 9a<sup>2</sup>x + 8b<sup>2</sup>x - 6ab = 0  $\Rightarrow$  3ax(4bx - 3a) + 2b(4bx - 3a) = 0  $\Rightarrow$  (4bx - 3a) (3ax + 2b) = 0  $\Rightarrow$  4bx - 3a = 0 or 3ax + 2b = 0  $\Rightarrow$  x =  $\frac{3a}{4b}$  or x =  $-\frac{2b}{3a}$