

Class X : MATH
Chapter - 4 : Quadratic Equation
Questions & Answers - Exercise : 4.1 - NCERT Book

Q1. Check whether the following are quadratic equations :

(i) $(x + 1)^2 = 2(x - 3)$

(ii) $x^2 - 2x = (-2)(3 - x)$

(iii) $(x - 2)(x + 1) = (x - 1)(x + 3)$

(iv) $(x - 3)(2x + 1) = x(x + 5)$

(v) $(2x - 1)(x - 3) = (x + 5)(x - 1)$

(vi) $x^2 + 3x + 1 = (x - 2)^2$

(vii) $(x + 2)^3 = 2x(x^2 - 1)$

(viii) $x^3 - 4x^2 - x + 1 = (x - 2)^3$

Sol. (i) $(x + 1)^2 = 2(x - 3)$

$$\Rightarrow x^2 + 2x + 1 = 2x - 6$$

$$\Rightarrow x^2 + 2x - 2x + 1 + 6 = 0$$

$$\Rightarrow x^2 + 0x + 7 = 0$$

It is of the form $ax^2 + bx + c = 0$.

Hence, the given equation is a quadratic equation.

(ii) $x^2 - 2x = (-2)(3 - x)$

$$\Rightarrow x^2 - 2x = -6 + 2x$$

$$\Rightarrow x^2 - 4x + 6 = 0$$

It is of the form $ax^2 + bx + c = 0$.

Hence, the given equation is a quadratic equation.

(iii) $(x - 2)(x + 1) = (x - 1)(x + 3)$

$$\Rightarrow x^2 + x - 2x - 2 = x^2 + 3x - x - 3$$

$$\Rightarrow x^2 - x - 2 = x^2 + 2x - 3$$

$$\Rightarrow -x - 2x - 2 + 3 = 0$$

$$\Rightarrow -3x + 1 = 0 \text{ or } 3x - 1 = 0$$

It is not of the form $ax^2 + bx + c = 0$

Hence, the given equation is not a quadratic equation.

$$(iv) (x - 3)(2x + 1) = x(x + 5)$$

$$\Rightarrow 2x^2 - 5x - 3 = x^2 + 5x$$

$$\Rightarrow x^2 - 10x - 3 = 0$$

It is of the form $ax^2 + bx + c = 0$

Hence, the given equation is a quadratic equation.

$$(v) (2x - 1)(x - 3) = (x + 5)(x - 1)$$

$$\Rightarrow 2x^2 - 7x + 3 = x^2 + 4x - 5$$

$$\Rightarrow x^2 - 11x + 8 = 0$$

It is of the form $ax^2 + bx + c = 0$.

Hence, the given equation is a quadratic equation.

$$(vi) x^2 + 3x + 1 = (x - 2)^2$$

$$\Rightarrow x^2 + 3x + 1 = x^2 + 4 - 4x$$

$$\Rightarrow 7x - 3 = 0$$

It is not of the form $ax^2 + bx + c = 0$.

Hence, the given equation is not a quadratic equation.

$$(vii) (x + 2)^3 = 2x(x^2 - 1)$$

$$\Rightarrow x^3 + 3 \times x \times 2(x + 2) + 2^3 = 2x(x^2 - 1)$$

$$\Rightarrow x^3 + 6x(x + 2) + 8 = 2x^3 - 2x$$

$$\Rightarrow x^3 + 6x^2 + 12x + 8 = 2x^3 - 2x$$

$$\Rightarrow -x^3 + 6x^2 + 14x + 8 = 0$$

$$\Rightarrow x^3 - 6x^2 - 14x - 8 = 0$$

It is a cubic equation and not a quadratic equation.

$$(viii) x^3 - 4x^2 - x + 1 = (x - 2)^3$$

$$\Rightarrow x^3 - 4x^2 - x + 1 = x^3 - 8 - 6x^2 + 12x$$

$$\Rightarrow 2x^2 - 13x + 9 = 0$$

It is of the form $ax^2 + bx + c = 0$.

Hence, the given equation is a quadratic equation.

Q2. Represent the following situations in the form of quadratic equations :

- (i) The area of a rectangular plot is 528 m^2 . The length of the plot (in metres) is one more than twice its breadth. We need to find the length and breadth of the plot.
- (ii) The product of two consecutive positive integers is 306. We need to find the integers.
- (iii) Rohan's mother is 26 years older than him. The product of their ages (in years) 3 years from now will be 360. We would like to find Rohan's present age.
- (iv) A train travels a distance of 480 km at a uniform speed. If the speed had been 8 km/hr less, then it would have taken 3 hours more to cover the same distance. We need to find the speed of the train.

Sol. (i) Let breadth be = x meters

Then length = $(2x + 1)$ meters.

$$x \times (2x + 1) = 528 \text{ (Area of the plot)}$$

$$\text{or } 2x^2 + x - 528 = 0$$

(ii) Let the consecutive integers be x and $x + 1$. It is given that their product is 306.

$$\therefore x(x + 1) = 306$$

$$\Rightarrow x^2 + x - 306 = 0$$

(iii) Let Rohan's present age = x years

Then present age of Rohan's mother

$$= (x + 26) \text{ years}$$

After 3 years, it is given that

$$(x + 3) \times \{(x + 26) + 3\} = 360$$

$$\text{or } (x + 3)(x + 29) = 360$$

$$\Rightarrow x^2 + 32x + 87 = 360$$

$$\Rightarrow x^2 + 32x + 87 - 360 = 0$$

$$\Rightarrow x^2 + 32x - 273 = 0$$

(iv) Let the speed of train be x km/h.

$$\text{Time taken to travel 480 km} = \frac{480}{x} \text{ hrs}$$

In second condition,

let the speed of train = $(x - 8)$ km/h

It is also given that the train will take 3 hours more to cover the same distance.

$$\text{Therefore, time taken to travel 480 km} = \left(\frac{480}{x} + 3 \right) \text{ hrs}$$

Speed \times Time = Distance

$$(x - 8) \left(\frac{480}{x} + 3 \right) = 480$$

$$\Rightarrow 480 + 3x - \frac{3840}{x} - 24 = 480$$

$$\Rightarrow 3x - \frac{3840}{x} = 24$$

$$\Rightarrow 3x^2 - 24x + 3840 = 0$$

$$\Rightarrow x^2 - 8x + 1280 = 0$$