

Chapter 4

EXERCISE 4.1

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

Solutions:

(i) $(x+1)^2 = 2(x-3)$
 $x^2 + 2x + 1 = 2x - 6$
 $x^2 + 7 = 0$

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

So, we can say that the given equation is a quadratic equation.

(ii) $x^2 - 2x = (-2)(3 - x)$
 $x^2 - 2x = -6 + 2x$
 $x^2 - 4x + 6 = 0$

Equation is in the form $ax^2 + bx + c = 0$.

Hence, the given equation is a quadratic equation.

$$\begin{aligned}
 \text{(iii)} \quad & (x-2)(x+1) = (x-1)(x+3) \\
 & x^2 - x - 2 = x^2 + 2x - 3 \\
 & 3x - 1 = 0
 \end{aligned}$$

Equation is not in the form $ax^2+bx+c = 0$.

Hence, the given equation is not a quadratic equation.

$$\begin{aligned}
 \text{(iv)} \quad & (x-3)(2x+1) = x(x+5) \\
 & 2x^2 - 5x - 3 = x^2 + 5x \\
 & x^2 - 10x - 3 = 0
 \end{aligned}$$

Equation is in the form $ax^2+bx+c = 0$.

Hence, the given equation is a quadratic equation.

$$\begin{aligned}
 \text{(v)} \quad & (2x-1)(x-3) = (x+5)(x-1) \\
 & 2x^2 - 7x + 3 = x^2 + 4x - 5 \\
 & x^2 - 11x + 8 = 0
 \end{aligned}$$

Equation is in the form $ax^2+bx+c = 0$.

Hence, the given equation is a quadratic equation.

$$\begin{aligned}
 \text{(vi)} \quad & x^2 + 3x + 1 = (x-2)^2 \\
 & x^2 + 3x + 1 = x^2 + 4 - 4x \\
 & 7x - 3 = 0
 \end{aligned}$$

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

Hence, the given equation is not a quadratic equation.

$$\begin{aligned}
 \text{(vii)} \quad & (x+2)^3 = 2x(x^2-1) \\
 & x^4 + 8 + 6x^2 + 12x = 2x^3 - 2x \\
 & x^3 - 14x - 6x^2 - 8 = 0
 \end{aligned}$$

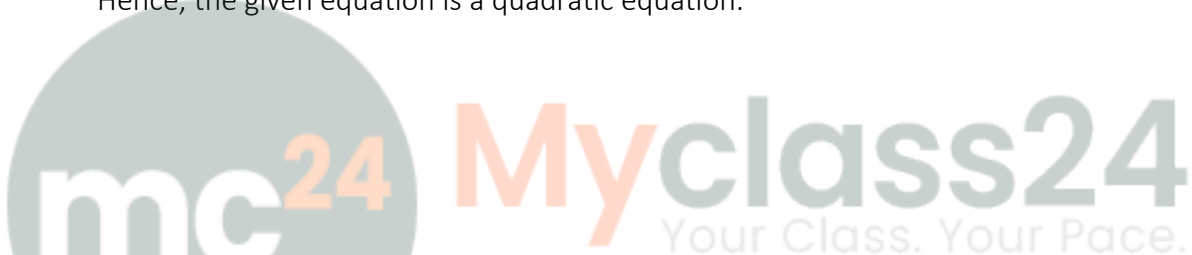
It is not of the form $ax^2+bx+c = 0$.

Hence, the given equation is not a quadratic equation.

$$\begin{aligned}
 \text{(viii)} \quad & X^3 - 4x^3 - x + 1 = (x-2)^3 \\
 & X^3 - 4x^2 - x + 1 = x^3 - 8 - 6x^2 + 12x \\
 & 2x^2 - 13x + 9 = 0
 \end{aligned}$$

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

Hence, the given equation is a quadratic equation.



2. 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/h less, then it would have taken 3 hours more to cover the same distance. We need to find the speed of the train.

Solutions:

- (i) Let the breadth of the plot be $x \text{ m}$.

Hence, the length of the plot is $(2x + 1)$ m.

Area of a rectangle = Length $\times$ Breadth

$$\therefore 528 = x(2x + 1)$$

$$2x^2 + x - 528 = 0 \quad (\text{required quadratic form})$$

(ii) Let the consecutive integers be x and $x + 1$.

It is given that their product is 306.

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

$$x^2 + x - 306 = 0 \quad (\text{required quadratic form})$$

(iii) Let Rohan's age be x .

Hence, his mother's age = $x+26$

3 years hence,

$$\text{Rohan's age} = x + 3$$

$$\text{Mother's age} = x + 26 + 3 = x + 29$$

It is given that the product of their ages after 3 years is 360.

$$\therefore (x+3)(x+29) = 360$$

$$x^2 + 32x - 273 = 0 \quad (\text{required quadratic form})$$

(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,

$$\text{let the speed of train} = (x - 8) \text{ km/h}$$

Given that the train will take 3 hours more to cover the same distance.

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

Speed $\times$ Time = Distance

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

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

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

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

$$= x^2 - 8x + 1280 = 0 \quad \text{(required quadratic form)}$$

