

Chapter 4 - Quadratic Equations

$$ax^2 + bx + c = 0 \quad a \neq 0$$

$$4x^2 + 2 = 0$$

$$9x^2 + 6x + 2 = 0$$

$$4x^2 - 2x + 3 = 0$$

$$9x + 2 = 0 \quad \text{X}$$

$$4x^2 = 5$$

$$4x^2 - 5 = 0$$

$$6x^2 - 5x = 0$$

Example 2 : Check whether the following are quadratic equations:

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

(ii) $x(x + 1) + 8 = (x + 2)(x - 2)$

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

(iv) $(x + 2)^3 = x^3 - 4$

$(x - 2)^2 + 1 = 2x - 3$ $[(a - b)^2 = a^2 + b^2 - 2ab]$

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

$x^2 + 4 - 4x + 1 - 2x + 3 = 0$

$x^2 - 6x + 8 = 0$

Yes, this is Quadratic equation

$$(ii) \quad x(x+1) + 8 = (x+2)(x-2)$$

$$x^2 + x + 8 = x^2 - 4$$

$$\cancel{x^2} + x + 8 - \cancel{x^2} + 4 = 0$$

$$x + 12 = 0$$

No., This is not a Quadratic equation

$$\begin{array}{l} (a+b)(a-b) \\ = a^2 - b^2 \end{array}$$



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

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

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

$$2x^2 - 6x - x + 3 = x(x-1) + 5(x-1)$$

$$2x^2 - 7x + 3 = x^2 - x + 5x - 5$$

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

$$2x^2 - 7x + 3 - x^2 - 4x + 5 = 0$$

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

Yes, this is a Quadratic equation

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

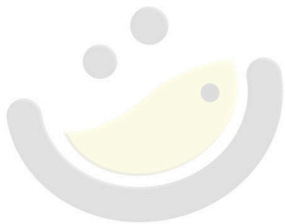
$$\begin{aligned} x^3 + 8 + 3x^2 \cdot 2 + 3(x)(2)^2 \\ = 2x^3 - 2x \end{aligned}$$

$$(a+b)^3 = a^3 + b^3 + 3ab^2 + 3a^2b.$$

$$x^3 + 8 + 6x^2 + 12x - 2x^3 + 2x = 0$$

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

No, This is not a Quadratic equation.



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The poetry of logical ideas.

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.

$$\text{Let Breadth} = x$$

$$\text{length} = 2x + 1$$

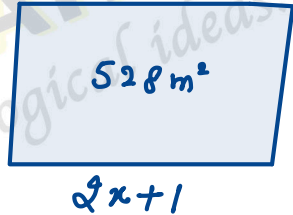
$$\text{Area} = 528 \text{ m}^2$$

$$l \times b = \text{area.}$$

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

$$2x^2 + x = 528$$

$$2x^2 + x - 528 = 0$$



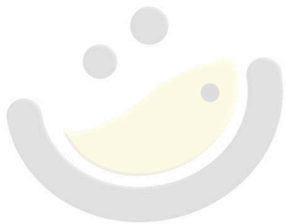
- (ii) The product of two consecutive positive integers is 306. We need to find the integers.

Let 1st No. $\rightarrow x$

2nd No. $\rightarrow x+1$

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

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



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- (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.

$$\text{Rohan's present age} = x$$

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

after 3 years

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

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

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

$$x^2 + 29x + 3x + 87 - 360 = 0$$

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

- (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.

$$\text{distance} = 480 \text{ km.}$$

$$\text{Let speed} = x \text{ km/hr.}$$

$$\text{New speed} = x - 8 \text{ km/hr.}$$

$$\begin{aligned} \text{Time} &= \frac{d}{s} \\ &= \frac{480}{x} \end{aligned}$$

$$\begin{aligned} \text{Time} &= \frac{d}{s} \\ &= \frac{480}{x-8} \end{aligned}$$

$$\frac{480}{x} + 3 = \frac{480}{x-8}$$

$$\frac{480 + 3x}{x} = \frac{480}{x-8}$$

$$(480 + 3x)(x-8) = 480x$$

$$480(x-8) + 3x(x-8) = 480x$$

$$~~480x~~ - 3840 + 3x^2 - 24x - ~~480x~~ = 0$$

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

$$3(x^2 - 8x - 1280) = 0$$

$$x^2 - 8x - 1280 = 0$$