ONLINE MATHS CLASS - X – 38 (16 / 09 / 2021)

4 . SECOND DEGREE EQUATIONS - CLASS - 5

Activity 1

In the polynomial $p(x) = 4x^2 + 24x + 11$, what number should be taken as x to get $p(x) = 0$?

Answer

$$p(x) = 0 \quad ==> \quad 4x^2 + 24x + 11 = 0$$

$$4x^2 + 24x = -11$$

$$\frac{4x^2 + 24x}{4} = -\frac{11}{4}$$

$$\frac{4x^2}{4} + \frac{24x}{4} = -\frac{11}{4}$$

$$x^2 + 6x = -\frac{11}{4}$$

$$x^2 + 6x + 3^2 = -\frac{11}{4} + 3^2$$

$$(x + 3)^2 = -\frac{11}{4} + 3^2$$

$$(x + 3)^2 = -\frac{11}{4} + 9 \implies (x + 3)^2 = -\frac{11}{4} + \frac{36}{4}$$

$$(x + 3)^2 = \frac{25}{4}$$

$$x + 3 = \pm\sqrt{\frac{25}{4}}$$

$$x + 3 = \frac{5}{2} \quad \text{OR} \quad x + 3 = -\frac{5}{2}$$

$$x = \frac{5}{2} - 3 \quad \text{OR} \quad x = -\frac{5}{2} - 3$$

$$x = \frac{5}{2} - \frac{6}{2} \quad \text{OR} \quad x = -\frac{5}{2} - \frac{6}{2}$$

$$x = -\frac{1}{2} \quad \text{OR} \quad x = -\frac{11}{2}$$

NOTE :

The stages of finding x		
1	Change the coefficient of x^2 to 1	$x^2 + 6x = -\frac{11}{4}$
2	Add the square of half the coefficient of x	$x^2 + 6x + 3^2 = -\frac{11}{4} + 3^2$
3	Write as a square	$(x + 3)^2 = \frac{25}{4}$
4	Take square roots	$x + 3 = \pm\sqrt{\frac{25}{4}}$
5	Calculate x	$x = \frac{5}{2} - 3$ OR $x = -\frac{5}{2} - 3$

Activity 2

In the polynomial $p(x) = 4x^2 + 24x + 11$, what number should be taken as x to get $p(x) = 3$?

Answer

$$p(x) = 3 \quad ==> \quad 4x^2 + 24x + 11 = 3$$

$$4x^2 + 24x = 3 - 11$$

$$4x^2 + 24x = -8$$

$$\frac{4x^2 + 24x}{4} = -\frac{8}{4}$$

$$\frac{4x^2}{4} + \frac{24x}{4} = -\frac{8}{4}$$

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

$$x^2 + 6x + 3^2 = -2 + 3^2$$

$$(x + 3)^2 = -2 + 9$$

$$(x + 3)^2 = 7$$

$$x + 3 = \pm\sqrt{7}$$

$$x + 3 = \sqrt{7} \quad \text{OR} \quad x + 3 = -\sqrt{7}$$

$$x = \sqrt{7} - 3 \quad \text{OR} \quad x = -\sqrt{7} - 3$$

NOTE :

Any second degree polynomial can be put in the form $p(x) = ax^2 + bx + c$

Activity 3

In the polynomial , $p(x) = ax^2 + bx + c$ **what number should be taken as** x **to get** $p(x) = 3$ **?**

Answer

$p(x) = 0$ s ==> $ax^2 + bx + c = 0$

$$ax^2 + bx = -c$$

$$\frac{ax^2 + bx}{a} = -\frac{c}{a}$$

$$\frac{ax^2}{a} + \frac{bx}{a} = -\frac{c}{a}$$

$$x^2 + \frac{b}{a}x = -\frac{c}{a} \qquad \left(\frac{b}{a} = 2 \times \frac{b}{2a}\right)$$

$$x^2 + \frac{b}{a}x + \left(\frac{b}{2a}\right)^2 = -\frac{c}{a} + \left(\frac{b}{2a}\right)^2$$

$$\left(x + \frac{b}{2a}\right)^2 = -\frac{c}{a} + \frac{b^2}{4a^2}$$

$$\left(x + \frac{b}{2a}\right)^2 = -\frac{4ac}{4a^2} + \frac{b^2}{4a^2} \implies \left(x + \frac{b}{2a}\right)^2 = \frac{-4ac + b^2}{4a^2}$$

$$\left(x + \frac{b}{2a}\right)^2 = \frac{b^2-4ac}{4a^2}$$

$$x + \frac{b}{2a} = \pm\sqrt{\frac{b^2 - 4ac}{4a^2}} \implies x + \frac{b}{2a} = \pm\frac{\sqrt{b^2 - 4ac}}{\sqrt{4a^2}}$$

$$x + \frac{b}{2a} = \pm\frac{\sqrt{b^2 - 4ac}}{2a}$$

$$x + \frac{b}{2a} = \frac{\sqrt{b^2 - 4ac}}{2a} \quad \text{OR} \quad x + \frac{b}{2a} = -\frac{\sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{\sqrt{b^2 - 4ac}}{2a} - \frac{b}{2a} \quad \text{OR} \quad x = -\frac{\sqrt{b^2 - 4ac}}{2a} - \frac{b}{2a}$$

$$x = -\frac{b}{2a} + \frac{\sqrt{b^2 - 4ac}}{2a} \quad \text{OR} \quad x = -\frac{b}{2a} - \frac{\sqrt{b^2 - 4ac}}{2a}$$

That is , $x = -\frac{b}{2a} \pm \frac{\sqrt{b^2 - 4ac}}{2a} \implies x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Conclusion

To get $ax^2 + bx + c = 0$, we must take $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

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