Pakistan School
Kingdom of Bahrain

# WELCOME CLASS 10TH (SCIENCE)

## Quadratic Equations

## Quadratic Formula

# Objectives

Students will be able to:

Solve quadratic equations using completing square method

## Quadratic Formula:

## Derivation of quadratic formula by using completing square method.

The quadratic equation in standard form is

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

Dividing each term of the equation by a, we get

$$x^2 + \frac{b}{a}x + \frac{c}{a} = 0$$

Shifting constant term $\frac{c}{a}$ to the right, we have

$$x^2 + \frac{b}{a}x = -\frac{c}{a}$$

Adding $\left(\frac{b}{a}\right)^2$ on both sides, we obtain

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

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

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

Taking square root of both sides, we get

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

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

Thus, $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ is known as "quadratic formula".

## Question no 1

$$2-x^2=7x$$

$$2-x^2=7x$$

$$1x^2+7x-2=0$$

$$ax^2+bx+c=0$$

$$a=1 \quad b=7 \quad c=-2$$

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

$$x=\frac{-(7)\pm\sqrt{(7)^2-4(1)(-2)}}{2(1)}$$

$$x=\frac{-7\pm\sqrt{49+8}}{2}$$

$$x=\frac{-7\pm\sqrt{57}}{2}$$

$$\text{S.Set} = \left\{\frac{-7\pm\sqrt{57}}{2}\right\}$$

**(vii)** $\dfrac{3}{x-6}-\dfrac{4}{x-5}=1$

**Solution:**

$$\frac{3}{x-6}-\frac{4}{x-5}=1$$

$$\frac{3(x-5)-4(x-6)}{(x-6)(x-5)}=1$$

$$3x-15-4x+24=(x-6)(x-5)$$

$$-x+9=x^2-11x+30$$

$$x^2-11x+x+30-9=0$$

$$x^2-10x+21=0$$

*Here* $a=1, b=-10, c=21$

Now $x=\dfrac{-b\pm\sqrt{b^2-4ac}}{2a}$

$$x=\frac{-(-10)\pm\sqrt{(-10)^2-4(1)(21)}}{2(3)}$$

$$x=\frac{10\pm\sqrt{100-84}}{2}$$

$$x=\frac{10\pm\sqrt{16}}{2}$$

$$x=\frac{-8\pm4}{2}$$

$$x=\frac{10+4}{2} \qquad x=\frac{10-4}{2}$$

$$x=\frac{14}{2} \qquad x=\frac{6}{2}$$

$$x=7 \qquad x=3$$

Thus, solution set = {3,7}

# Plenary

Q. Solve using quadratic formula

$6x^2 - 3 - 7x = 0$

# Solution

**(v)** $6x^2 - 3 \quad -7x = 0$

**Solution:**

$$6x^2 - 3 - \quad -7x = 0$$

$$6x^2 - 7x - 3 = 0$$

Compare it with, we have

$$ax^2 + bx + c = 0$$

Here $a = 6, b = -7, c = -3$

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

$$x = \frac{-(-7) \pm \sqrt{(-7)^2 - 4(6)(-3)}}{2(6)}$$

$$x = \frac{7 \pm \sqrt{49 + 72}}{12}$$

$$x = \frac{7 \pm \sqrt{121}}{12}$$

$$x = \frac{7 \pm 11}{12}$$

$$x = \frac{7 \pm 11}{12} \quad , \quad x = \frac{7 - 11}{12}$$

$$= \frac{18}{12} \qquad\qquad = -\frac{4}{12}$$

$$= \frac{3}{2} \qquad\qquad = -\frac{1}{3}$$

Thus, solution set $= \left\{-\frac{1}{3}, \frac{3}{2}\right\}$

# Homework

Ex 1.2 Remaining parts