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Solving Quadratic Equations

Linear Equations

$$3x + 2 = 23$$

Degree $\rightarrow 1$

Solutions $\rightarrow 1$

vs

Quadratic Equations

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

Degree $\rightarrow 2^{\text{nd}}$

Solutions $\rightarrow 2$

Three Methods for solving Quadratic Equations

Method 1: The Factoring Method

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

$$(x+2)(x+3) = 0$$

1) Set to 0.

2) Factor the Polynomial

The property of zero

If $a \cdot b = 0$ then $a = 0$ or $b = 0$

3) Set each factor equal to 0 and solve.

$$x + 2 = 0$$

$$\begin{array}{r} -2 \quad -2 \\ \hline \end{array}$$

$$x = -2$$

or

$$x + 3 = 0$$

$$\begin{array}{r} -3 \quad -3 \\ \hline \end{array}$$

$$x = -3$$

Web assign Question

Ex 1:

$$28x^2 + 4x = 0$$

$$4x(7x + 1) = 0$$

$$4x = 0$$

$$x = 0$$

$$\text{or } 7x + 1 = 0$$

$$\begin{array}{r} -1 \quad -1 \\ \hline 7x = -1 \\ \frac{7x}{7} = \frac{-1}{7} \rightarrow x = -\frac{1}{7} \end{array}$$

Solutions: $x = 0$
and

$$x = -\frac{1}{7}$$

Ex 2: $36x^2 - 1 = 0$

Solutions: $x = \frac{1}{6}$
and
 $x = -\frac{1}{6}$

$$(6x - 1)(6x + 1) = 0$$

$$\begin{array}{r} 6x - 1 = 0 \\ +1 \quad +1 \\ \hline 6x = 1 \\ \frac{6x}{6} = \frac{1}{6} \\ x = \frac{1}{6} \end{array} \quad \text{or} \quad \begin{array}{r} 6x + 1 = 0 \\ -1 \quad -1 \\ \hline 6x = -1 \\ \frac{6x}{6} = \frac{-1}{6} \\ x = -\frac{1}{6} \end{array}$$

Ex 3: $4x^2 - 25 = 0$

Solutions: $x = \frac{5}{2}$
and
 $x = -\frac{5}{2}$

$$(2x - 5)(2x + 5) = 0$$

$$\begin{array}{r} 2x - 5 = 0 \\ +5 \quad +5 \\ \hline 2x = 5 \\ \frac{2x}{2} = \frac{5}{2} \\ x = \frac{5}{2} \end{array} \quad \text{or} \quad \begin{array}{r} 2x + 5 = 0 \\ -5 \quad -5 \\ \hline 2x = -5 \\ \frac{2x}{2} = \frac{-5}{2} \\ x = -\frac{5}{2} \end{array}$$

Difference of Squares = 0

Solutions will be opposites of each other

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

Solutions: $x = 1$
and
 $x = 2$

$$(x - 1)(x - 2) = 0$$

$$\begin{array}{r} x - 1 = 0 \\ +1 \quad +1 \\ \hline x = 1 \end{array} \quad \text{or} \quad \begin{array}{r} x - 2 = 0 \\ +2 \quad +2 \\ \hline x = 2 \end{array}$$

Ex 5:

$$81x^2 + 36x + 4 = 0$$

square root
square root
square root

$$(9x + 2)^2 = 0$$

$$(9x + 2)(9x + 2) = 0$$

$$9x + 2 = 0 \text{ or } 9x + 2 = 0$$

$$\frac{-2 - 2}{9}$$

$$9x = -\frac{2}{9}$$

$$x = -\frac{2}{9}$$

$$x = -\frac{2}{9}$$

Solutions: $x = -\frac{2}{9}$

Perfect square = 0

Solutions are identical

Ex 6:

$$2x^2 = 7x + 15$$

$$\begin{array}{r} 2x^2 - 7x = 15 \\ -15 \quad -15 \\ \hline \end{array}$$

$$2x^2 - 7x - 15 = 0$$

$$(2x + 3)(x - 5) = 0$$

$$\begin{array}{r} 2x + 3 = 0 \\ -3 \quad -3 \\ \hline \end{array}$$

$$2x = -\frac{3}{2}$$

$$x = -\frac{3}{2}$$

$$\text{or } \begin{array}{r} x - 5 = 0 \\ +5 \quad +5 \\ \hline \end{array}$$

$$x = 5$$

Solutions: $x = 5$

and

$$x = -\frac{3}{2}$$

Ex 7:

$$\frac{1}{12}x^2 - x - 24 = 0$$

Solutions: $x = -12$
and
 $x = 24.$

$$x^2 - 12x - (12 \cdot 24) = 12 \cdot 0$$

$$x^2 - 12x - 288 = 0$$

$$(x - 24)(x + 12) = 0$$

$$x - 24 = 0 \quad \text{or} \quad x + 12 = 0$$

$$x = 24$$

$$x = -12$$