

## 8 Algebra RH

Essential Question: How do we solve a quadratic equation?

Do Now:

Solve for  $x$ .

1)  $x^2 + 5 = 5$

$$\sqrt{x^2} = \sqrt{0}$$

$$x = 0$$

2)  $\frac{3x^2}{3} = \frac{48}{3}$

$$\sqrt{x^2} = \sqrt{16}$$

$$x = \pm 4$$

3)  $x^2 + 4 = 0$

$$\sqrt{x^2} = \sqrt{-4}$$

$$x = \pm 2i$$

$i = \sqrt{-1}$   
↑  
imaginary  
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## What is a quadratic equation?



A quadratic equation is an equation of the form  $ax^2 + bx + c = 0$  where  $a$ ,  $b$ , and  $c$  are real numbers and  $a \neq 0$ .

## Methods used to Solve Quadratic Equations:

- square root method
- factoring
- completing the square
- quadratic formula
- graphing

➤ **Square Root Method:** Quadratic Equations in the form of  $x^2 = d$

•  $d = 0$  1 solution ( $x^2 = 0, x = 0$ )

•  $d > 0$  2 solutions ( $x^2 = 16, x = \{4, -4\}$ )

•  $d < 0$  No real solutions ( $x^2 = -4$ )

➤ **Factoring: Quadratic Equations in the form of  $ax^2 + bx + c = 0$ , where  $a \neq 0$**

1.  $x^2 - 7x + 12 = 0$

$$\begin{array}{l} (x-3)(x-4) = 0 \\ \hline x-3=0 \quad | \quad x-4=0 \\ x=3 \quad \quad | \quad x=4 \\ \hline \{3, 4\} \end{array}$$

2.  $x^2 - 3 = 2x$   
 $-2x \quad -2x$

$$\begin{array}{l} x^2 - 2x - 3 = 0 \\ (x-3)(x+1) = 0 \\ \hline x-3=0 \quad | \quad x+1=0 \\ x=3 \quad \quad | \quad x=-1 \\ \hline \{3, -1\} \end{array}$$



Let's try some more examples.

3.  $2x^2 - 2x = 40$

$$\begin{array}{l} 2x^2 - 2x - 40 = 0 \\ 2(x^2 - x - 20) = 0 \\ 2(x-5)(x+4) = 0 \\ \hline 2 \neq 0 \quad | \quad x-5=0 \quad | \quad x+4=0 \\ \quad \quad \quad | \quad x=5 \quad \quad | \quad x=-4 \\ \hline \{5, -4\} \end{array}$$

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

$$\begin{array}{l} 2x(x-2) = 0 \\ \hline 2x=0 \quad | \quad x-2=0 \\ x=0 \quad \quad | \quad x=2 \\ \hline \{0, 2\} \end{array}$$

5.  $(x+1)(x+2) = 12$

$$\begin{array}{l} x^2 + 3x + 2 = 12 \\ x^2 + 3x - 10 = 0 \\ (x-2)(x+5) = 0 \\ \hline x-2=0 \quad | \quad x+5=0 \\ x=2 \quad \quad | \quad x=-5 \\ \hline \{2, -5\} \end{array}$$

6.  $100x^2 = 121$

$$\begin{array}{l} 100x^2 - 121 = 0 \\ (10x-11)(10x+11) = 0 \\ \hline 10x-11=0 \quad | \quad 10x+11=0 \\ 10x=11 \quad \quad | \quad 10x=-11 \\ x=\frac{11}{10} \quad \quad | \quad x=-\frac{11}{10} \\ \hline \sqrt{x^2} = \sqrt{\frac{121}{100}} \\ x = \pm \frac{11}{10} \end{array}$$