Algebra 1 Unit 9 - Quadratic Equations Notes

Unit 9: Solving Quadratic Equations

After completion of this unit, you will be able to…

Learning Target #9.1: Solving Quadratic Equations

- Solve a quadratic equation by factoring a GCF.
- Solve a quadratic equation by factoring when a is not 1.
- Create a quadratic equation given a graph or the zeros of a function.
- Solve a quadratic equation by finding square roots.
- Solve a quadratic equation by completing the square.
- Solve a quadratic equation by using the Quadratic Formula.
- Solve a quadratic equation by analyzing the equation and determining the best method for solving.
- Solve application problems using quadratic equations.

Monday	Tuesday	Wednesday	Thursday	Friday
2/10 *Day 1* Solving by Factoring	**2/11** *Day 2* Solving by Factoring	**2/12** *Day 3* Solving by Factoring	**2/13** Review for Cumulative Exam	**2/14** **Cumulative Exam (Unit 7 & 8)**
2/17 **Winter Break**	**2/18** **Winter Break**	**2/19** **Winter Break**	**2/20** **Winter Break**	**2/21** **Winter Break**
2/24 *Day 3* Solving by Factoring Review	**2/25** *Day 4* Solving by Square Roots	**2/26** *Day 5* Solving by Square Roots	**2/27** *Day 6* Solving by Completing the Square	**2/28** *Day 7* Finding the Vertex via Completing the Square
3/2 *Day 8* Solving by Quadratic Formula	**3/3** *Day 9* Solving by Quadratic Formula	**3/4** *Day 10* Quadratic Formula Applications	**3/5** *Day 11* Determining Best Method and Review Day	**3/6** *Day 12* **9.1 Learning Assessment**

Tutoring Times

	Monday	Tuesday	Wednesday	Thursday	Friday
AM	Mrs. Jackson 7:45 – 8:15 Room 1210	Mr. Phillips 7:45 – 8:15 Room 1206	Mrs. Jackson & Mr. Webb 7:45 – 8:15 Room 1210 Room 1205	Mr. Watson & Mr. Phillips 7:45 – 8:15 Room 1208 Room 1206	Mr. Watson 7:45 – 8:15 Room 1208
PM	NONE	Mrs. Petersen 3:30 – 4:30 Room 1210	NONE	NONE	NONE

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Day 4: Solving by Finding Square Roots

Review: If possible, simplify the following radicals completely.

a. $\sqrt{25}$ 5

b. $\sqrt{125}$ $\sqrt{5\cdot5\cdot5}$ $5\sqrt{5}$

c. $\sqrt{24}$ $\sqrt{2\cdot2\cdot2\cdot3}$ $2\sqrt{6}$

Explore: Solve the following equations for x:

a. $x^2 = 16$ $x = 4$, $x = -4$

b. $x^2 = 4$ $x = \pm 2$

c. $x^2 = 9$ $x = \pm 3$

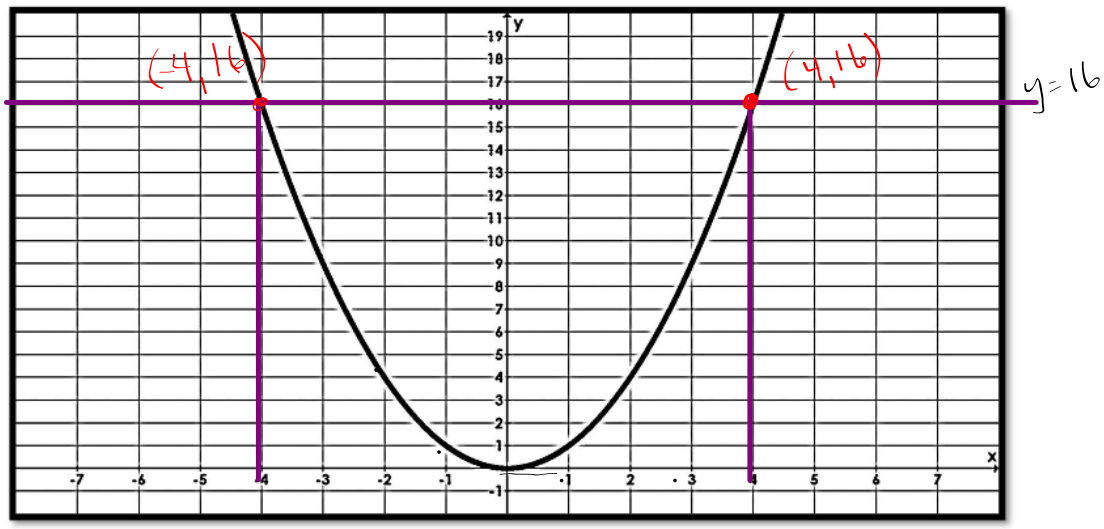
d. $x^2 = 1$ $x = 1$, $x = -1$

What operation did you perform to solve for x?

took square root ($\sqrt{}$)

How many of you only had one number as an answer for each equation?

Well, let's take a look at the graph of this function.



After looking at the graph, what values of x produce a y value of 1, 4, 9, and 16?

$y = x^2$ $y = (1)^2 \Rightarrow (1,1)$ $y = (4)^2 \Rightarrow (4,16)$

What would be your new answers for the previous equations?

a. $x^2 = 16$ b. $x^2 = 4$ c. $x^2 = 9$ d. $x^2 = 1$

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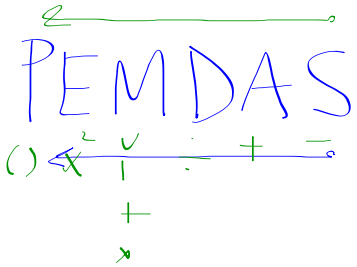
In order to be successful at today's lesson, you need to understand two things: how to solve a linear equation and understand that square roots and squares are inverses of each other.

Key Idea #1: Solving a Linear Equation:
S/A D/M E P = SADMEP



Practice: Solve the following equations for x:

a. $2x + 8 = 12$

$-8 \quad -8$

$\frac{2x}{2} = \frac{4}{2}$

$x = 2$

b. $3(x + 5) = 6$

$3x + 15 = 6$

$-15 \quad -15$

$\frac{3x}{3} = \frac{-9}{3}$

$x = -3$

c. $10x + 9 = 499$

$-9 \quad -9$

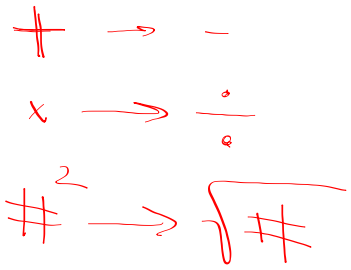
$\frac{10x}{10} = \frac{490}{10}$

$x = 49$

Key Idea #2: Square Roots and Squares

$5 \rightarrow (5)^2 \rightarrow 25 \rightarrow \sqrt{25} \rightarrow 5$

Squaring a number and taking the square root of a number undo each other (you end up with what you started with).



Practice: Take the following numbers and square them; then take the square root of your new number to show how you end up with the number you started with.

$7 \rightarrow 7^2 \rightarrow 49 \rightarrow \sqrt{49} \rightarrow 7$

$3 \rightarrow 3^2 \rightarrow 9 \rightarrow \sqrt{9} \rightarrow 3$

Algebra 1 Unit 9 - Quadratic Equations Notes

Solving by Taking Square Roots without Parentheses

Steps for Solving Quadratics by Finding Square Roots

1. Add or Subtract any constants that are on the same side of x^2.
2. Multiply or Divide any constants from x^2 terms. "Get x^2 by itself"
3. Take square root of both sides and set equal to positive and negative roots (±).

Ex: $x^2 = 25$
$\sqrt{x^2} = \sqrt{25}$
$x = \pm 5$
$x = +5$ and $x = -5$

REMEMBER WHEN SOLVING FOR X YOU GET A positive (+) AND negative (-) ANSWER!

Solve the following for x:

1) $\sqrt{x^2} = \sqrt{49}$

$x = \pm 7$

2) $\sqrt{x^2} = \sqrt{20}$

20
4 5
2 2

$x = \pm\sqrt{2 \cdot 2 \cdot 5}$
$x = \pm 2\sqrt{5}$

3) $\sqrt{x^2} = \sqrt{7}$

$x = \pm\sqrt{7}$

4) $3x^2 = 108$

$\frac{3x^2}{3} = \frac{108}{3}$
$\sqrt{x^2} = \sqrt{36}$
$x = \pm 6$

5) $2x^2 = 128$

6) $x^2 - 11 = 14$

7) $7x^2 - 6 = 57$

$+6 \quad +6$
$\frac{7x^2}{7} = \frac{63}{7}$
$\sqrt{x^2} = \sqrt{9}$
$x = \pm 3$

8) $2x^2 + 8 = 170$

9) $x^2 = 0$

$x = 0$

10) $10x^2 + 9 = 499$

11) $4x^2 - 6 = 74$

$+6 \quad +6$
$4x^2 = 80$
$\frac{4x^2}{4} = \frac{80}{4}$
$x^2 = 20$
$x = \pm 2\sqrt{5}$

12) $3x^2 + 7 = 301$

$-7 \quad -7$
$\frac{3x^2}{3} = \frac{294}{3}$
$x^2 = 98$
$x = \pm 7\sqrt{2}$

98
2 49
7 7

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Applications of Solving by Square Roots

Falling Objects: $h = -16t^2 + h_0$ **h_0 = starting height, h = ending height**

1. The tallest building in the USA is in Chicago, Illinois. It is 1450 ft tall. How long would it take a penny to drop from the top of the building to the ground?

$h = -16t^2 + h_0$

$0 = -16t^2 + 1450$

$-1450 \quad -1450$

$\frac{-1450}{-16} = \frac{-16t^2}{-16}$

$\sqrt{90.6} = \sqrt{t^2}$

$t = 9.51$

2. When an object is dropped from a height of 72 feet, how long does it take the object to hit the ground?

$0 = -16t^2 + 72$

$-72 \quad -72$

$\frac{-72}{-16} = \frac{-16t^2}{-16}$

$\sqrt{4.5} = \sqrt{t^2}$

$2.12 = t$

Application:

3. For a period of 48 months, the average monthly operating costs for a small business C (in dollars) is approximated by the model $C = 0.55t^2 + 550$, where t is the number of months. During which month was the average operating cost $1430?

$1430 = 0.55t^2 + 550$

$-550 \quad -550$

$\frac{880}{0.55} = \frac{0.55t^2}{0.55}$

$\sqrt{1600} = \sqrt{t^2}$

$+40 = t$

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