Warm-Up

1. Check classwork/homework answers around the room
2. Solve the following by factoring:

a) $x^2 - x = 6$

b) $5x^2 + 11x + 6 = 0$

c) $8x = x^2$

d) $x^2 = 100$

Hidden Figures Due Dates

- 21-23 due March 26 (TUESDAY) → Book completed!

When we have finished the novel,
we will watch the movie!

Unit Map - Quadratics

~~Tuesday, 3/12/2019 - Standard Form of Graphing Quadratics~~

~~Wednesday, 3/13/2019 - Half-Day, HF Reading Day with Substitute Ms. Krupski~~

~~Thursday, 3/14/2019 - Quadratic Functions~~

~~Friday, 3/15/2019 - Solving Quadratic Equations by Graphing with Substitute Ms. Mitchell~~

~~Monday, 3/18/2019 - Solving Quadratic Equations by Factoring~~

~~Tuesday, 3/19/2019 - Review Day~~

Wednesday, 3/20/2019 - The Quadratic Formula

Thursday, 3/21/2019 - Vertex Form

Friday, 3/22/2019 - Quadratic Word Problems

Monday, 3/25/2019 - Word Problems Continued (NC Check-Ins) with Substitute Ms. Mitchell

Tuesday, 3/26/2019 - Systems of Linear and Quadratic Equations

Wednesday, 3/27/2019 - Review Day

Thursday, 3/28/2019 - Test Day

Friday, 3/29/2019 - Begin watching Hidden Figures

The Quadratics Test will be the first grade of the 4th Quarter.

Solving Quadratic Equations with the Quadratic Formula

3/20/2019

The solutions of a quadratic equation of the form $ax^2 + bx + c = 0$ are given by the following formula:

The Quadratic Formula

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

take note

Key Concept Quadratic Formula

Algebra

If $ax^2 + bx + c = 0$, and $a \neq 0$, then

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

Example

Suppose $2x^2 + 3x - 5 = 0$. Then $a = 2$, $b = 3$, and $c = -5$. Therefore

$$x = \frac{-(3) \pm \sqrt{(3)^2 - 4(2)(-5)}}{2(2)}$$

Here's Why It Works If you complete the square for the general equation $ax^2 + bx + c = 0$, you can derive the quadratic formula.

Step 1 Write $ax^2 + bx + c = 0$ so the coefficient of x^2 is 1.

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

$$x^2 + \frac{b}{a}x + \frac{c}{a} = 0 \quad \text{Divide each side by a.}$$

Step 2 Complete the square.

$$x^2 + \frac{b}{a}x = -\frac{c}{a} \quad \text{Subtract } \tfrac{c}{a} \text{ from each side.}$$

$$x^2 + \frac{b}{a}x + \left(\frac{b}{2a}\right)^2 = -\frac{c}{a} + \left(\frac{b}{2a}\right)^2 \quad \text{Add } \left(\tfrac{b}{2a}\right)^2 \text{ to each side.}$$

$$\left(x + \frac{b}{2a}\right)^2 = -\frac{c}{a} + \frac{b^2}{4a^2} \quad \text{Write the left side as a square.}$$

$$\left(x + \frac{b}{2a}\right)^2 = -\frac{4ac}{4a^2} + \frac{b^2}{4a^2} \quad \text{Multiply } -\tfrac{c}{a} \text{ by } \tfrac{4a}{4a} \text{ to get like denominators.}$$

$$\left(x + \frac{b}{2a}\right)^2 = \frac{b^2 - 4ac}{4a^2} \quad \text{Simplify the right side.}$$

Step 3 Solve the equation for x.

$$\sqrt{\left(x + \frac{b}{2a}\right)^2} = \pm\sqrt{\frac{b^2 - 4ac}{4a^2}} \quad \text{Take square roots of each side.}$$

$$x + \frac{b}{2a} = \pm\frac{\sqrt{b^2 - 4ac}}{2a} \quad \text{Simplify the right side.}$$

$$x = -\frac{b}{2a} \pm \frac{\sqrt{b^2 - 4ac}}{2a} \quad \text{Subtract } \tfrac{b}{2a} \text{ from each side.}$$

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

This step uses the property $\sqrt{\frac{m}{n}} = \frac{\sqrt{m}}{\sqrt{n}}$, which you will study in Lesson 10-2.

If you are interested in why the quadratic formula works, please see this

What are the solutions of $x^2 - 8 = 2x$? Use the quadratic formula.

$x^2 - 2x - 8 = 0$	Write the equation in standard form.
$x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$	Use the quadratic formula.
$x = \dfrac{-(-2) \pm \sqrt{(-2)^2 - 4(1)(-8)}}{2(1)}$	Substitute 1 for *a*, −2 for *b*, and −8 for *c*.
$x = \dfrac{2 \pm \sqrt{36}}{2}$	Simplify.
$x = \dfrac{2+6}{2}$ or $x = \dfrac{2-6}{2}$	Write as two equations.
$x = 4$ or $x = -2$	Simplify.

What are the solutions of $2x^2 + 3x = 5$? Use the quadratic formula to solve.

What are the roots of the equation $x^2 - 4x = -4$? Use the quadratic formula to solve.

7. $2x^2 + 5x + 3 = 0$

8. $5x^2 + 16x - 84 = 0$

9. $4x^2 + 7x - 15 = 0$

10. $3x^2 - 41x = -110$

11. $18x^2 - 45x - 50 = 0$

12. $3x^2 + 44x = -96$

13. $3x^2 + 19x = 154$

14. $2x^2 - x - 120 = 0$

15. $5x^2 - 47x = 156$

. A batter strikes a baseball. The equation $y = -0.005x^2 + 0.7x + 3.5$ models its path, where x is the horizontal distance, in feet, the ball travels and y is the height, in feet, of the ball. How far from the batter will the ball land? Round to the nearest tenth of a foot.

There are many methods for solving a quadratic equation.

Method	When to Use
Graphing	Use if you have a graphing calculator handy.
Square roots	Use if the equation has no x-term.
Factoring	Use if you can factor the equation easily.
Completing the square	Use if the coefficient of x^2 is 1, but you cannot easily factor the equation.
Quadratic formula	Use if the equation cannot be factored easily or at all.

Which method(s) would you choose to solve each equation? Explain your reasoning.

A $3x^2 - 9 = 0$	Square roots; there is no x-term
B $x^2 - x - 30 = 0$	Factoring; the equation is easily factorable
C $6x^2 + 13x - 17 = 0$	Quadratic formula, graphing; the equation cannot be factored
D $x^2 - 5x + 3 = 0$	Quadratic formula, completing the square, or graphing; the coefficient of the x^2-term is 1, but the equation cannot be factored
E $-16x^2 - 50x + 21 = 0$	Quadratic formula, graphing; the equation cannot be factored easily since the numbers are large

Quadratic equations can have two, one, or no real - number solutions

You can determine how many real - number solutions it has by using the discriminates.

The discriminant is the expression under the radical sign in the quadratic formula.

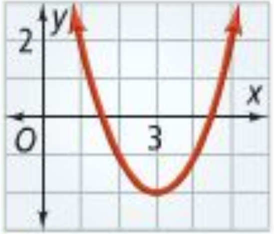
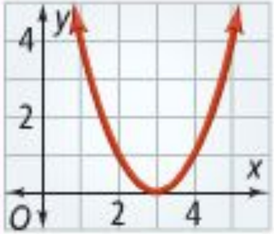
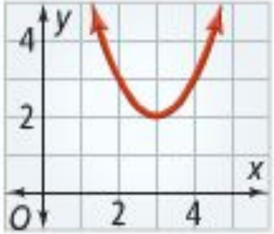
$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

the discriminant

The discriminant of a quadratic equation can be positive, zero, or negative.

take note

Key Concept Using the Discriminant

<table>
<tr><td>Discriminant</td><td>$b^2 - 4ac > 0$</td><td>$b^2 - 4ac = 0$</td><td>$b^2 - 4ac < 0$</td></tr>
<tr><td>Example</td><td>$x^2 - 6x + 7 = 0$
The discriminant is $(-6)^2 - 4(1)(7) = 8$, which is positive.

</td><td>$x^2 - 6x + 9 = 0$
The discriminant is $(-6)^2 - 4(1)(9) = 0$.

</td><td>$x^2 - 6x + 11 = 0$
The discriminant is $(-6)^2 - 4(1)(11) = -8$, which is negative.

</td></tr>
<tr><td>Number of Solutions</td><td>There are two real-number solutions.</td><td>There is one real-number solution.</td><td>There are no real-number solutions.</td></tr>
</table>

How many solutions?

$$2x^2 - 3x + 5 = 0$$

$$\begin{aligned} b^2 - 4ac &= (-3)^2 - 4(2)(5) \\ &= -31 \end{aligned}$$

Because the discriminant is negative, the equation has no real-number solutions.

How many solutions?

29. $x^2 - 2x + 3 = 0$

30. $x^2 + 7x - 5 = 0$

31. $x^2 + 3x + 11 = 0$

32. $x^2 - 15 = 0$

33. $x^2 + 2x = 0$

34. $9x^2 + 12x + 4 = 0$

Homework

Two worksheets posted on my website. Only complete the evens for both worksheets.