

# Intro to Quadratic Formula

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

## Entrance Ticket

- Find the roots of the following factored equation.

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

- Find the roots of the following quadratic equation by factoring.

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

# Quadratic Formula

- Learning Goal
  - Students will solve quadratic equations in one variable with real roots by using the quadratic formula.
- Success Criteria
  - Students can write the quadratic formula.
  - Students can identify the values for  $a$ ,  $b$ , and  $c$ .
  - Students can use the quadratic formula to solve for real roots.

# Agenda

- Entrance ticket
- Exploration
- Notes
- Question-question-swap
- Notes
- Activity
- Exit ticket

## Exploration

- Find the roots of the following quadratic equation by factoring.

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

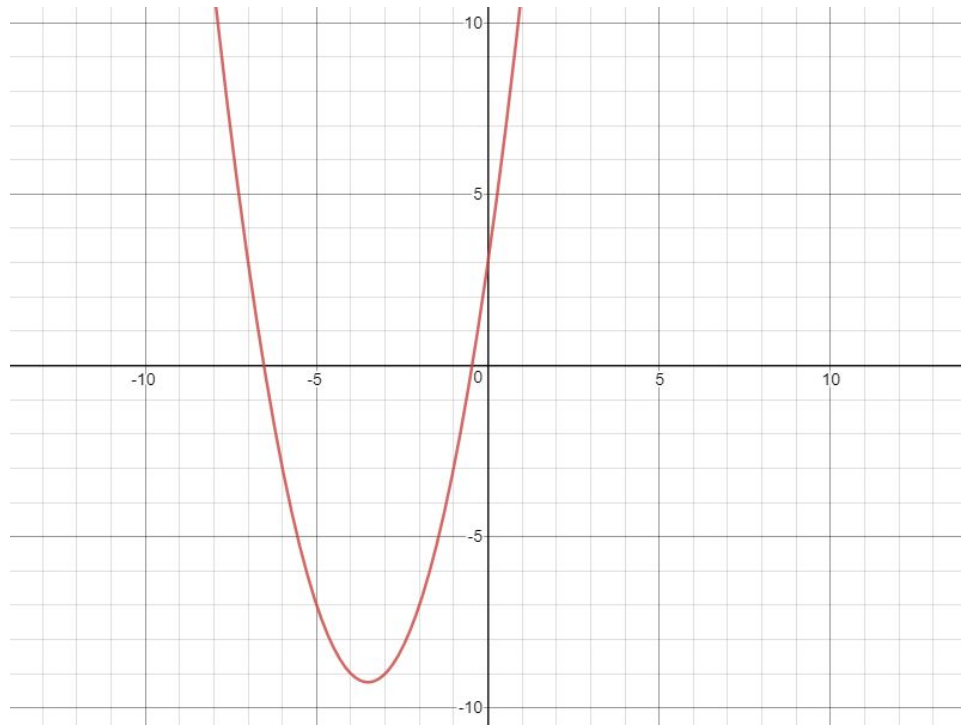
## Exploration

- If you cannot find the roots of the quadratic equation by factoring, then try graphing.

$$y = x^2 + 7x + 3$$

# Exploration

$$y = x^2 + 7x + 3$$



# Think-Pair-Share

1. Why can't we factor the equation even though it has roots?
2. How might we be able to find the roots, without a graphing calculator, for a quadratic equation that cannot be factored?



# Quadratic Formula - Notes

- The quadratic formula is another method for solving quadratic equations. It is helpful when a quadratic equation cannot be factored, but it can be used to solve any quadratic equation.

- The general quadratic equation is  $ax^2 + bx + c = 0$

- The quadratic formula is

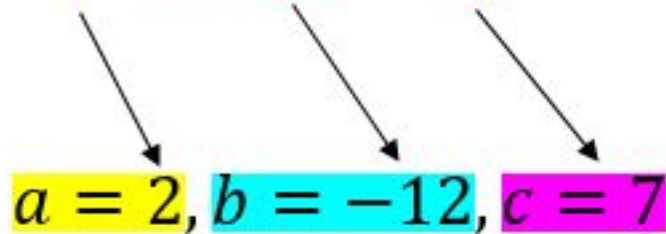
$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

where  $a$ ,  $b$ , and  $c$  are constants and  $a \neq 0$

# Quadratic Formula - Notes

- The general quadratic equation is  $ax^2 + bx + c = 0$

- EXAMPLE

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

$$a = 2, b = -12, c = 7$$

# Question-Question-Swap

1. Each person will receive a card with a quadratic equation on one side and the values for  $a$ ,  $b$ , and  $c$  on the other.
2. Stand up, put your hand up, find another person with his/her hand up, give each other a high five - this is your partner!
3. Partner A show the equation side to your partner.
4. Partner B look at the quadratic equation and identify the values for  $a$ ,  $b$ , and  $c$ .
5. Partner A tell your partner whether he/she got the answer correct.
6. Switch roles.
7. TRADE your cards, put your hand up, and find a new partner.
8. Repeat at least 3 times.

# Quadratic Formula - Notes

- Now we will use the quadratic formula to solve a quadratic equation.
- If  $x^2 + x - 12 = 0$
- Then  $a = 1$ ,  $b = 1$ ,  $c = -12$
- And

$$x = \frac{-(1) \pm \sqrt{(1)^2 - 4(1)(-12)}}{2(1)}$$

# Quadratic Formula - Notes

$$x = \frac{-1 \pm \sqrt{1^2 - 4(1)(-12)}}{2(1)}$$

$$x = \frac{-1 \pm \sqrt{1 + 48}}{2}$$

$$x = \frac{-1 \pm \sqrt{49}}{2}$$

$$x = \frac{-1 \pm 7}{2}$$

$$x = \frac{-1+7}{2}$$

AND

$$x = \frac{-1-7}{2}$$

$$x = \frac{6}{2} \rightarrow x = 3$$

AND

$$x = \frac{-8}{2} \rightarrow x = -4$$

Let's check by factoring.

- If  $x^2 + x - 12 = 0$
- Then  $(x - 3)(x + 4) = 0$
- $(x - 3) = 0 \rightarrow x = 3$
- $(x + 4) = 0 \rightarrow x = -4$
- $x = 3$  and  $x = -4$  are the solutions we got when we used the quadratic formula!

# Using the Quadratic Formula Activity

- Insert the quadratic formula handout into your sheet pocket.
- Group leader
  - Grab your deck of equations and place face down in the middle of the group.
  - Turn the top card over.
- Everybody
  - Write the equation on the first line.
  - Identify  $a$ ,  $b$ , and  $c$  and write them on the second line.
  - Place  $a$ ,  $b$ , and  $c$  into the correct highlighted areas in the quadratic formula.
  - Use order of operations to finish solving the equation.
  - Share your solution(s) with the group. If everybody gets the same solution, turn the next card over and repeat. If somebody gets a different answer, check your work, find the error, and correct it until everybody has the same solution(s). Turn the next card over and repeat.

## Using the Quadratic Formula Activity

- If  $\text{yellow box } x^2 + \text{cyan box } x + \text{magenta box} = 0$

- Then  $a = \text{yellow box}, b = \text{cyan box}, c = \text{magenta box}$

- And

$$x = \frac{-\text{cyan box} \pm \sqrt{(\text{cyan box})^2 - 4(\text{yellow box})(\text{magenta box})}}{2(\text{yellow box})}$$



## Using the Quadratic Formula Activity

- If  $\square x^2 + \square x + \square = 0$

- Then  $a = \square, b = \square, c = \square$

- And

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

# Exit Ticket

- Solve the following equation using the quadratic formula.

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

- Which success criteria did you meet? Which success criteria did you not meet?
  - Students can write the quadratic formula.
  - Students can identify the values for  $a$ ,  $b$ , and  $c$ .
  - Students can use the quadratic formula to solve for real roots.