High School Algebra Playlist: Solving Quadratic Equations

Aligns with CCSS.Math.Content.HSA.REI.B.4.b: Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers a and b.

Related Standards

- CCSS.Math.Content.HSA.SSE.B.3.a: Factor a quadratic expression to reveal the zeros of the function it defines.
- CCSS.Math.Content.HSA.SSE.B.3.b: Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.
- CCSS.Math.Content.HSA.REI.B.4.a: Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x - p)^2 = q$ that has the same solutions. Derive the quadratic formula from this form.
- CCSS.Math.Content.HSN.CN.C.7: Solve quadratic equations with real coefficients that have complex solutions.

Objectives

In this module, you will learn and practice the following skills:

- choose a method for solving a quadratic equation
- write complex solutions when appropriate

Let's get started!

Key Terms

- A **quadratic equation** is a polynomial of degree 2, typically written $ax^2 + bx + c = 0$.
- **Completing the square** is the process of converting an expression, such as a quadratic expression, into a perfect square by adding or subtracting terms on both sides.
- The **quadratic formula** is a formula that determines the roots of a quadratic equation from its coefficients.
- A **complex number** can be written as $a + bi$, where a and b are real and i is an imaginary number whose square equals -1.

Connections

- https://openstaxcollege.org/textbooks/algebra-and-trigonometry; section 2.4
- https://openstaxcollege.org/textbooks/algebra-and-trigonometry; section 2.5.4

Solving Quadratic Equations

(CCSS.Math.Content.HSA.REI.B.4.b)

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If your students…

Choose the "wrong" method:

Congratulate your students on finding the right solution(s), and then point out that, say, they didn't need to use the quadratic formula to solve $x^2-2x+1=0$ when it is so easily factorable.

Mishandle complex numbers:

Remind them of the essential features of imaginary numbers: that i can be thought of as $i=\sqrt{-1}$ and $i^2=-1$.

WATCH: Complex Numbers - Multiplying and Dividing

https://www.opened.com/video/complex-numbers-multiplying-and-dividing/116107

Mishandle quadratic equations with complex solutions:

Some students work with the quadratic formula until they determine that the discriminant is negative, and then they get lost amidst the imaginary numbers.

WATCH: Solving Quadratic Equations using the Quadratic Formula - Example 2, Complex Solutions

https://www.opened.com/video/solving-quadratic-equations-using-the-quadratic-formula/115844