Solve Quadratics
Taking the Square Root of Both Sides

**Common Core Georgia Performance Standards**

MCC9–12.N.CN.7

MCC9–12.A.CED.1★

MCC9–12.A.REI.4b

- A quadratic equation is an equation that can be written in the form $ax^2 + bx + c = 0$, where $a \neq 0$.

- Quadratic equations can have no real solutions, one real solution, or two real solutions. When a quadratic has no real solutions, it has two complex solutions.

- Quadratic equations that contain only a squared term and a constant can be solved by taking the square root of both sides. These equations can be written in the form $x^2 = c$, where $c$ is a constant.

- When we take the square root of both sides, we need to remember that a number and its opposite have the same square. Therefore, rather than simply taking the positive square root, we need to take the positive and negative square root. For $x^2 = c$, we find that $x = \pm\sqrt{c}$.

- We can use a similar method to solve quadratic equations in the form $(ax + b)^2 = c$.

- $c$ tells us the number and type of solutions for the equation.

| $c$ | Number and type of solutions |
|---|---|
| Negative | Two complex solutions |
| 0 | One real, rational solution |
| Positive and a perfect square | Two real, rational solutions |
| Positive and not a perfect square | Two real, irrational solutions |

## Guided Practice 5.2.1

**Example 1**

Solve $2x^2 - 5 = 195$ for $x$.

**Example 3**

Solve $4(x + 3)^2 - 10 = -6$ for $x$.

## Problem-Based Task 5.2.1: Time to Splash

Nina dives into a pool from a platform 3.75 feet above the water. Her height above the water in feet $x$ seconds into the jump is given by the expression $-5(x - 0.5)^2 + 5$. How long will it take Nina to hit the water?

## Practice 5.2.1: Taking the Square Root of Both Sides

Solve each equation for $x$.

1.  $x^2 = 81$

2.  $x^2 = -25$

3.  $x^2 - 5 = 4$

4.  $(x + 3)^2 = 1$

5.  $(x + 3)^2 + 7 = -2$

6.  $4(x - 10)^2 = 25$

Use what you know about square roots to complete problems 7–10.

7.  When does a quadratic equation in the form $ax^2 + b = c$ have only complex solutions?

8.  The area of a square with sides of length $s$ is given by $s^2$. The area of a square is 40 square centimeters. What is the length of one side of the square?

9.  The area of a circle with radius $r$ is given by $\pi r^2$. The area of a circle is 60 square millimeters. What is the radius of the circle?

10. The surface area of a cube with sides of length $a$ is given by $6a^2$. If the surface area of a cube is 200 square inches, what is the length of one side of the cube?

Closing:   When solving a quadratic equation we are finding the **zeros** or **x-intercepts** of the graph. This would be the value at which the equation is **ZERO.**
Find a quadratic equation that has zeros or solutions x = 4 and -4.