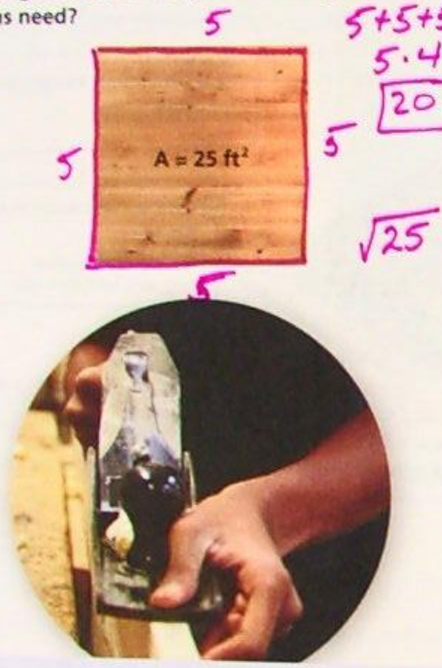
? **Essential Question** How can you solve equations with squares and cubes?

INTERACTIVE ANIMATION | ASSESS

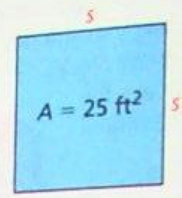
Scan for Multimedia

## EXAMPLE 1 Solve Equations Involving Perfect Squares

Darius is restoring a square tabletop. He wants to finish the outside edges with a piece of decorative molding. What total length of molding will Darius need?




Draw a diagram to represent the tabletop.




Use the formula $A = s^2$ to find each side length. To solve, take the square root of both sides of the equation.

$A = s^2$

$25 = s^2$

$\sqrt{25} = \sqrt{s^2}$

$\pm 5 = s$

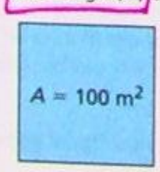
Because $5^2 = 5 \times 5 = 25$ and $(-5)^2 = -5 \times -5 = 25$, $s = 5$ and $s = -5$, or $s = \pm 5$.

Since length is positive, each side length of the tabletop is 5 feet. Darius needs 20 feet of decorative molding.

**Generalize** In general, an equation of the form $x^2 = p$, where $p$ is a positive rational number, has two solutions, $x = \pm\sqrt{p}$. MP.8

## Try It!

What is the side length, $s$, of the square below?




$A = s^2$

$100 = s^2$

$\sqrt{100} = \sqrt{s^2}$

$\pm 10 = s$

10 + −10

10·10 = 100
−10·−10 = 100

Each side of the square measures 10 meters.

**Convince Me!** Why are there two possible solutions to the equation $s^2 = 100$? Explain why only one of the solutions is valid in this situation.

## EXAMPLE 2 Solve Equations Involving Perfect Cubes

ACTIVITY ASSESS

**Kyle has a large, cube-shaped terrarium for his iguana. He wants to cover the opening with a square screen. What are the dimensions, *s*, for the screen?**


$V = s^3$

$343 = s^3$

$\sqrt[3]{343} = \sqrt[3]{s^3}$

$7 = s$

The value of *s* is not $\pm\sqrt[3]{343}$ because $(-7)^3 = -7 \times -7 \times -7 = -343$.

Each edge of the terrarium is 7 feet, so the dimensions of the screen are 7 feet by 7 feet.

## Try It!

Solve $x^3 = 64$.

Take the cubed root

$\sqrt[3]{x^3} = \sqrt[3]{64}$

$x = 4$

$-4 \cdot -4 \cdot -4 = -64$

$\sqrt{x^2} = \sqrt{81}$

$x = \pm 9$

9 ¢ -9

Take the square root

$x^2 = 49$

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

$x = \pm 7$

means 7 and -7

$7^2 = 49$

$(-7)^2 = 49$

## EXAMPLE 3 Solve Equations Involving Imperfect Squares and Cubes

**Solve for *x*.**

**A.** $x^2 = 50$

$\sqrt{x^2} = \sqrt{50}$

$x = \pm\sqrt{50}$

Because 50 is not a perfect square, write the solution using the square root symbol.

There are two possible solutions, $x = +\sqrt{50}$ and $x = -\sqrt{50}$.

**B.** $x^3 = 37$

$\sqrt[3]{x^3} = \sqrt[3]{37}$

$x = \sqrt[3]{37}$

$x = \sqrt[3]{37}$ is an exact solution of the equation.

There is one possible solution, $x = \sqrt[3]{37}$.

## Try It!

**a.** Solve $a^3 = 11$.

$\sqrt[3]{a^3} = \sqrt[3]{11}$

$a = \sqrt[3]{11}$

between 2 ¢ 3

**b.** Solve $c^2 = 27$.

$\sqrt{c^2} = \sqrt{27}$

$c = \pm\sqrt{27}$

$\pm 5$ ¢ $\pm 6$