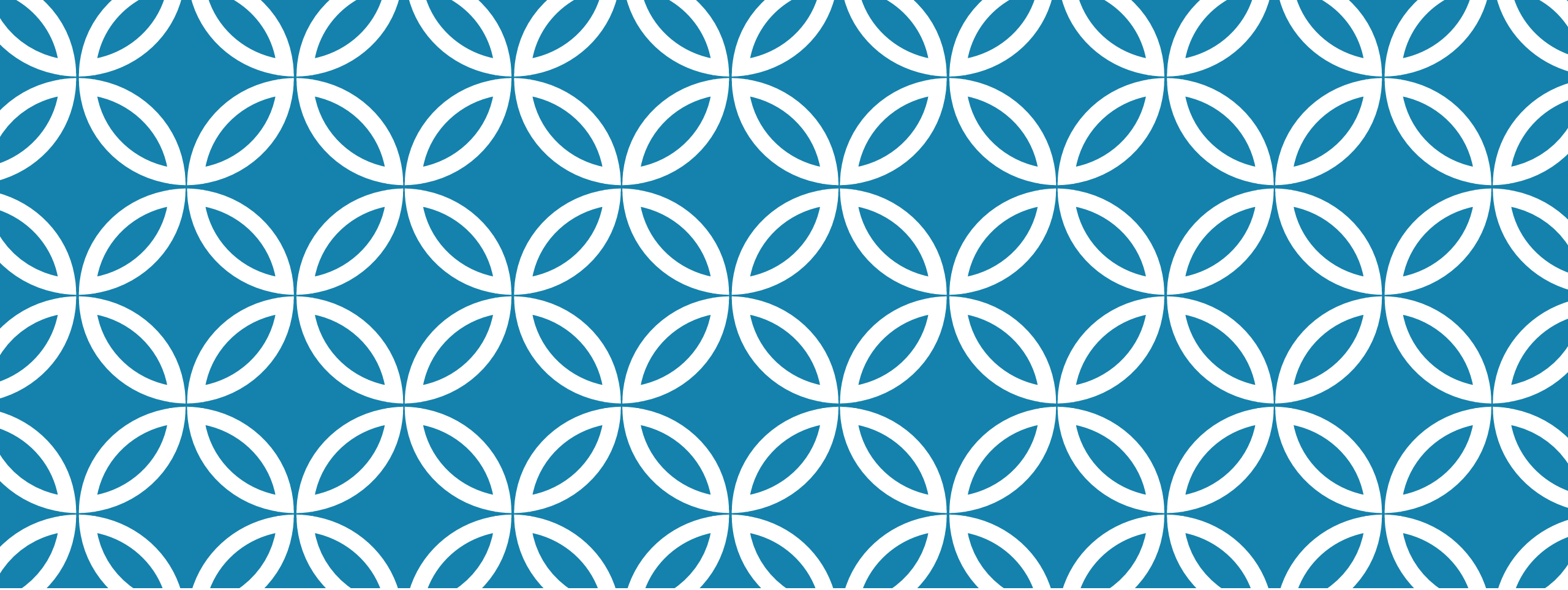

SOLVING QUADRATIC FUNCTIONS USING SQUARE ROOTS

Lesson 9.2

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In Section 6.1, you studied properties of square roots. Here you will use square roots to solve quadratic equations of the form $ax^2 + c = 0$.

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- When $d = 0$, $x^2 = d$ has one real solution, $x = 0$.
- When $d < 0$, $x^2 = d$ has no real solutions.

EXAMPLE 1 Solving Quadratic Equations Using Square Roots

a. Solve $3x^2 - 27 = 0$ using square roots.

b. Solve $x^2 - 10 = -10$ using square roots.

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$3x^2 - 27 = 0$	Write the equation.
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$x^2 = 0$	Add 10 to each side.
$x = 0$	Take the square root of each side.

The only solution is $x = 0$.

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$-5x^2 = 5$ Subtract 11 from each side.

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c. Solve $-5x^2 + 11 = 16$ using square roots.

$-5x^2 + 11 = 16$	Write the equation.
$-5x^2 = 5$	Subtract 11 from each side.
$x^2 = -1$	Divide each side by -5.

The equation has no real solutions.

The square of a real number cannot be negative.

That is why the equation in part c has no real solutions.

On Your Own

Solve the equation using square roots.

1. $-3x^2 = -75$

2. $x^2 + 12 = 10$

3. $4x^2 - 15 = -15$

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$x = 5, x = -5$

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$(x-1)^2 = 25$ Write the equation.

$x - 1 = \pm 5$ Take the square root of each side.

$x = 1 \pm 5$ Add 1 to each side.

So, the solutions are $x = 1 + 5 = 6$ and $x = 1 - 5 = -4$.

b. **Solve $9(x-2)^2 = 25$ using square roots.**

$9(x-2)^2 = 25$ Write the equation.

$(x-2)^2 = \frac{25}{9}$ Divide both sides by 9.

$x - 2 = \pm\frac{5}{3}$ Take the square root of each side.

$x = 2 \pm \frac{5}{3}$ Add 2 to each side.

So, the solutions are $x = 2 + \frac{5}{3} = 3\frac{2}{3}$ *or* $x = 2 - \frac{5}{3} = \frac{1}{3}$

EXAMPLE 3 Real-Life Application

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$270 = 3w(w)(3)$ Substitute 270 for V, $3w$ for ℓ, and 3 for h.

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$270 = 9w^2$ Multiply.

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$30 = w^2$ Divide each side by 9.

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$270 = 9w^2$ Multiply.

$30 = w^2$ Divide each side by 9.

$\pm\sqrt{30} = w$ Take the square root of each side.

Use the positive solution.

So, the width is $\sqrt{30} \approx 5.5$ feet and the length is $3\sqrt{30} \approx 16.4$ feet.

5.5 feet is a reasonable solution because $\sqrt{30}$ falls between $\sqrt{25}$ and $\sqrt{36}$

On Your Own

Solve the equation using square roots.

4. $(x + 7)^2 = 0$

5. $4(x - 3)^2 = 9$

6. $(2x + 1)^2 = 35$

7. **WHAT IF?** In Example 3, the volume of the tank is 315 cubic feet. Find the length and width of the tank.

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$x = 1.5, x = 4.5$

6. $(2x + 1)^2 = 35$

$x = \frac{-1 + \sqrt{35}}{2}$, $x = \frac{-1 - \sqrt{35}}{2}$

7. WHAT IF? In Example 3, the volume of the tank is 315 cubic feet. Find the length and width of the tank.

width: about 5.9 ft;
length: about 17.7 ft