When solving applications, we often have to solve equations involving radicals.

Consider the equation: \[ \sqrt{x} = 4 \]

Raise both sides to the second power:
(square both sides)

Solve and check the solution:

Note: If \( a = b \), then \( a^n = b^n \), where \( n \neq 1 \).

Raising both sides of an equation to a power, \( n \), will give all the solutions of the original equation among the solutions to the new equation.

This means that raising both sides of an equation to a power does not create an ____________________ (one that has the same set of solutions), as does adding/subtracting/multiplying/dividing both sides of an equation by the same quantity. In fact, raising both sides to a power creates a new equation whose solutions will contain the solutions to the original equation.

The solutions to the new equation are called ____________________ solutions of the original equation (in other words, they are the possible solutions). You MUST CHECK the solutions in the original equation to determine which ones work. Any that don’t are called ____________________ solutions.

For example, consider the basic equation: \( x = 8 \)

**Solving Radical Equations**

1. Isolate a radical on one side.
2. Raise each side to a power = index of the radical.
3. Solve, as usual.
4. Check the solutions in the original equation.

If there is more than one radical, repeat the above process (steps 1 and 2), if needed.
Example 1: Solve the following equations.

a) \( \sqrt{2x - 3} - 2 = 1 \)

b) \( \sqrt{x - 2} - 3 = 0 \)

c) \( \sqrt{x - 8} + 2 = 0 \)

d) \( \sqrt{x + 1} = \sqrt{2x + 3} \)

e) \( \sqrt{28 + 2x} = x + 2 \)

Application

Example 2: One of the tallest structures in the U.S. is a TV tower in North Dakota. Its height is 2063 feet. A 2383-foot length of wire is to be used as a wire attached to the top of the tower and to the ground. Approximate to the nearest foot how far from the base of the tower this wire should be anchored.