# Square Root Method

Some quadratic equations cannot be easily solved by factoring. Square roots can be used to solve some of these quadratic equations.

**Every positive real number has two square roots, one positive and one negative.**

$\sqrt{25} = 5$

# Principal Square Root

So if there are really two square roots, why do people say $\sqrt{25} = 5$ ?

Because $\sqrt{}$ means the **principal square root** ... the one that isn't negative!

There **are** two square roots, but **the symbol** $\sqrt{}$ means **just the principal square root**.

Example:

The square roots of 36 are 6 **and** −6

But $\sqrt{36} = 6$ (not −6)

The Principal Square Root is sometimes called the Positive Square Root.

$\sqrt{x^2} = \sqrt{25}$ $x = \pm 5$

## Square-Root Property

| WORDS | NUMBERS | ALGEBRA |
| --- | --- | --- |
| To solve a quadratic equation in the form $x^2 = a$, take the square root of both sides. | $x^2 = 15$<br>$\sqrt{x^2} = \pm\sqrt{15}$<br>$x = \pm\sqrt{15}$ | If $x^2 = a$ and $a$ is a positive real number, then $x = \pm\sqrt{a}$. |

## Reading Math

The expression ±3 is read "plus or minus three"

Solve using square roots.

$$\sqrt{x^2} = \sqrt{169}$$

$$x = \pm 13$$

Solve using square roots.

$\sqrt{x^2} = \sqrt{45}$

$x = \pm 3\sqrt{5}$

Solve using square roots.

$\sqrt{x^2} = \sqrt{900}$

$x = \pm 30$

Solve using square roots.

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

No Real solution

$x = \pm 7i$

Solve using square roots.

$x^2 = 121$

Solve using square roots.

$x^2 = -16$

If a quadratic equation is not written in the form $x^2 = a$, isolate $x^2$ before taking the square root of both sides.

Solve using square roots.

$x^2 + 7 = 7$

$-7 \quad -7$

$\sqrt{x^2} = \sqrt{0}$

$x = \pm 0$

$x = 0$

# Solve using square roots.

$$16x^2 - 49 = 0$$

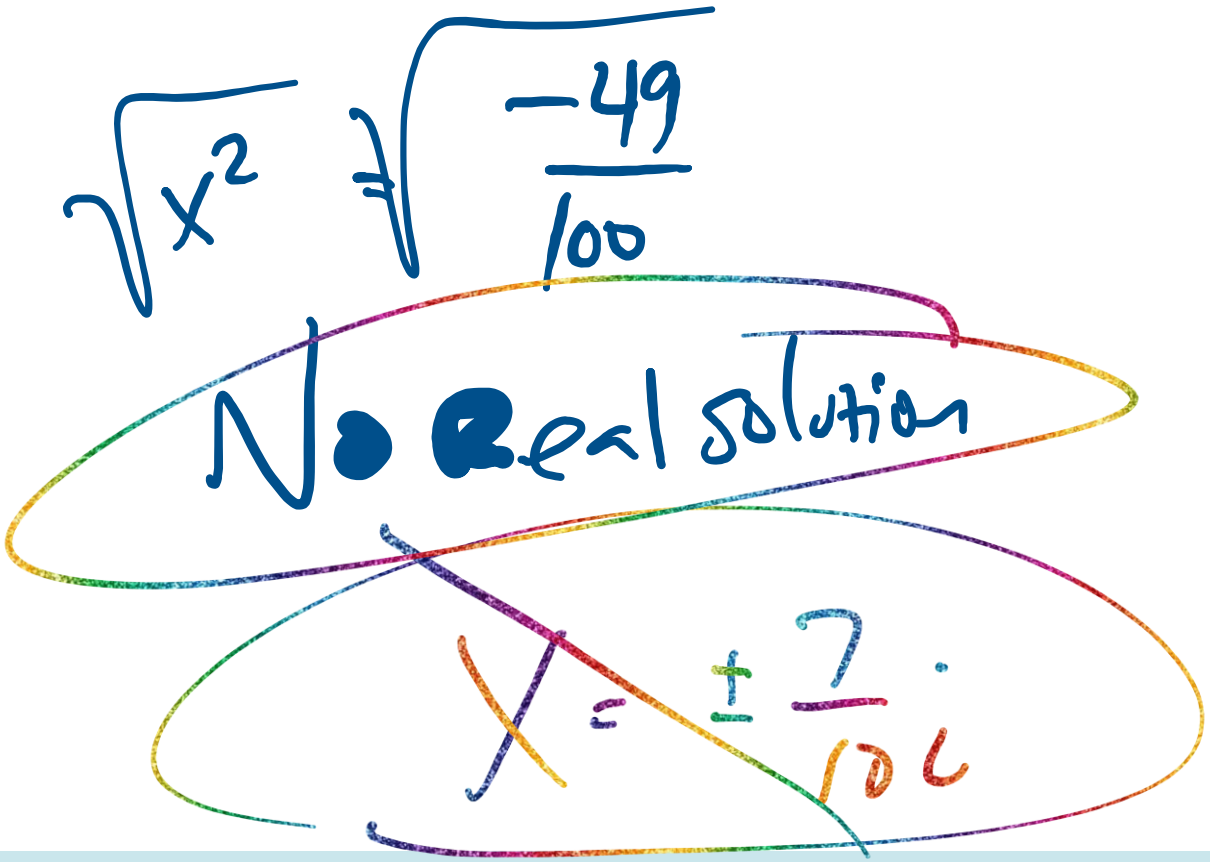
$$\frac{16x^2}{16} = \frac{49}{16}$$

$$\sqrt{x^2} = \sqrt{\frac{49}{16}}$$

$$x = \pm\frac{7}{4}$$

Solve by using square roots.

$$100x^2 + 49 = 0$$



Solve by using square roots.

$$-3x^2 + 90 = 0$$

Solve by using square roots.

$$(x - 1)^2 - 19 = 81$$

$$+19 \qquad +19$$

$$\sqrt{(x-1)^2} = \sqrt{100}$$

$$x - 1 = \pm 10$$

$$x = 1 \pm 10$$

$-9$

$11$

Solve by using square roots.

$$(x-14)^2 + 13 = 14$$

$(X-14)^2 = 1$

$X - 14 = \pm 1$

$X = 14 \pm 1$

15 or 13

Solve by using square roots.

$$2(x-3)^2 + 1 = 73$$

$2(x-3)^2 = 72$

$(x-3)^2 = 36$

$x-3 = \pm 6$

$x = 3 \pm 6$

$x = 9$ or $-3$

Solve by using square roots.

$$5(x - 7)^2 + 10 = 25$$

$5(x-7)^2 = 15$

$(x-7)^2 = 3$

$x - 7 = \pm\sqrt{3}$

$x = 7 \pm \sqrt{3}$

Solve by using square roots.

$$2(x+1)^2 - 1 = 31$$

$$(x+1)^2 = 16$$

$$x+1 = \pm 4$$

$$x = -1 \pm 4$$

$$x = -5 \text{ or } 3$$

A ball is dropped from a height of 64 feet. Its height, in feet, can be modeled by the function $h(t) = -16t^2 + 64$, where $t$ is the time in seconds since the ball was dropped. After how many seconds will the ball hit the ground?

$h(t) = 0$

$0 = -16t^2 + 64$

$-64 \quad -64$

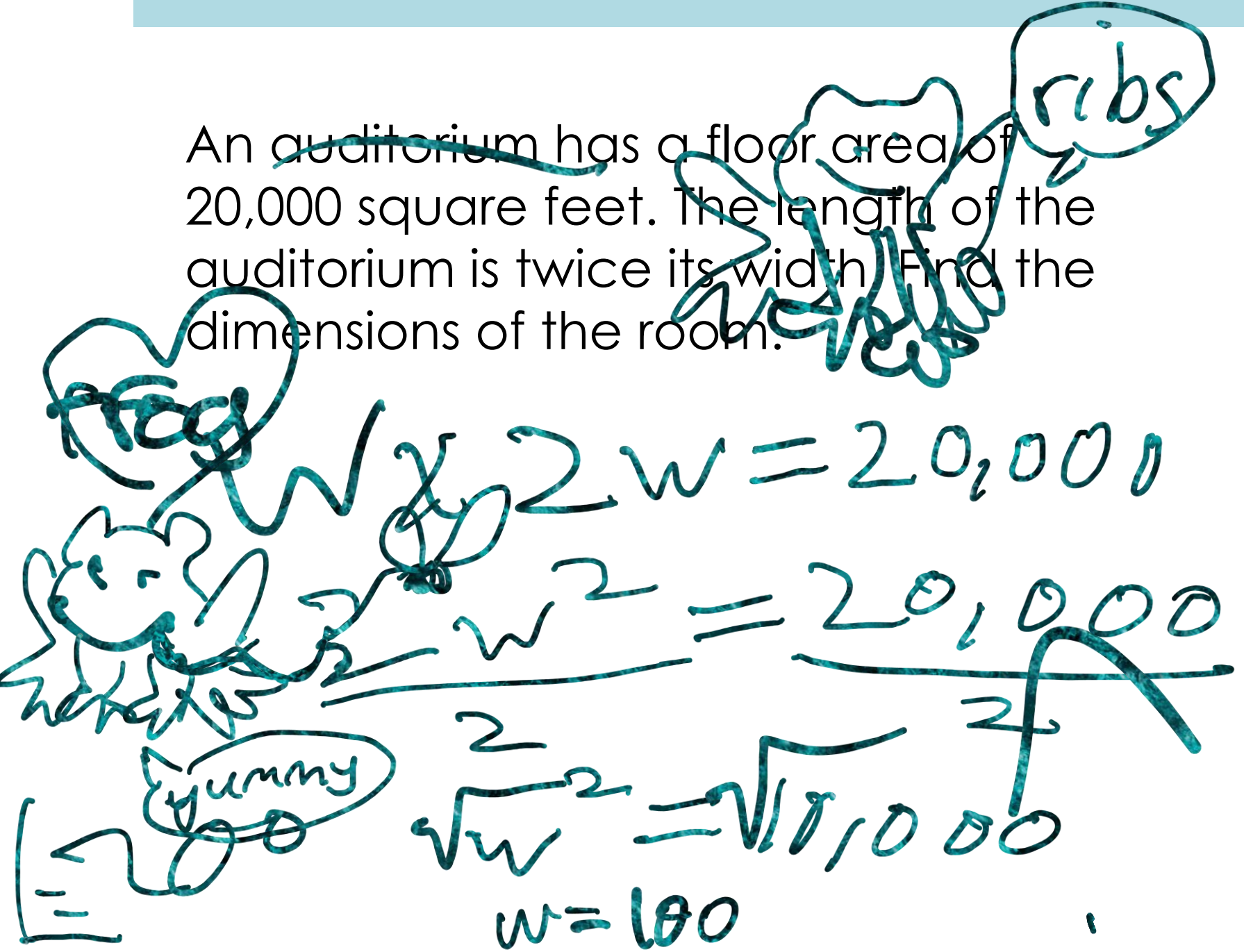
$\frac{-64}{-16} = \frac{-16t^2}{-16}$

$4 = t^2$

$t = \pm 2$

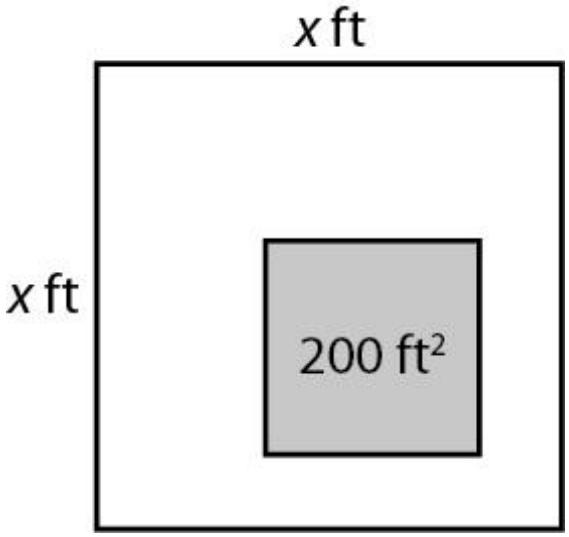
2 seconds

An auditorium has a floor area of 20,000 square feet. The length of the auditorium is twice its width. Find the dimensions of the room.




Ribs
Woof

A plot of land is in the shape of a square. The shaded square inside is covered with gravel. The rest of the square plot is covered in grass. Its area is 1400 square feet. How long are the sides of the square?



# Homework

Worksheet