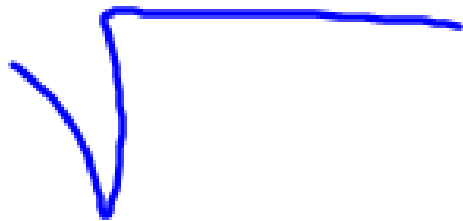


## Lesson 26: Radical Equations (5.8)

By the end of the lesson, we will be able to:

~ Solve equations with radicals in them.



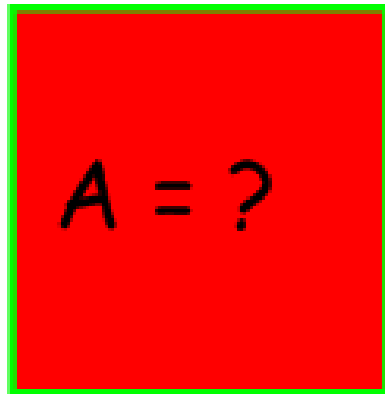
What is a radical?



What is an example of a Radical Equation?

$$4 + \sqrt{x} = 10$$

What is the area of the square?



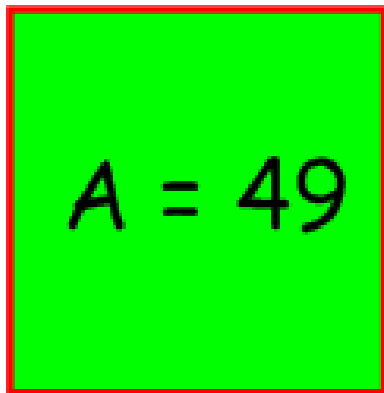
5

$$A = 25$$

5

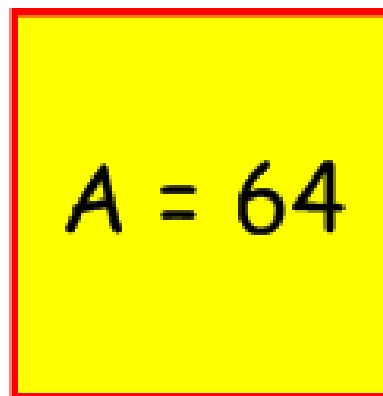
What is the length of a side of the square?

7



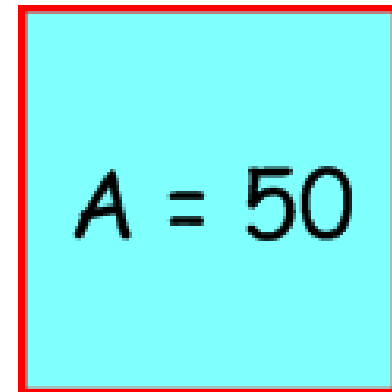
7

8



8

$$\sqrt{50} = 5\sqrt{2}$$



$5\sqrt{2}$

### **Steps for solving radical equations:**

1. Isolate the radical. (If there is more than one radical, isolate the biggest radical expression.)
2. Square both sides of the equation. (Or cube if radical is cube root, etc.)
3. If there are additional radicals left, repeat steps 1 and 2.
4. Isolate the variable.
5. Check your solution. (Some solutions may be extraneous.)

← doesn't work in original problem

## Examples:

a.)  $(\sqrt{x})^2 = (4)^2$   
 $x = 16$

b.)  $(\sqrt[3]{x - 20})^3 = (5)^3$   
 $x - 20 = 125$   
 $\quad +20 \quad +20$   
 $x = 145$

c.)  $5 + \sqrt{h + 1} = 8$   
 $\quad -5 \quad \quad -5$   
 $(\sqrt{h+1})^2 = (3)^2$   
 $h + 1 = 9$   
 $\quad -1 \quad -1$   
 $h = 8$

d.)  $5 + \sqrt{w + 3} = -8$

↓ next slide

$$d.) \begin{array}{rcl} 5 + \sqrt{w+3} & = & -8 \\ -5 & & -5 \end{array}$$

$$\left( \sqrt{w+3} \right)^2 = (-13)^2$$

$$\begin{array}{rcl} w+3 & = & 169 \\ -3 & & -3 \end{array}$$

$$\boxed{\cancel{w = 166}}$$

check:

$$5 + \sqrt{166+3} = 8$$

$$18 \neq -8$$

$$\begin{array}{rcl} 5 + \sqrt{w+3} & = & -8 \\ -5 & & -5 \end{array}$$

$$\sqrt{w+3} = -13$$

**No Sol.**

extraneous solution

**No Sol.**

Lesson 26: Radical Equations (5.8)

## Examples:

e.)  $\frac{2\sqrt{m-3}}{2} = \frac{7}{2}$

$$\left(\sqrt{m-3}\right)^2 = \left(\frac{7}{2}\right)^2$$

$$\begin{array}{r} m-3 = \frac{49}{4} + \frac{3}{1} \\ \hline \end{array}$$

$$m = \frac{49}{4} + \frac{12}{4}$$

$$\boxed{m = \frac{61}{4}}$$

Check:

$$2\sqrt{\frac{61}{4} - \frac{12}{4}} = 7$$

$$2\sqrt{\frac{49}{4}} = 7$$

$$2\left(\frac{7}{2}\right) = 7$$

$$7 = 7$$

## Examples:

$$\text{f.) } (3y - 1)^{\frac{1}{3}} - 2 = 0$$

$$\begin{array}{r} \sqrt[3]{3y-1} - 2 = 0 \\ +2 \quad +2 \end{array}$$

$$\hline (\sqrt[3]{3y-1})^3 = (2)^3$$

$$\begin{array}{r} 3y - 1 = 8 \\ +1 \quad +1 \end{array}$$

$$\begin{array}{r} 3y = 9 \\ \hline \frac{3y}{3} = \frac{9}{3} \end{array}$$

$$\rightarrow \boxed{y = 3}$$



## Examples:

g.)  $(2n + 1)^{\frac{1}{4}} + 5 = 2$

$$\sqrt[4]{2n+1} + 5 = 2$$

-5      -5

---

$$\sqrt[4]{2n+1} = -3$$

No Solution

\* even roots  
= neg

→ no sol.

\* odd roots = neg  
could have  
an answer

## Lesson 26: Radical Equations (5.8)

### Examples:

h.) Solve for L:  $T = 2\pi \sqrt{\frac{L}{g}}$

$$\left(\frac{T}{2\pi}\right)^2 = \left(\sqrt{\frac{L}{g}}\right)^2$$

$$\left(\frac{T^2}{4\pi^2}\right) \frac{g}{1} = \left(\frac{L}{\cancel{g}}\right) \frac{\cancel{g}}{1}$$

$$\rightarrow \boxed{\frac{T^2 g}{4\pi^2} = L}$$

Lesson 26: Radical Equations (5.8)

Examples: *biggest*

i.)  $\sqrt{x+21} - 1 = \sqrt{x+12} + 1$

$$(\sqrt{x+21})^2 = (\sqrt{x+12} + 1)^2$$

$$x+21 = (\sqrt{x+12} + 1)(\sqrt{x+12} + 1)$$

$$x+21 = x+12 + \sqrt{x+12} + \sqrt{x+12} + 1$$

$$\begin{array}{r} x+21 \\ -x-13 \\ \hline 8 \end{array} = \begin{array}{r} x+13 \\ -x-13 \\ \hline 2\sqrt{x+12} \end{array}$$

$$\frac{8}{2} = \frac{2\sqrt{x+12}}{2}$$

$$4 = \sqrt{x+12}$$

$$(4)^2 = (\sqrt{x+12})^2$$

$$\begin{array}{r} 16 = x+12 \\ -12 \quad -12 \\ \hline \end{array}$$

$$\boxed{4 = x}$$

Lesson 26: Radical Equations (5.8)

Examples: <sup>biggest</sup>

$$\text{j.) } \sqrt{x-1} = \sqrt{x} - \sqrt{5}$$
$$\quad \quad \quad +\sqrt{5} \quad \quad +\sqrt{5}$$

$$(\sqrt{x-1} + \sqrt{5})^2 = (\sqrt{x})^2$$

$$(\sqrt{x-1} + \sqrt{5})(\sqrt{x-1} + \sqrt{5}) = x$$

$$x-1 + \sqrt{5(x-1)} + \sqrt{5(x-1)} + 5 = x$$

$$\begin{array}{rcl} x+4 + 2\sqrt{5x-5} & = & x \\ -x-4 & & -x-4 \end{array}$$

---



$$\frac{2\sqrt{5x-5}}{2} = \frac{-4}{2}$$

$$\sqrt{5x-5} = -2$$

No Solution

By the end of the lesson, we will be able to:

~ Solve equations with radicals in them.

Can you?

## Homework:

### Assignment 26



Happy Holidays!

