Section 7.1

$$x^{2} = 64 \qquad x^{2} = 64$$
  

$$x^{2} - 64 = 0 \qquad \sqrt{x^{2}} = \sqrt{64}$$
  
Solve:  $(x - 8)(x + 8) = 0 \qquad \text{or} \qquad x = \pm 8$   
 $x = 8 \quad x = -8$   
 $x \in \{8, -8\}$ 

In the second line of the second version, we "took the square root" of two items. This was an operation.

I will explain the reason this "operation" results in two answers in a moment.

Consider: "Find the square root of 64" This is written:  $x = \sqrt{64}$ .

In this case there is ONLY one answer and that answer is 8. Writing  $\sqrt{64}$  is just another way to write an 8.... as  $\frac{12}{2}$  is another way to write a 6. We say that  $x = \sqrt{64}$  asks for the "principle square root". If we wanted the – 8 answer, we would have to specifically ask for the negative root.

The reason we get two answer as in our first example is from the definition of absolute value:

$$\sqrt{\bigstar^2} = |\bigstar| = \begin{cases} -\bigstar & \text{if } \bigstar < 0 \\ \bigstar & \text{if } \bigstar \ge 0 \end{cases}$$

Actually we get two answers for  $\sqrt{x^2}$ , we get + x and - x and the square root of 64 is 8. Thus we have x = 8 and -x = 8 and end up with two solutions.

The rule is....

"If YOU put in the square root, then there are 2 answers."

"If the square root is already there, there one answer."

## Math 104

## Section 7.2 Rational Exponents

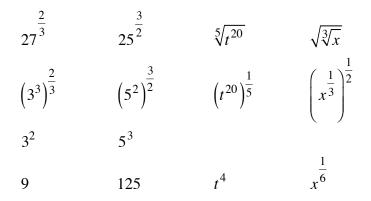
This extends our definition of exponents. No longer can we "count items" to determine

 $(x^3)^2$ the exponent as we have before:  $x^3 \cdot x^3$ 

$$\underbrace{x \cdot x \cdot x}_{x^6} \xrightarrow{x \cdot x \cdot x}_{x^6}$$

Exponents can be rational numbers (fractions) instead of integers.

$$x^{\frac{a}{b}} = \sqrt[b]{x^a} = \left(\sqrt[b]{x}\right)^a$$



All or our rules for exponents still apply.

When you write a square root symbol, be sure it covers everything that is inside the square root.

We want this:  $\sqrt{13ab}$  rather than  $\sqrt{13a} b$ 

## Mr. Mumaugh

Section 7.3 Multiplying Radical Expressions

$$a^{\frac{1}{n}} \cdot b^{\frac{1}{n}} = (a \cdot b)^{\frac{1}{n}} = \sqrt[n]{ab}$$

$$\sqrt{500} \qquad \sqrt{15} \cdot \sqrt{6}$$

$$\sqrt{100}\sqrt{5} \qquad \sqrt{3} \cdot 5 \cdot 3 \cdot 2$$

$$10\sqrt{5} \qquad 3\sqrt{10}$$

For a square root, it takes 2 identical factors on the inside to get one factor on the outside.

In the square root of 100, we had two 10s so we got a single 10 on the outside. In the second example, we had a pair of 3s so we got ONE 3 on the outside.

If we had cube roots, we would need 3 identical factors on the inside to get ONE factor on the outside.