A Radical Review

Objective: Simplify radical expressions

Look—square roots.

Perfect Squares & Square Roots

Perfect Squares
4 = 2 x 2
9 = 3 x 3
16 = 4 x 4
25 = 5 x 5
36 = 6 x 6
49 = 7 x 7
64 = 8 x 8
81 = 9 x 9
100 = 10 x 10

Radicals (square roots)
$\sqrt{4} = 2$
$\sqrt{9} = 3$
$\sqrt{16} = 4$
$\sqrt{25} = 5$
$\sqrt{36} = 6$
$\sqrt{49} = 7$
$\sqrt{64} = 8$
$\sqrt{81} = 9$
$\sqrt{100} = 10$

Simplifying Radicals/Square Roots

Method 1

1. Find the largest perfect square which will divide evenly into the radicand—the number under the radical sign

2. Write the radicand as a product containing the perfect square; each factor should be its own square root

$$\sqrt{48} = \sqrt{16} \bullet \sqrt{3}$$

3. Reduce the "perfect" radical to obtain your answer.

$$\sqrt{48} = 4\sqrt{3}$$

Method 2

1. Find the prime factorization.

$$\sqrt{72} = \sqrt{2 \times 2 \times 2 \times 3 \times 3}$$

2. When working w/ squares look for pairs. (Circle these.)

$$\sqrt{72} = \sqrt{2 \times 2} \times 2 \times \sqrt{3 \times 3}$$

3. "The Buddy System" - Only a "factor pair" can be removed from the radicand.

4. The square root of a "factor pair is the factor: $\sqrt{2 \times 2} = 2$

$$\sqrt{72} = 2 \times 3\sqrt{2} = 6\sqrt{2}$$

- What happens if I do not choose the largest perfect square to start the process?!
  - For instance:

Starting with the prime factorization prevents you from having to repeat the process.

If instead of choosing 16 as the largest perfect square to start this process, you choose 4, look what happens.....

$$\sqrt{48} = \sqrt{4 \cdot 12}$$

$$\sqrt{48} = \sqrt{4 \cdot 12} = \sqrt{4} \cdot \sqrt{12} = 2\sqrt{12}$$

Unfortunately, this answer is **not in simplest form.** The 12 can also be divided by the perfect square (4).

$$2\sqrt{12} = 2\sqrt{4 \cdot 3} = 2\sqrt{4} \cdot \sqrt{3} = 2 \cdot 2\sqrt{3} = 4\sqrt{3}$$

Product Property of Radicals	$\sqrt{ab} = \sqrt{a} \bullet \sqrt{b}$	Quotient Property of Radicals	$\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$

Examples: Simplify.

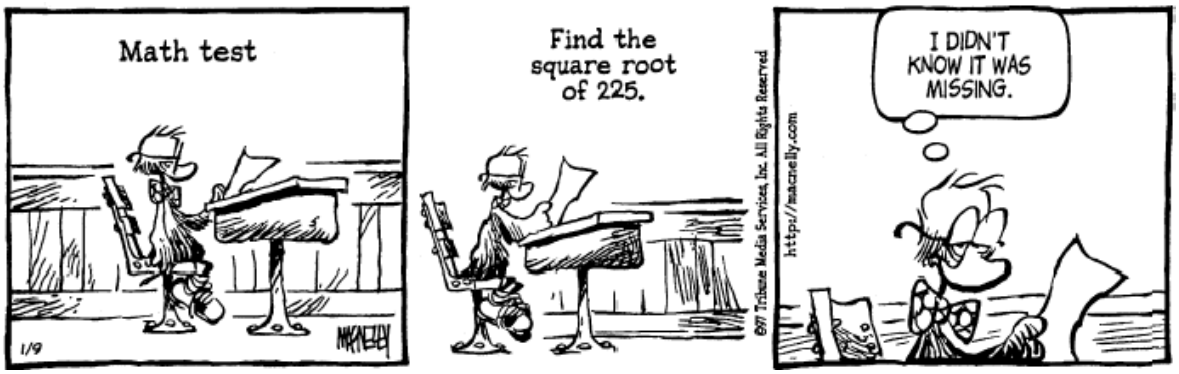
1. $\sqrt{75}$

2. $\sqrt{3} \bullet \sqrt{15}$

3. $\sqrt{\frac{81}{100}}$

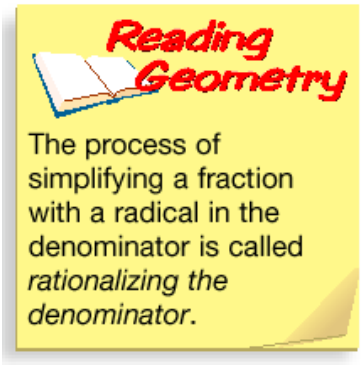
4. $\frac{\sqrt{16}}{\sqrt{25}}$

5. Help the character from *Shoe* w/the question on his math test.



Rules for Simplifying Radical Expressions

- There are no perfect square factors other than 1 in the radicand.
- The radicand is not a fraction.
  - Try to simplify the fraction, if possible: $\frac{\sqrt{16}}{\sqrt{8}} = \sqrt{\frac{16}{8}} = \sqrt{2}$
- The denominator does not contain a radical expression.



Multiply the numerator & the denominator by the radical in the denominator.

$$\frac{\sqrt{a}}{\sqrt{b}} = \frac{\sqrt{a} \bullet \sqrt{b}}{\sqrt{b} \bullet \sqrt{b}} = \frac{\sqrt{ab}}{\sqrt{b^2}} = \frac{\sqrt{ab}}{b}$$

Examples: Simplify. If necessary, simplify by rationalizing the denominator.

5. $\frac{\sqrt{50}}{\sqrt{5}}$

6. $\sqrt{\frac{10}{3}}$

7. $\sqrt{\frac{1}{8}}$

8. $\frac{6}{\sqrt{18}}$

Squaring Radicals

$(\sqrt{x})^2 = x$ $\quad \left(a\sqrt{b}\right)^2 = (a\sqrt{b}) \times (a\sqrt{b}) = a^2 \times b = a^2 b$

9. $(\sqrt{5})^2$

10. $\frac{1}{2}(\sqrt{6})^2$

11. $(2\sqrt{3})^2$

12. $(-3\sqrt{6})^2$