

Algebra 1/Part 2 – Unit 8
Simplifying Square Roots NOTES

When we raise a number to the second power, we square that number. Squaring a number means to multiply the number by itself. The square of an integer is called a perfect square.

If $x^2 = 49$, then $x^2 = \underline{7 \cdot 7}$, and $x = \underline{7}$.

If $x^2 = 25$, then $x^2 = \underline{5 \cdot 5}$, and $x = \underline{5}$.

integer → $4^2 = 16$ → *perfect square*
 $\sqrt{16} = 4$ → *square root*

- The symbol $\sqrt{\quad}$ is called a radical sign.
- The number under the radical sign is called the radicand.
- Together, the radical sign and the radicand is called a radical.
- An algebraic expression containing a radical is called a radical expression.

Properties of Radicals

$$\sqrt{45} = \sqrt{5 \cdot 9} = \sqrt{3 \cdot 15} \quad \sqrt{9x} = \sqrt{9} \cdot \sqrt{x}$$

Product Property: $\sqrt{ab} = \sqrt{a} \cdot \sqrt{b}$, when a and b are positive numbers.

Quotient Property: $\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$, when a and b are positive numbers.

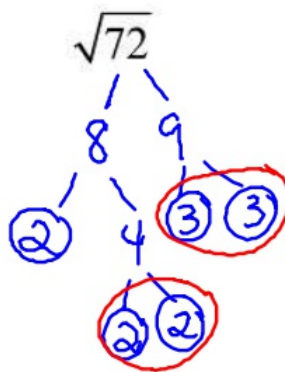
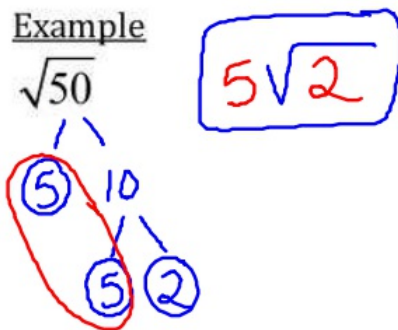
An expression with radicals is in simplest form if the following are true:

- No perfect squares (other than 1) are in the radicand
- No fractions are in the radicand
- No radicals appear in the denominator

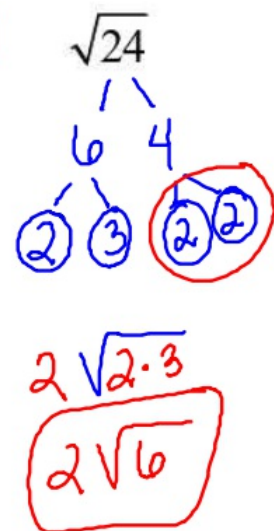
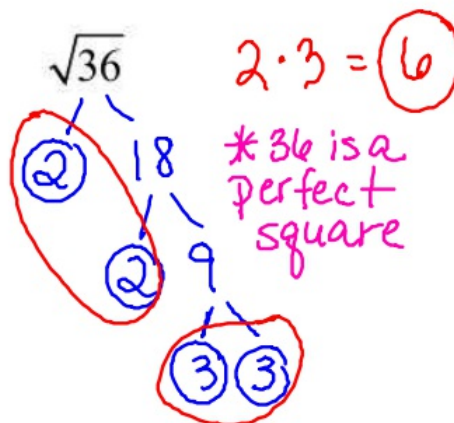
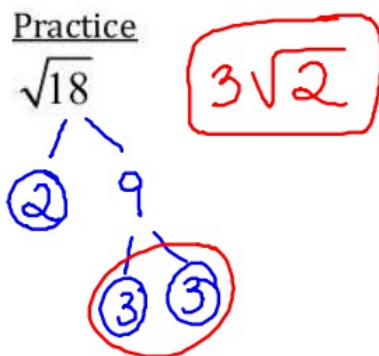
Simplifying square root expressions without using decimals

- Factor the radicand using a factor tree
- Circle "pairs" of numbers
- Remove the pair from under the radical and place a "representative" of each "pair" outside of the radical
- Multiply numbers on the outside of the radical to simplify

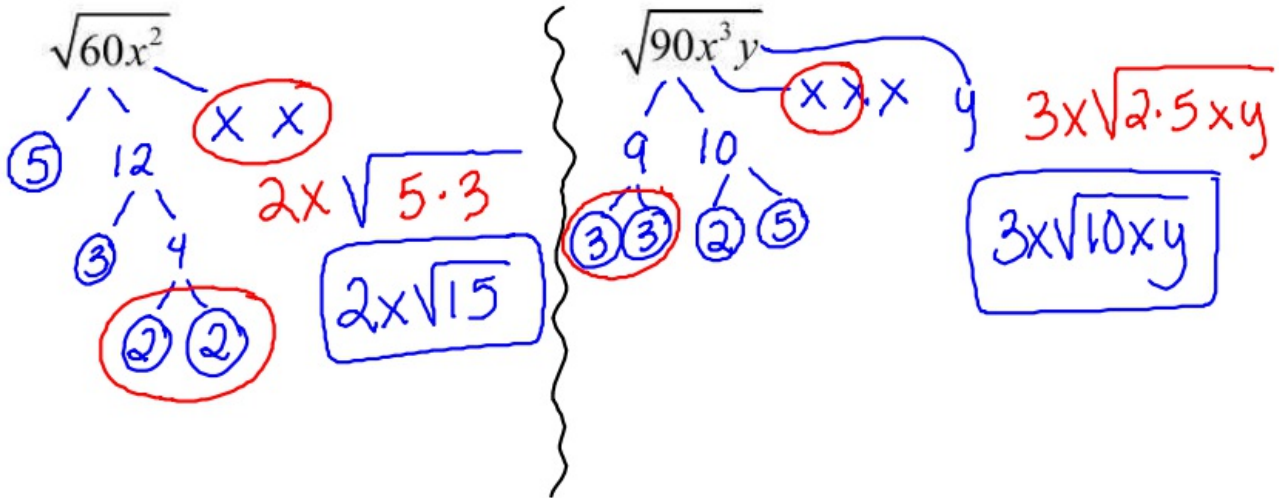
Example



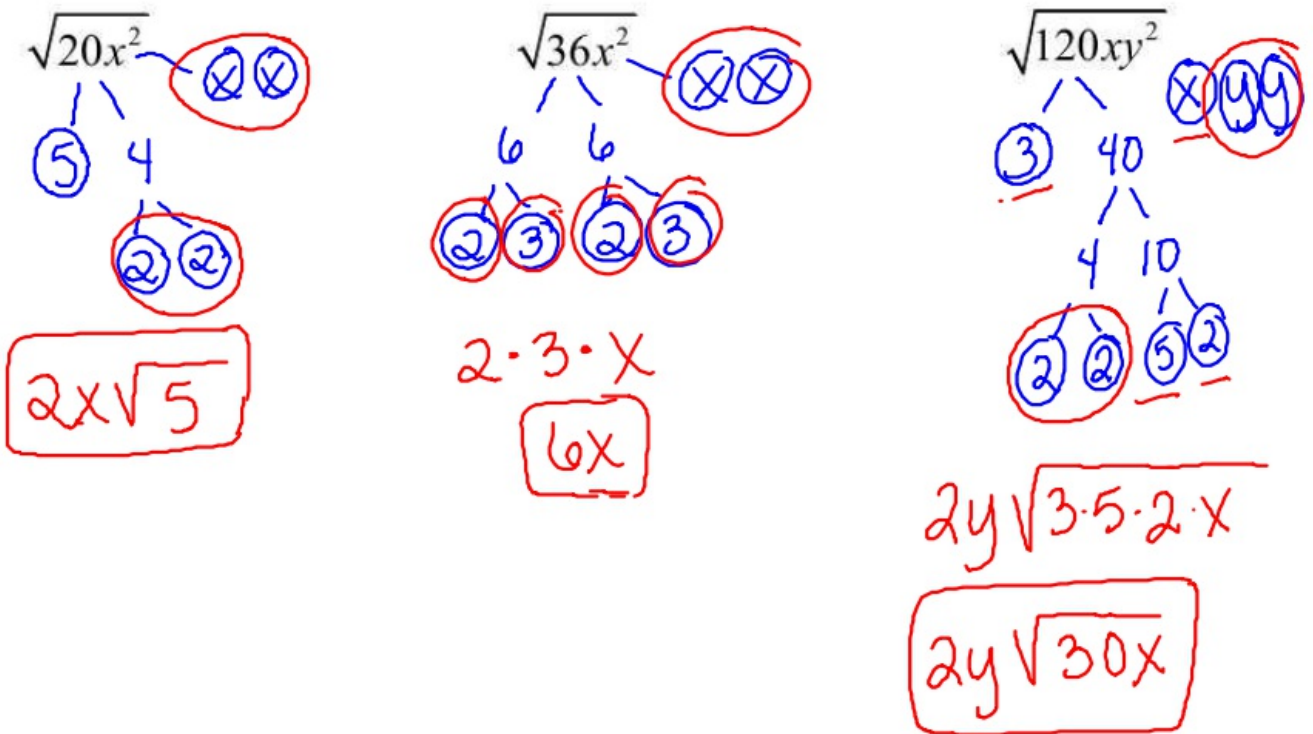
Practice



Examples with variables in the radicand.



Practice



What if there is a number outside of the radical to begin with?

Anything that moves outside of the radical will be multiplied by the term already outside.

$$\begin{array}{c} 2\sqrt{20} \\ \swarrow \quad \searrow \\ 4 \quad \underline{5} \\ \swarrow \quad \searrow \\ \underline{2} \quad \underline{2} \end{array}$$

$2 \cdot 2 \sqrt{5}$

$4\sqrt{5}$

$$\begin{array}{c} 5\sqrt{32} \\ \swarrow \quad \searrow \\ 4 \quad 8 \\ \swarrow \quad \searrow \quad \swarrow \quad \searrow \\ \underline{2} \quad \underline{2} \quad \underline{2} \quad 4 \\ \swarrow \quad \searrow \\ \underline{2} \quad \underline{2} \end{array}$$

$2 \cdot 2 \cdot 5 \sqrt{2}$

$20\sqrt{2}$

$$\begin{array}{c} 3\sqrt{120} \\ \swarrow \quad \searrow \\ 10 \quad 12 \\ \swarrow \quad \searrow \quad \swarrow \quad \searrow \\ \underline{2} \quad \underline{5} \quad \underline{3} \quad 4 \\ \swarrow \quad \searrow \\ \underline{2} \quad \underline{2} \end{array}$$

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

$6\sqrt{30}$

HW

1, 3, 7, 9

13, 15, 17, 19

27, 29, 31, 33

39, 43, 45, 47