

key

Unit 9
Simplify Radicals



Radical – the generic name for square roots, cube roots, 4th roots, etc.

The process of simplifying radicals is a hold-over from before handheld calculators. It does help to organize us a bit, but also to know where on a number line a number falls (number sense). This topic still shows up on standardized tests and so we will need to show you.

Let's get started:

Discuss: Between what two integers does $\sqrt{56}$ fall?

Question: What does it mean for a radical to be in simplest form?

Can you guess which ones are simplified?

$\sqrt{50}$

$\sqrt{2}$

$3\sqrt{10}$

$\sqrt{\frac{81}{16}}$

$\sqrt{\frac{5}{4}}$

$\frac{1}{2}\sqrt{3}$

$-\sqrt{5}$

Simplest Form of a Radical includes...

1. **No perfect squares inside the square root.**
2. **No Fractions inside square root**
3. **No square root in denominator.**

Circle the expressions written in simplest form:

~~$\sqrt{\frac{9}{25}}$~~

$3\sqrt{2}$

~~$\sqrt{9}$~~

$\frac{\sqrt{2}}{5}$

~~$\frac{\sqrt{2}}{\sqrt{3}}$~~

$-\sqrt{5}$

Now, why is the $\sqrt{9} = 3$?

Because $\sqrt{9} = \sqrt{3 \cdot 3} = 3$, right? And what about $\sqrt{16}$? $\sqrt{16} = \sqrt{4 \cdot 4} = 4$.

So, for every PAIR under the square root, you get ONE outside.

Product Property of Radicals: $\sqrt{a} \cdot \sqrt{b} = \sqrt{ab}$

★ you can split the square root when multiplying

Examples:

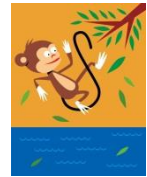
$$1. \sqrt{2} \cdot \sqrt{4} = \sqrt{8} = 2\sqrt{2}$$

$$2. \sqrt{7} \cdot \sqrt{3}$$

$$3. \sqrt{3} \cdot 4\sqrt{2} = 4\sqrt{6}$$

$$4. 3\sqrt{6} \cdot 7\sqrt{7} = 21\sqrt{42}$$

The Factor Tree Method to "Simplify Radicals"



$$\begin{array}{c} \sqrt{24} \\ \wedge \\ 6 \quad 4 \\ \wedge \quad \wedge \\ (2)(3) \quad (2)(2) \\ 2\sqrt{6} \end{array}$$

$$\begin{array}{c} \sqrt{75} \\ \wedge \\ (5) \quad 15 \\ \wedge \quad \wedge \\ (5) \quad (3) \\ 5\sqrt{3} \end{array}$$

$$\begin{array}{c} \sqrt{18} \\ \wedge \\ 6 \quad (3) \\ \wedge \quad \wedge \\ (3)(2) \\ 3\sqrt{2} \end{array}$$

$$\begin{array}{c} \sqrt{32} \\ \wedge \\ 4 \quad 8 \\ \wedge \quad \wedge \quad \wedge \\ (2)(2) \quad (2) \quad 4 \\ \wedge \quad \wedge \\ (2) \quad (2) \\ 4\sqrt{2} \end{array}$$

$$\begin{array}{c} 2\sqrt{75} \\ \wedge \\ (5) \quad 15 \\ \wedge \quad \wedge \\ (5) \quad (3) \\ 2 \cdot 5\sqrt{3} \\ 10\sqrt{3} \end{array}$$

$$\begin{array}{c} 3\sqrt{200} \\ \wedge \\ (2) \quad 100 \\ \wedge \quad \wedge \\ 10 \quad 10 \\ \wedge \quad \wedge \quad \wedge \\ (2)(5) \quad (2)(5) \\ 3 \cdot 2 \cdot 5\sqrt{2} = 30\sqrt{2} \end{array}$$

$$\begin{array}{c} 2\sqrt{3} \cdot 4\sqrt{2} \\ 8\sqrt{6} \end{array}$$

$$\begin{array}{c} 3\sqrt{11} \cdot \sqrt{2} \\ 3\sqrt{22} \end{array}$$

$$\begin{array}{c} 2\sqrt{10} \cdot 3\sqrt{2} \\ 6\sqrt{20} \\ \wedge \\ 4 \quad (5) \\ \wedge \quad \wedge \\ (2) \quad (2) \\ 2 \cdot 6\sqrt{5} \\ 12\sqrt{5} \end{array}$$

$$\begin{array}{c} \sqrt{8} \cdot 5\sqrt{2} \\ 5\sqrt{16} \\ \wedge \\ 8 \quad (2) \\ \wedge \quad \wedge \\ 4 \quad (2) \\ \wedge \quad \wedge \\ (2) \quad (2) \\ 5 \cdot 2 \cdot 2 = 20 \end{array}$$