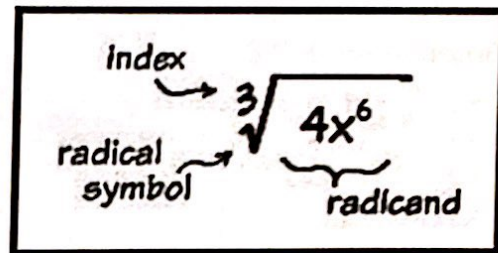
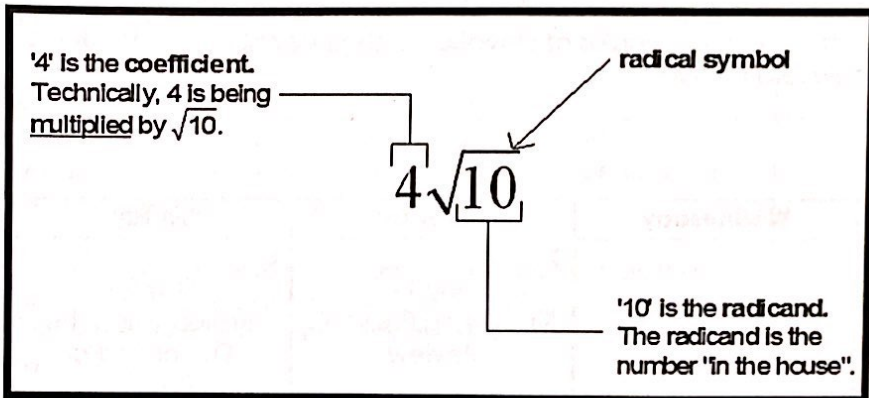


Day 1 – Simplifying Radicals – Notes

A **radical** is any number with a radical symbol ($\sqrt{\quad}$). A **radical expression** is an expression (coefficients and/or variables) with radical.



Square Root Table

Complete the table below.

Square each of the following numbers.

Perfect Squares

Take the square root of each of your perfect squares.

Square Roots

	1^2	2^2	3^2	4^2	5^2	6^2	7^2	8^2	9^2	10^2	x^2
Perfect Squares	1	4	9	16	25	36	49	64	81	100	x^2
Take the square root of each of your perfect squares.	$\sqrt{1}$	$\sqrt{4}$	$\sqrt{9}$	$\sqrt{16}$	$\sqrt{25}$	$\sqrt{36}$	$\sqrt{49}$	$\sqrt{64}$	$\sqrt{81}$	$\sqrt{100}$	$\sqrt{x^2}$
Square Roots	1	2	3	4	5	6	7	8	9	10	x

Perfect Squares are the product of a number multiplied by itself ($4 \cdot 4 = 16$; 16 is the perfect square).

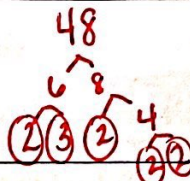
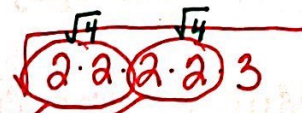
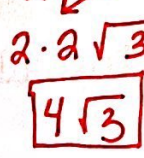
Think about the process we just performed: **Number** \rightarrow **Squared It** \rightarrow **Took Square Root** \rightarrow **Same Number**

A root and an exponent are **inverses** of each other (they undo each other). Therefore, square roots and squaring a number are **inverses** or they undo each other, just like adding and subtracting undo each other.

Simplifying Radicals

Example: $\sqrt{48}$

Prime #s: 2, 3, 5, 7, 11, 13, 17, 19, ...

Steps for Simplifying Square Roots	Example
1. Complete the prime factorization of the number underneath the square root.	
2. Rewrite the radical as a product of its prime factorization. Since these are square roots, circle groups of 2 (these represent perfect squares).	
3. Any numbers within a circle are moved outside the radical and listed as just one factor and any numbers not circled remain inside the radical. Multiply factors if necessary. (You know it is simplified if the number underneath the radical has no more perfect squares).	

Practice: Simplify the square roots, leaving your answer in radical form (no decimals).

a. $\sqrt{125}$

b. $\sqrt{45}$

c. $\sqrt{72}$

d. $\sqrt{56}$

e. $\sqrt{108}$

125
 $\sqrt{5 \cdot 25}$
 $\sqrt{5 \cdot 5 \cdot 5}$
 $5\sqrt{5}$

45
 $\sqrt{9 \cdot 5}$
 $\sqrt{3 \cdot 3 \cdot 5}$
 $3\sqrt{5}$

72
 $\sqrt{9 \cdot 8}$
 $\sqrt{3 \cdot 3 \cdot 2 \cdot 4}$
 $\sqrt{2 \cdot 2 \cdot 2 \cdot 3 \cdot 3}$
 $2 \cdot 3 \sqrt{2}$
 $6\sqrt{2}$

56
 $\sqrt{7 \cdot 8}$
 $\sqrt{4 \cdot 2}$
 $\sqrt{2 \cdot 2 \cdot 2 \cdot 7}$
 $2\sqrt{14}$

108
 $\sqrt{12 \cdot 9}$
 $\sqrt{4 \cdot 3 \cdot 3 \cdot 3}$
 $\sqrt{2 \cdot 2 \cdot 3 \cdot 3 \cdot 3}$
 $2 \cdot 3 \cdot \sqrt{3}$
 $6\sqrt{3}$

Multiplying Radicals

The Product Property of Radicals states the square root of a product equals the product of the square roots of the factors.

$$\sqrt{ab} = \sqrt{a} \cdot \sqrt{b} \text{ where } a \geq 0 \text{ and } b \geq 0$$

When multiplying radicals, follow the following rules:

Multiplying Radicals – RULE

1. Multiply the coefficients (outsides) together.
2. Multiply the radicands (insides) together.
3. Simplify the radical.

Practice: Multiply the following radicals. Make sure they are in simplest form.

a. $\sqrt{2} \cdot \sqrt{18} = \sqrt{36}$ perfect square
 $\boxed{6}$

b. $\sqrt{5} \cdot \sqrt{10} = \sqrt{50}$
 $\begin{matrix} 50 \\ \swarrow \downarrow \searrow \\ 5 \quad 10 \\ \swarrow \downarrow \searrow \\ 2 \quad 5 \\ \swarrow \downarrow \searrow \\ \sqrt{2 \cdot 5 \cdot 5} \\ \boxed{5\sqrt{2}} \end{matrix}$

c. $\sqrt{8} \cdot \sqrt{32} = \sqrt{256}$ perfect square
 $= \boxed{16}$

d. $4\sqrt{6} \cdot 4\sqrt{6} = 16\sqrt{36}$
 $= 16 \cdot 6$
 $= \boxed{96}$

e. $-\sqrt{6} \cdot 3\sqrt{8} = -3\sqrt{48}$
 $\begin{matrix} 48 \\ \swarrow \downarrow \searrow \\ 6 \quad 8 \\ \swarrow \downarrow \searrow \\ 2 \quad 3 \quad 4 \quad 2 \\ \swarrow \downarrow \searrow \\ 2 \quad 2 \\ \swarrow \downarrow \searrow \\ -3 \cdot \sqrt{2 \cdot 2 \cdot 2 \cdot 2} \cdot 3 \\ -3 \cdot 2 \cdot 2 \sqrt{3} \\ \boxed{-12\sqrt{3}} \end{matrix}$

f. $6\sqrt{15} \cdot \sqrt{10} = 6\sqrt{150}$
 $\begin{matrix} 150 \\ \swarrow \downarrow \searrow \\ 5 \quad 3 \quad 10 \\ \swarrow \downarrow \searrow \\ 25 \quad 3 \\ \swarrow \downarrow \searrow \\ 5 \quad 5 \\ \swarrow \downarrow \searrow \\ 6 \sqrt{2 \cdot 3 \cdot 5 \cdot 5} \\ = 6 \cdot 5 \sqrt{6} \\ = \boxed{30\sqrt{6}} \end{matrix}$