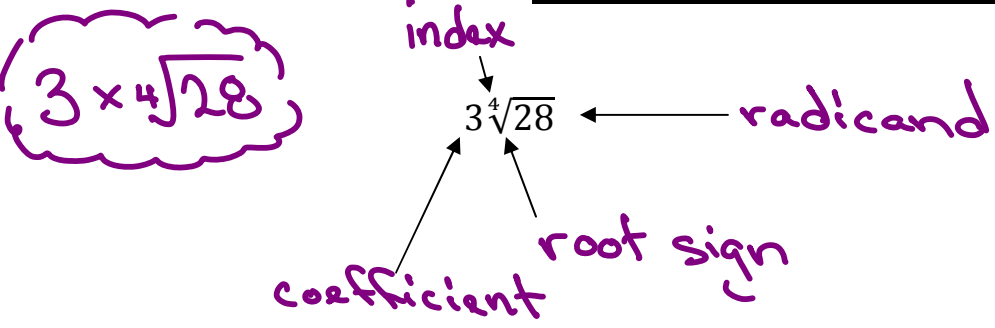


Section 4.3 - Simplifying Radicals



**Perfect Squares**

$1^2 = \underline{1}$  therefore  $\sqrt{1} = 1$

$2^2 = \underline{4}$   $\therefore \sqrt{4} = 2$

$3^2 = \underline{9}$

$4^2 = \underline{16}$

$5^2 = \underline{25}$

$6^2 = \underline{36}$

$7^2 = \underline{49}$

$8^2 = \underline{64}$

$9^2 = \underline{81}$

$10^2 = \underline{100}$

$11^2 = \underline{121}$

$12^2 = \underline{144}$

← know these →

**Perfect Cubes**

$1^3 = \underline{1}$   $\therefore \sqrt[3]{1} = 1$

$2^3 = \underline{8}$   $\therefore \sqrt[3]{8} = 2$

$3^3 = \underline{27}$

$4^3 = \underline{64}$

$5^3 = \underline{125}$

$6^3 = \underline{216}$

Entire Radical: When all the numbers are        the root sign. (Except the index.) e.g.  $\sqrt[3]{20}$

Mixed Radical: When there are numbers        of the root sign, as well as numbers under the root sign. e.g.  $3\sqrt[3]{6}$

All mixed radicals can be written as entire radicals and vice versa.

**Entire to Mixed**

1. Rewrite the radicand as a product of 2 or more radicals. Try to use perfect roots.
2. Solve the perfect root(s) to make coefficients.

**Ex. #1:** Express the following entire radicals as mixed radicals.

(a)  $\sqrt{12}$   
 $(\sqrt{4 \cdot 3})$   
 $= \sqrt{4} \cdot \sqrt{3}$   
 $= 2\sqrt{3}$

(b)  $\sqrt{45}$   
 $= \sqrt{9} \cdot \sqrt{5}$   
 $= 3\sqrt{5}$

(c)  $\sqrt{72}$   
 $= \sqrt{9} \cdot \sqrt{8}$   
 $= 3 \cdot \sqrt{4} \sqrt{2}$   
 $= 3(2)\sqrt{2}$   
 $= 6\sqrt{2}$

$\begin{array}{l} \sqrt{36} \sqrt{2} \\ = 6\sqrt{2} \\ \sqrt{36} \sqrt{2} \\ \sqrt{72} \end{array}$

d)  $\sqrt[3]{24}$   
 $= \sqrt[3]{8} \sqrt[3]{3}$   
 $= 2\sqrt[3]{3}$

use prime factors.

e)  $\sqrt[3]{144}$   
 $\sqrt[3]{12 \cdot 12}$   
 $\sqrt[3]{4 \cdot 3 \cdot 4 \cdot 3}$

$\sqrt[3]{2 \cdot 2 \cdot 3 \cdot 2 \cdot 2 \cdot 3}$   
 $\sqrt[3]{2 \cdot 2 \cdot 2 \cdot \text{[yellow box]}}$  rearranged  
 $\underbrace{2 \cdot 2 \cdot 2}_{2^3} \rightarrow 2\sqrt[3]{18}$

**Mixed to Entire**

1. Rewrite the coefficient as a radical.
2. Multiply radicals to make a single radical.

**Ex. #2:** Express the following mixed radicals as entire radicals.

(a)  $5\sqrt{3}$   
 $\sqrt[5]{25} \sqrt{3}$   
 $= \sqrt{75}$

(b)  $2\sqrt{7}$   
 $\sqrt[4]{4} \sqrt{7}$   
 $= \sqrt{28}$

(c)  $3\sqrt[3]{4}$   
 $\sqrt[3]{27} \sqrt[3]{4}$   
 $= \sqrt[3]{108}$

HW p 218-220  
 # 3-5, 10-12