Section 4.3 - Simplifying Radicals

$3 \times \sqrt[4]{28}$

index

$3\sqrt[4]{28}$ ← radicand

coefficient

root sign

Perfect Squares

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

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

$3^2 =$ 9

$4^2 =$ 16

$5^2 =$ 25

$6^2 =$ 36

$7^2 =$ 49

$8^2 =$ 64

$9^2 =$ 81

$10^2 =$ 100

$11^2 =$ 121

$12^2 =$ 144

← know these →

Perfect Cubes

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

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

$3^3 =$ 27

$4^3 =$ 64

$5^3 =$ 125

$6^3 =$ 216

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

Mixed Radical: When there are numbers [redacted]t 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) $\sqrt{72}$

$= \sqrt{9} \cdot \sqrt{8}$

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

$= 3(2)\sqrt{2}$

$= 6\sqrt{2}$

$= \sqrt{36}\sqrt{2}$

$= 6\sqrt{2}$

$\sqrt{36}\ \sqrt{2}$

$\sqrt{72}$

d) $\sqrt[3]{24}$

$= \sqrt[3]{8}\sqrt[3]{3}$

$= 2\sqrt[3]{3}$

use prime factors.

e) $\sqrt[3]{144}$

$\sqrt[3]{12 \cdot 12}$

$\sqrt[3]{4 \cdot 3 \cdot 4 \cdot 3}$

$\sqrt[3]{2 \cdot 2 \cdot 3 \cdot 2 \cdot 2 \cdot 3}$ rearranged

$\sqrt[3]{\underbrace{2 \cdot 2 \cdot 2}_{2^3} \cdot}$

$= 2\sqrt[3]{18}$

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) $5\sqrt{3}$

$\sqrt{25}\sqrt{3}$

$= \sqrt{75}$

(b) $2\sqrt{7}$

$\sqrt{4}\sqrt{7}$

$= \sqrt{28}$

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

$\sqrt[3]{27}\sqrt[3]{4}$

$= \sqrt[3]{108}$

HW p218-220
#3-5, 10-12