Chapter 5: Radicals

5.1a Entire and Mixed Radical Conversions (Math 10 Review)

Convert to mixed radicals in lowest terms.

a) $\sqrt{300} = \sqrt{100 \times 3} = 10\sqrt{3}$ (100 = 10×10)

b) $\sqrt{72} = 3\sqrt{8} = 3(\sqrt{4 \times 2}) \; 3(2\sqrt{2}) = 6\sqrt{2}$

$= \sqrt{36 \times 2} = 6\sqrt{2}$

c) $\sqrt[4]{m^{10}y^5} = \sqrt[4]{m^4 \cdot m^4 \cdot m^2 \cdot y^4 \cdot y} = m^2 y \sqrt[4]{m^2 y}$ (m, m, y)

d) $\sqrt[3]{54y^3} = \sqrt[3]{27 \times 2 \cdot y^3} = 3y\sqrt[3]{2}$ (3, y)

*Know

x^2: 4, 9, 16, 25, 36, 49, 64, ...

x^3: 8, 27, 64, 125, 216 ...

Simplify:

1) $2\sqrt{75}$

$2\sqrt{25 \times 3}$

$2(5\sqrt{3})$

$10\sqrt{3}$

2) $\frac{-3}{10}\sqrt[3]{250}$

$\frac{-3}{10}\sqrt[3]{125 \times 2}$

$\frac{-3}{\cancel{10}_{2}}\left(\frac{\cancel{5}^{1}}{1}\sqrt[3]{2}\right)$

$-\frac{3}{2}\sqrt[3]{2}$

3) $-\sqrt[4]{16}$

-2

4) $\sqrt[4]{-16}$ even → ④ negs will not multiply to give a neg.

Convert to an entire radical

a) $8\sqrt{3} = \sqrt{8^2 \times 3} = \sqrt{64 \times 3} = \sqrt{192}$

b) $a^3b\sqrt{c}$ $\sqrt{(a^3b)^2 c} = \sqrt{a^6 b^2 c}$

c) $4x\sqrt[3]{2x} = \sqrt[3]{(4x)^3 2x} = \sqrt[3]{64x^3 2x} = \sqrt[3]{128x^4}$

Try:

1) $4\sqrt{3}$

$\sqrt{4^2 \times 3}$

$\sqrt{16 \times 3}$

$\sqrt{48}$

2) $-5\sqrt[3]{12}$

$\sqrt[3]{(-5)^3 \times 12}$

$\sqrt[3]{-125 \times 12}$

$\sqrt[3]{-1500}$

3) $\frac{2x}{3y}\sqrt{3y}$

$\sqrt{\left(\frac{2x}{3y}\right)^2 \cdot \frac{3y}{1}}$

$\sqrt{\frac{4x^2 \cancel{3y}}{\cancel{9y^2}} \cdot \frac{\cancel{3}}{1}}$

$\sqrt{\frac{4x^2}{3y}}$

4) $\frac{1}{2x}\sqrt[3]{5x}$

$\sqrt[3]{\left(\frac{1}{2x}\right)^3 \cdot \frac{5x}{1}}$

$\sqrt[3]{\frac{1}{8x^{\cancel{3}2}} \cdot \frac{5x}{1}}$

$\sqrt[3]{\frac{5}{8x^2}}$

Restrictions on Variables:

Determine the decimal values of the following:

$\sqrt{4} = 2$

$\sqrt{3} = 1.73\ldots$

$\sqrt{2} = 1.41\ldots$

$\sqrt{1} = 1$

$\sqrt{0} = 0$ ← boundary point

$\sqrt{-1} =$ } not real } restricted in the real # system.

$\sqrt{-2} =$ }

In general, the radicand (the quantity under the radical sign) cannot be less than zero.

Ex. Determine the restriction on the variable:

a) $\sqrt{5a}$

$5a \geq 0$

$a \geq 0$

b) $\sqrt{x-5}$

$x-5 \geq 0$

$x \geq 5$

c) $\sqrt{x+7}$

$x+7 \geq 0$

$x \geq -7$

d) $\sqrt{3a-7}$

$3a-7 \geq 0$

$3a \geq 7$

$a \geq 7/3$

e) $\sqrt{-2a+1}$

$-2a+1 \geq 0$

$\frac{-2a}{-2} \geq \frac{-1}{-2}$ ← reverses the sign

$a \geq 1/2$

Ex. Why are there no restrictions for:

a) $\sqrt{a^2}$

$a^2 \geq 0$

↑ always positive

b) $\sqrt[3]{w}$

odd roots can be neg.

In general, odd index numbers have no restrictions.

Assignment: Simplifying Radical Worksheet