Simplifying Radicals [Root Index = 2]

- To simplify, factor the radical to "expose" any "hidden squares"

(e.g. 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 169, 196, 225, etc.)

Then, square-root the square, take that number outside/in front of the square-root sign. All that remains in the square-root sign is the factor that wasn't a square (i.e. not square-rootable).

Simplify :

e.g. 1 $\sqrt{18}$

$\sqrt{2\cdot\cancel{9}}$

$3\sqrt{2}$

e.g. 2 $3\sqrt{32}$

$3\sqrt{\cancel{4}\cdot 8}$

$3\cdot 2\sqrt{8}$

$6\sqrt{8}$

$6\sqrt{2\cdot 4}$

$6\cdot 2\sqrt{2}$

$12\sqrt{2}$

$3\sqrt{2\cdot 16}$

$12\sqrt{2}$

e.g. $-\frac{1}{2}\sqrt{128}$

$$-\frac{1}{2}\sqrt{2\cdot 64}$$

$$\left(-\frac{1}{2}\right)(8)\sqrt{2}$$

Square-root sign is gone!

$$\boxed{-4\sqrt{2}}$$

e.g. $\frac{4}{7}\sqrt{147}$

$\frac{4}{7}\sqrt{3 \cdot 49}$

$\frac{\cancel{7}}{1}\left(\frac{4}{\cancel{7}}\right)\sqrt{3} = 4\sqrt{3}$

e.g. $\sqrt{150}$

$\sqrt{6 \cdot 25}$

$5\sqrt{6}$

Adding + Subtracting Radical

→ You can only add up similar / same fruit radicals.

Just Like:

$$3x + 4y + 2x - y =$$

$$5x \qquad 3y$$

$$3\boxed{\sqrt{2}} + 4\sqrt{3} + 2\boxed{\sqrt{2}} - 1\sqrt{3} =$$

$$5\sqrt{2} + 3\sqrt{3}$$

* Treat the radicals as if they are variables!

$\boxed{\text{e.g.}}$

$$\sqrt{98} - \sqrt{18} + 3\sqrt{72}$$

$$\sqrt{2 \cdot 49} - \sqrt{2 \cdot 9} + 3\sqrt{2 \cdot 36}$$

$$\boxed{7}\sqrt{2} \boxed{-3}\sqrt{2} + \boxed{18}\sqrt{2}$$

$$22\sqrt{2}$$

e.g.

$$\left(\sqrt{32} - 3\sqrt{2}\right) - \left(5\sqrt{18} - \sqrt{8} + \sqrt{12}\right)$$

$$\sqrt{32} - 3\sqrt{2} - 5\sqrt{18} + \sqrt{8} - \sqrt{12}$$

$$\sqrt{2 \cdot 16} - 3\sqrt{2} - 5\sqrt{2 \cdot 9} + \sqrt{2 \cdot 4} - \sqrt{4 \cdot 3}$$

$$\underline{4}\sqrt{2} \underline{-3}\sqrt{2} \underline{-15}\sqrt{2} \underline{+2}\sqrt{2} - 2\sqrt{3}$$

$$-12\sqrt{2} - 2\sqrt{3}$$

Multiplying + Dividing

$\Rightarrow$ Multiply coefficients separately from radicals, then multiply radicals.

e.g. $3\sqrt{2} \cdot 4\sqrt{3}$

$12\sqrt{6}$

e.g. $3\sqrt{2} \cdot 4\sqrt{2}$

$12\sqrt{4}$

$12 \cdot 2 = 24$

e.g. $3\sqrt{6} \cdot 4\sqrt{12}$

$12\sqrt{72}$

$12\sqrt{36 \cdot 2}$

$72\sqrt{2}$

OR $3\sqrt{6} \cdot 4\sqrt{12}$

$3\sqrt{6} \cdot 4\sqrt{3 \cdot 4}$

$3\sqrt{6} \cdot 8\sqrt{3}$

$24\sqrt{18}$

$24\sqrt{2 \cdot 9}$

$72\sqrt{2}$

e.g. $-2\sqrt{3} \cdot 4\sqrt{6}$

$-8\sqrt{18}$

$-8\sqrt{2 \cdot 9}$

$\boxed{-24\sqrt{2}}$

e.g. $-2\sqrt{5} \cdot (-3\sqrt{2}) \cdot 4\sqrt{8}$

$6\sqrt{10} \cdot 4\sqrt{8}$

$24\sqrt{80}$

$24\sqrt{5 \cdot 16}$

$\boxed{96\sqrt{5}}$

e.g. $$\frac{6^{\div 6}\sqrt{48}}{18^{\div 6}\sqrt{6}} = \frac{1\sqrt{8}}{3}$$

$$\frac{\sqrt{8}}{3} = \frac{\sqrt{2 \cdot 4}}{3} = \boxed{\frac{2\sqrt{2}}{3}}$$

$\frac{3}{\sqrt{2}}$ ← an irrational number.

In math it's illegal to have an irrational number for a denominator.

You would be expected to rationalize the denominator!

HOW? MULTIPLY TOP + BOTTOM BY THE SAME RADICAL!

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

e.g. $$\frac{8}{3\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{8\sqrt{3}}{3\sqrt{9}} = \boxed{\frac{8\sqrt{3}}{9}}$$

e.g. $$\frac{6\sqrt{54}}{3\sqrt{3}} = \frac{2\sqrt{18}}{1}$$

$$= 2\sqrt{2\cdot 9}$$

$$= \boxed{6\sqrt{2}}$$

e.g. $$\frac{2\sqrt{45}}{\frac{1}{2}\sqrt{2}} = \frac{4\sqrt{45}}{\sqrt{2}} \frac{\cdot\sqrt{2}}{\cdot\sqrt{2}}$$

$$= \frac{4\sqrt{90}}{\sqrt{4}} = \frac{4\sqrt{9\cdot 10}}{2}$$

$$= \frac{12\sqrt{10}}{2}$$

$$= \boxed{6\sqrt{10}}$$

Do:

1. Chap 4 handout

2. Review Booklet #8, #10, #14

3. Quiz pkg pp. 11, 12, 17, 18