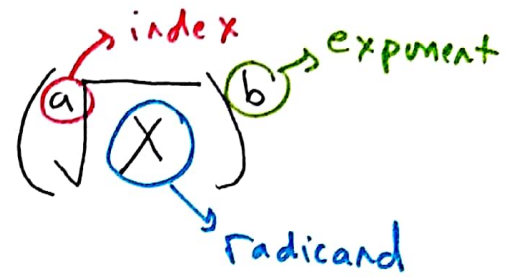


objective: To apply properties of radicals (square roots) and apply operations of square roots.



I.) Simplifying square roots:

Example: $\sqrt{148}$

$= 2\sqrt{37}$

★ use prime factorization to find pairs of common prime factors to pull out of square root.

II.) Product Property of square roots

a) $\sqrt{ab} = \sqrt{a} \cdot \sqrt{b}$
 separate

b) $\sqrt{a} \cdot \sqrt{b} = \sqrt{ab}$
 combine

Examples: $\sqrt{2} \cdot \sqrt{2} = \sqrt{4} = 2$ ★ Multiply two square with same radicand will give the same radicand answer.
 $\sqrt{3} \cdot \sqrt{3} = \sqrt{9} = 3$
 $\sqrt{5} \cdot \sqrt{5} = \sqrt{25} = 5$

1.) $\sqrt{18} = \sqrt{9} \cdot \sqrt{2} = \boxed{3\sqrt{2}}$

2.) $\sqrt{2} \cdot \sqrt{10} = \sqrt{20} = \sqrt{4} \cdot \sqrt{5} = \boxed{2\sqrt{5}}$

3.) $\sqrt{5} \cdot \sqrt{20} = \sqrt{100} = \boxed{10}$

- 4
- 9
- 16
- 25
- 36
- 49
- 64
- 81
- 100
- ↓

III.) Quotient Property of Square roots (fraction)

$$a.) \sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$$

separate

$$b.) \frac{\sqrt{a}}{\sqrt{b}} = \sqrt{\frac{a}{b}}$$

combine

$$1.) \sqrt{\frac{5}{9}} = \frac{\sqrt{5}}{\sqrt{9}} = \boxed{\frac{\sqrt{5}}{3}}$$

$$2.) \sqrt{\frac{25}{49}} = \frac{\sqrt{25}}{\sqrt{49}} = \boxed{\frac{5}{7}}$$

$$3.) \frac{\sqrt{40}}{\sqrt{5}} = \sqrt{\frac{40}{5}} = \sqrt{8} = \sqrt{4} \cdot \sqrt{2} = \boxed{2\sqrt{2}}$$

4
9
16
25
36
49
↓

IV.) Rationalize the Denominator:

To completely simplify a square root or radical you can never have a square root or radical in the denominator.

- You must multiply numerator and denominator by the radical (square root) in the denominator.

$$a.) \sqrt{\frac{7}{3}} = \frac{\sqrt{7}}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \boxed{\frac{\sqrt{21}}{3}}$$

$$\begin{aligned} \sqrt{\frac{5}{8}} &= \frac{\sqrt{5}}{\sqrt{8}} = \frac{\sqrt{5}}{\sqrt{4 \cdot 2}} = \frac{\sqrt{5}}{2\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} \\ &= \frac{\sqrt{10}}{2 \cdot 2} = \boxed{\frac{\sqrt{10}}{4}} \end{aligned}$$

b.) $\frac{3}{(2+\sqrt{5})(2-\sqrt{5})}$ you must multiply by the conjugate of the denominator.

$(a+\sqrt{b}) \Rightarrow (a-\sqrt{b})$
 $(2+\sqrt{5}) \Rightarrow (2-\sqrt{5})$

$$\frac{6-3\sqrt{5}}{4-2\sqrt{5}+2\sqrt{5}-5} = \boxed{\frac{6-3\sqrt{5}}{-1}}$$

V.) Adding and Subtracting square roots

- You can only add/subtract radicals (square roots) that have the same radicand and index.
- You must fully simplify all square roots before adding/subtracting

$$1.) \sqrt{3} + 4\sqrt{3} = \boxed{5\sqrt{3}}$$

* combine like terms

$$\begin{aligned} 2.) \sqrt{5} + \sqrt{75} - \sqrt{25} \\ \sqrt{5} + (\sqrt{25} \cdot \sqrt{3}) - \sqrt{25} \\ \boxed{\sqrt{5} + 5\sqrt{3} - 5} \end{aligned}$$

$$\begin{aligned} 3.) \sqrt{3} + \sqrt{27} - \sqrt{12} \\ \sqrt{3} + (\sqrt{9} \cdot \sqrt{3}) - (\sqrt{4} \cdot \sqrt{3}) \\ \sqrt{3} + 3\sqrt{3} - 2\sqrt{3} \\ 4\sqrt{3} - 2\sqrt{3} = \boxed{2\sqrt{3}} \end{aligned}$$