What is a radical?

$4^2 = 16$ so $\sqrt{16} = 4$ square roots

$\sqrt{4 \cdot 4}$

so any # under a square root sign that is multiplec
times itself can be brought out of the radical

$3^3 = 27$ so $\sqrt[3]{27} = 3$ cube roots

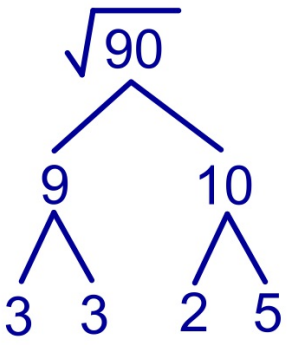
$5^4 = 625$ so $\sqrt[4]{625} = 5$ fourth roots

Simplifying Square Roots

A Simplified square root can have NO perfect square factors inside the radical.

Name some perfect squares...

Simplifying using the factor tree



$\sqrt{2 \cdot 3 \cdot 3 \cdot 5} = 3\sqrt{2 \cdot 5} = 3\sqrt{10}$

Simplify the following Radicals

1) $\sqrt{20}$

2) $\sqrt{54}$

3) $3\sqrt{50}$

4) $5\sqrt{24}$

Simplifying with Variables

$\sqrt{x^2} = \sqrt{x \cdot x} = x$

$\sqrt{x^4} = \sqrt{x \cdot x \cdot x \cdot x} = x \cdot x = x^2$

for each pair you bring one ou

$\sqrt{x^5} = \sqrt{x \cdot x \cdot x \cdot x \cdot x} = x \cdot x \sqrt{x} = x^2\sqrt{x}$

Simplify

5) $\sqrt{x^4y^3}$

6) $\sqrt{a^5b^2c^3}$

7) $\sqrt{40a^4}$

8) $\sqrt{50m^3n^5}$

Adding and Subtracting Radicals

-simplify first
-combine like radicals

$$\sqrt{2} + \sqrt{2} = 2\sqrt{2}$$

$$3\sqrt{5} - 2\sqrt{5} = \sqrt{5}$$

$$5\sqrt{2} + 3\sqrt{3} + 2\sqrt{2} = 7\sqrt{2} + 3\sqrt{3}$$

Simplify

9) $3\sqrt{11} + 6\sqrt{11} - 2\sqrt{11}$

10) $3\sqrt{5} - 5\sqrt{3}$

11) $2\sqrt{27} - 4\sqrt{12}$

Multiplying

-insides times insides
-outsides times outsides
-simplify

12) $5\sqrt{6} \cdot 2\sqrt{3}$

13) $\sqrt{10} \cdot \sqrt{20}$

14) $3\sqrt{2x} \cdot 2\sqrt{6x}$

Dividing (Rationalizing)

-For a radical to be simplified
- -no perfect square factors ✓
- -no fractions under the radical
- -no radicals in the denominator

$$\sqrt{\frac{5}{6}} = \frac{\sqrt{5}}{\sqrt{6}} \times \frac{\sqrt{6}}{\sqrt{6}} = \frac{\sqrt{30}}{\sqrt{36}}$$

Seperate fract. first (if needed)

mult top and bottom by the $\sqrt{\ }$ in the denom.

Simplify

15) $\sqrt{\frac{10}{3}}$

16) $\frac{\sqrt{7x}}{\sqrt{8}}$

17) $\sqrt{\frac{3}{5}} \cdot \sqrt{\frac{6}{4}}$

18) $\sqrt{\frac{1}{7}} \cdot \sqrt{\frac{7}{11}}$