Name Key Date

Simplifying Radicals

Key Ideas	Notes/Examples

Perfect Squares

1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144

Perfect Square Roots

$\sqrt{4} = 2$ $\sqrt{16} = 4$

$\sqrt{25} = 5$ $\sqrt{100} = 10$

Simplifying Non-Perfect Square Roots

1. Find the largest perfect square that the number in the radical is divisible by. Break down the radical using this number
2. Take the square root of the perfect square. Take it out of the radical.
3. Leave the "leftover" under the radical symbol.

$\sqrt{8}$ → $\sqrt{4}\sqrt{2}$ → $2\sqrt{2}$

$\sqrt{20} = \sqrt{4}\sqrt{5} = 2\sqrt{5}$

$\sqrt{32} = \sqrt{16}\sqrt{2} = 4\sqrt{2}$

$\sqrt{75} = \sqrt{25}\sqrt{3} = 5\sqrt{3}$

$\sqrt{40} = \sqrt{4}\sqrt{10} = 2\sqrt{10}$

Try These!

$\sqrt{48} = \sqrt{16}\sqrt{3} = 4\sqrt{3}$

$\sqrt{80} = \sqrt{16}\sqrt{5} = 4\sqrt{5}$

$\sqrt{450} = \sqrt{25}\sqrt{18} = \sqrt{25}\sqrt{9}\sqrt{2} = 5 \cdot 3\sqrt{2} = 15\sqrt{2}$

$\sqrt{125} = \sqrt{25}\sqrt{5} = 5\sqrt{5}$

With a Coefficient

If there is a coefficient out front of the radical, simply multiply it by the perfect square factor after you simplify it.

$2\sqrt{54} = 2\sqrt{9}\sqrt{6} = 2 \cdot 3\sqrt{6} = 6\sqrt{6}$

$8\sqrt{128} = 8 \cdot \sqrt{64}\sqrt{2} = 8 \cdot 8\sqrt{2} = 64\sqrt{2}$

$-5\sqrt{150} = -5\sqrt{25}\sqrt{6} = -5 \cdot 5\sqrt{6} = -25\sqrt{6}$

$3\sqrt{28} = 3 \cdot \sqrt{4}\sqrt{7} = 3 \cdot 2\sqrt{7} = 6\sqrt{7}$

$2\sqrt{32} = 2 \cdot \sqrt{16}\sqrt{2} = 2 \cdot 4\sqrt{2} = 8\sqrt{2}$

$9\sqrt{175} = 9 \cdot \sqrt{25}\sqrt{7} = 9 \cdot 5\sqrt{7} = 45\sqrt{7}$

Rationalizing The Denominator

To be fully simplified means there is no radical in the denominator. Sometimes this can occur when dividing. The process of eliminating the radical is called **rationalizing the denominator.**

To rationalize the denominator, multiply both the numerator and denominator by the radical in the denominator, then simplify.

Examples

Directions: Find each quotient. Write your answer in simplest radical form.

$\frac{4}{\sqrt{7}}\left(\frac{\sqrt{7}}{\sqrt{7}}\right) = \frac{4\sqrt{7}}{\sqrt{49}} = \boxed{\frac{4\sqrt{7}}{7}}$

$\frac{\sqrt{5}}{\sqrt{2}}\frac{\sqrt{2}}{\sqrt{2}} = \frac{\sqrt{10}}{\sqrt{4}} = \boxed{\frac{\sqrt{10}}{2}}$

$\frac{\sqrt{81}}{\sqrt{2}} = \frac{9}{\sqrt{2}}\frac{\sqrt{2}}{\sqrt{2}} = \frac{9\sqrt{2}}{\sqrt{4}}$

$\boxed{\frac{9\sqrt{2}}{2}}$

$\frac{\sqrt{6}}{\sqrt{18}}\frac{\sqrt{1}}{\sqrt{6}} = \frac{1}{\sqrt{6}}$ *reduce first!

$\frac{1}{\sqrt{6}}\cdot\frac{\sqrt{6}}{\sqrt{6}} = \frac{\sqrt{6}}{\sqrt{36}} = \boxed{\frac{\sqrt{6}}{6}}$

$\frac{4\sqrt{3}}{\sqrt{2}}\frac{\sqrt{2}}{\sqrt{2}} = \frac{4\sqrt{6}}{\sqrt{4}} = \frac{4\sqrt{6}}{2}$

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

$\frac{\sqrt{4}}{10\sqrt{3}}\frac{\sqrt{3}}{\sqrt{3}} = \frac{\sqrt{12}}{10\sqrt{9}} = \frac{\sqrt{4}\sqrt{3}}{10\cdot 3}$

$\boxed{\frac{2\sqrt{3}}{30} = \frac{\sqrt{3}}{15}}$

reduce first

$\frac{5\sqrt{12}}{\sqrt{10}} = \frac{5\sqrt{6}}{\sqrt{5}}\frac{\sqrt{5}}{\sqrt{5}}$

$\frac{5\sqrt{30}}{\sqrt{25}} = \frac{5\sqrt{30}}{5}$

$\boxed{\sqrt{30}}$

$\frac{2}{5\sqrt{6}}\frac{\sqrt{6}}{\sqrt{6}} = \frac{2\sqrt{6}}{5\sqrt{36}}$

$\frac{2\sqrt{6}}{5\cdot 6} = \frac{2\sqrt{6}}{30}$

$= \boxed{\frac{\sqrt{6}}{15}}$