KEY

5/15/14
4th

Unit 11: Radicals and Sequences
Simplifying Radicals Class Notes

The expression under a radical sign is the radicand.

A radical expression is in simplest form when

- no radicands have perfect square factors other than 1. EX: $\sqrt{18} = \boxed{3\sqrt{2}}$
- no radicands contain fractions. EX: $\sqrt{\frac{1}{4}} = \boxed{\frac{1}{2}}$
- no radicals can appear in the denominator of a fraction EX: $\frac{3}{\sqrt{2}} \bullet \frac{\sqrt{2}}{\sqrt{2}} = \boxed{\frac{3\sqrt{2}}{2}}$

Product Property of Square Roots: For any numbers *a* and *b,* where a≥0 and b≥0, $\sqrt{ab} = \sqrt{a} \bullet \sqrt{b}$

Example: Simplify $\sqrt{180}$.

2 90
2 45
3 15
3 5

$\sqrt{180} = \sqrt{2 \cdot 2 \cdot 3 \cdot 3 \cdot 5}$	prime factorization of 180
$=\sqrt{2^2} \bullet \sqrt{3^2} \bullet \sqrt{5}$	product property of square roots
$= 2 \bullet 3 \bullet \sqrt{5}$	Simplify
$= 6\sqrt{5}$	Simplified square root!

Practice: *Simplify* each expression.

1. $\sqrt{18}$

2 9
3 3

$\boxed{3\sqrt{2}}$

2. $\sqrt{68}$

2 34
2 17

$\boxed{2\sqrt{17}}$

3. $\sqrt{75}$

3 25
5 5

$\boxed{5\sqrt{3}}$

4. $\sqrt{162}$

2 81
3 27
3 9
3 3

$3 \cdot 3\sqrt{2}$

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

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Quotient Property of Square Roots: For any numbers a and b, where $a \geq 0$ and $b \geq 0$, $\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$

Example1: Simplify $\sqrt{\frac{3}{4}}$ $\rightarrow$ $\sqrt{\frac{3}{4}} = \frac{\sqrt{3}}{\sqrt{4}}$ quotient property of square roots

$= \frac{\sqrt{3}}{\sqrt{2 \cdot 2}}$ prime factor to simplify

$= \frac{\sqrt{3}}{2}$ simplified square root!

Rationalize the Denominator

Example 2: Simplify $\frac{2}{\sqrt{7}}$ $\rightarrow$ $\frac{2}{\sqrt{7}} = \frac{2}{\sqrt{7}} \cdot \frac{\sqrt{7}}{\sqrt{7}}$ Multiply by $\frac{\sqrt{7}}{\sqrt{7}}$ to make the denominator a rational number

$\sqrt{7 \cdot 7}$

$= \frac{2\sqrt{7}}{7}$ simplified square root!

Practice: *Simplify* each expression

5. $\sqrt{\frac{18}{9}} = \sqrt{2}$

$\frac{\sqrt{18}}{\sqrt{9}} = \frac{3\sqrt{2}}{\cancel{3}} = \boxed{\sqrt{2}}$

6. $\sqrt{\frac{5}{16}} = \frac{\sqrt{5}}{\sqrt{16}} = \boxed{\frac{\sqrt{5}}{4}}$

$\sqrt{\frac{3}{25}} = \frac{\sqrt{3}}{\sqrt{25}} = \boxed{\frac{\sqrt{3}}{5}}$

Rationalize the denominator

7. $\frac{5}{\sqrt{15}} \cdot \frac{\sqrt{15}}{\sqrt{15}} = \frac{5\sqrt{15}}{\sqrt{15 \cdot 15}}$

$\frac{1\cancel{5}\sqrt{15}}{3\cancel{15}}$

$\boxed{\frac{\sqrt{15}}{3}}$

8. $\frac{7}{\sqrt{13}} \cdot \frac{\sqrt{13}}{\sqrt{13}} = \frac{7\sqrt{13}}{\sqrt{13 \cdot 13}}$

$= \boxed{\frac{7\sqrt{13}}{13}}$