Chapter 7 – Simplifying and Multiplying Radicals (Square Roots)

- $\sqrt{9} =$ 3
- $\sqrt{121} =$ 11
- $\sqrt{256} =$ 16
- $\sqrt{x^2} =$ x

Perfect Squares

- **Identify the perfect square in each set.**

1. 45 (81) 27 111
2. 156 99 8 (25)
3. (256) 84 12 1000
4. 35 216 (196) 72

Simplifying Radicals

- $\sqrt{40}$ $\sqrt{4} \cdot \sqrt{10} = 2\sqrt{10}$
- $\sqrt{700}$ $\sqrt{7} \cdot \sqrt{100} = 10\sqrt{7}$
- $\sqrt{72}$ $\sqrt{9} \cdot \sqrt{8} = 3\sqrt{8} = 3\sqrt{4} \cdot \sqrt{2}$ $6\sqrt{2}$

- $\sqrt{75x^2}$ $\sqrt{25} \cdot \sqrt{3} \cdot \sqrt{x^2} = 5x\sqrt{3}$
- $\sqrt{8x^3y^5}$ $\sqrt{4} \cdot \sqrt{2} \cdot \sqrt{x^2} \cdot \sqrt{x} \cdot \sqrt{y^2} \cdot \sqrt{y^2} \cdot \sqrt{y}$ $2xy^2\sqrt{2xy}$
- $\sqrt{27x^4y^8}$ $\sqrt{9} \cdot \sqrt{3} \cdot \sqrt{x^2} \cdot \sqrt{x^2} \cdot \sqrt{y^2} \cdot \sqrt{y^2} \cdot \sqrt{y^2} \cdot \sqrt{y^2}$ $3x^2y^4\sqrt{3}$

Alternate Method – Create a factor tree to look for pairs

$\sqrt{108}$

54 2

2 27

9 3

3 3

$2 \cdot 3\sqrt{3}$

$6\sqrt{3}$

$\sqrt{200}$

100 2

10 10

5 2 5 2

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

$\sqrt{90x^3}$

90 x^3

9 10 x x x

3 3 5 2

$3 \cdot x \cdot \sqrt{10x}$

$3x\sqrt{10x}$

$\sqrt{48x^2y^7}$

48 x^2 y^7

8 6 x x y y y y y y y

4 2 3 2

2 2

$2 \cdot 2xy^3\sqrt{3y} = 4xy^3\sqrt{3y}$

Multiplying Radicals

$2\sqrt{15} \cdot 3\sqrt{35}$

1. Multiply numbers and variables outside of the radical $6\sqrt{525}$
2. Multiply numbers and variables inside the radical
3. Simplify the numbers and variables inside the radical. $6\sqrt{25 \cdot 21}$

$6 \cdot 5 \cdot \sqrt{21} = 30\sqrt{21}$

- Another Example:

$3\sqrt{2xy^2} \cdot \sqrt{10xy}$

$3\sqrt{20x^2y^3}$

10 2 y y y

5 2

$3 \cdot 2 \cdot x \cdot y\sqrt{5y} = 6xy\sqrt{5y}$