

Warm-Up

1. Take out your homework

$$3x^2y\sqrt{5x}$$

2. Simplify:

$$\sqrt{45x^5y^2}$$

~~⑨ $\sqrt{5} \cancel{x^3} \times \cancel{y^2}$~~

3. Simplify:

$$4\sqrt{80} + \sqrt{245}$$

$$4\sqrt{16}\sqrt{5} \quad | \quad \sqrt{49}\sqrt{5}$$

$\parallel \quad 16\sqrt{5} \quad + \quad 7\sqrt{5}$

$$23\sqrt{5}$$

Homework

$$1) 2\sqrt{7}$$

$$2) 3\sqrt{6}$$

$$3) 64\sqrt{5}$$

$$4) 2\sqrt[3]{6}$$

$$5) 4ab\sqrt{6a}$$

$$6) 28x^2yz^2\sqrt{5z}$$

$$7) 4m^2n \sqrt[3]{mn}$$

$$8) -6\sqrt{2}$$

$$9) -2\sqrt{3}$$

$$10) 6\sqrt{6}$$

$$11) 4\sqrt{2} + 2\sqrt{5}$$

$$12) 4xy^3\sqrt{7x}$$

Objective:

Today we will

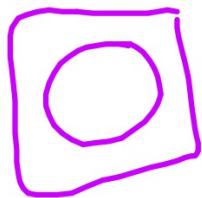
- Multiply radical expressions
- Divide radical expressions

Agenda:

- Warm-up/ review yesterday
- Notes and Examples
- Independent practice worksheet

$$-5\sqrt{7} + 5\sqrt{7}$$

$$0\sqrt{7}$$



Notation

$$25^{\frac{1}{2}}$$

$$\begin{matrix} \sqrt{25} \\ 5 \end{matrix}$$

$$(12x^3)^{\frac{1}{2}}$$

$$\sqrt{12x^3}$$

$$(\sqrt{4})^3$$

$$(24x^4)^{\frac{1}{3}}$$

$$\sqrt[3]{24x^4}$$

$$4^{3/2}$$

$$\sqrt{4^3}$$

Multiplying Radicals

- outside

- 1) Multiply coefficients together, multiply radicands *together*, and turn into one radical *Inside*
- 2) Simplify

Ex. 1

$$\sqrt{6} \bullet \sqrt{12}$$

$$\sqrt{72}$$

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

Ex. 2

$$4\sqrt{8} \bullet 3\sqrt{6}$$

$$12\sqrt{48}$$

$$12\sqrt{16}\sqrt{3}$$

$$48\sqrt{3}$$

Ex. 3 $3\sqrt{5xy^3} \bullet \sqrt{5x^2y}$

$$3\sqrt{25x^3y^4}$$
$$3\sqrt{25}\sqrt{x^2y^2} = 15xy^2\sqrt{x}$$

Ex. 4 $2\sqrt[3]{4} \bullet 7\sqrt[3]{10}$

$$14\sqrt[3]{40} = 14\sqrt[3]{8}\sqrt[3]{5}$$
$$28\sqrt[3]{5}$$

Ex. 5 $\sqrt{2}(\sqrt{10} + 5)$

$$\sqrt{20} + 5\sqrt{2}$$

$$\begin{array}{c} \cancel{\sqrt{5}\sqrt{4}} \\ \text{---} \\ 2\sqrt{5} + 5\sqrt{2} \end{array}$$

Ex. 6 $(1 + \sqrt{3})(-4 + \sqrt{3})$

$$-4 + \sqrt{3} - 4\sqrt{3} + \sqrt{9}$$

$$\begin{array}{c} -4 - 3\sqrt{3} + 3 \\ \text{---} \end{array}$$

$$\begin{array}{c} -1 - 3\sqrt{3} \\ \text{---} \end{array}$$

$$\text{Ex. 7} \quad (\sqrt{2} + \sqrt{3})(\sqrt{4} + \sqrt{3})$$

$$\begin{array}{r} \cancel{\sqrt{8}} + \cancel{\sqrt{6}} + \cancel{\sqrt{12}} + \sqrt{9} \\ \cancel{\sqrt{4}\sqrt{2}} + \cancel{\sqrt{6}} + \cancel{\sqrt{4}\sqrt{3}} + \sqrt{3} \end{array}$$

$$2\sqrt{2} + \sqrt{6} + 2\sqrt{3} + 3$$

$$\text{Ex. 8 } (\sqrt{6} + \sqrt{5})(\sqrt{6} + \sqrt{4})$$

$$\begin{aligned}& \sqrt{36} + \sqrt{24} + \sqrt{30} + \sqrt{20} \\& 6 + \sqrt{4\sqrt{6}} + \sqrt{30} + \sqrt{4\sqrt{5}}\end{aligned}$$

$$6 + 2\sqrt{6} + \sqrt{30} + 2\sqrt{5}$$

$$(-\sqrt{2} + 5\sqrt{6})(-5\sqrt{3} - 4\sqrt{6})$$

$$5\sqrt{6} + 8\sqrt{3} - 75\sqrt{2} - 120$$

Dividing Radicals

Fraction

- Rational expressions can **Never** have a radical left in the denominator.
 - Rationalize the denominator by multiplying the numerator and denominator by whatever radical is in the denominator
 - If it is a binomial, use the conjugate

$$\begin{aligned} (3+\sqrt{2}) &\rightarrow (3-\sqrt{2}) \\ (-5-\sqrt{3}) &\rightarrow (-5+\sqrt{3}) \end{aligned}$$

Ex. 1

$$\sqrt{\frac{25}{49}} \quad \frac{\cancel{5}}{\cancel{7}} \quad \boxed{\frac{5}{7}}$$

Ex. 2

$$\frac{\sqrt{20}}{\sqrt{9}} = \frac{\sqrt{4}\sqrt{5}}{3} = \frac{2\sqrt{5}}{3}$$

Ex. 3

$$\frac{\sqrt{10}}{\sqrt{5}} \cdot \frac{\sqrt{5}}{\sqrt{5}} = \frac{\sqrt{50}}{\sqrt{25}} = \frac{\sqrt{25}\sqrt{2}}{5}$$

Ex. 4

$$\frac{\sqrt{8}}{\sqrt{50}} = \sqrt{\frac{8}{50}} = \sqrt{\frac{4}{25}} = \frac{\sqrt{4}}{\sqrt{25}} = \frac{2}{5}$$

Ex. 5 $\frac{\sqrt{6}}{\sqrt{32}}$

1) $\sqrt{\frac{6}{32}} = \sqrt{\frac{3}{16}} = \frac{\sqrt{3}}{\sqrt{16}} = \frac{\sqrt{3}}{4}$

2) $\frac{\sqrt{6}}{\sqrt{32}} \cdot \frac{\sqrt{32}}{\sqrt{32}} = \frac{\sqrt{192}}{32} = \frac{\sqrt{64} \sqrt{3}}{32} = \frac{8\sqrt{3}}{32}$

$\frac{\sqrt{3}}{4}$

Ex. 6

$$\frac{2}{(4 + \sqrt{5})(4 - \sqrt{5})} \cdot \frac{(4 - \sqrt{5})}{(4 - \sqrt{5})}$$

$$\begin{aligned} & \frac{8 - 2\sqrt{5}}{16 - \cancel{4}\sqrt{5} + \cancel{4}\sqrt{5} - \sqrt{25}} \\ & \boxed{\frac{8 - 2\sqrt{5}}{-5}} = \end{aligned}$$

Ex. 7

$$\frac{3\sqrt{2}}{(4 - 2\sqrt{3})(4 + 2\sqrt{3})} \cdot \frac{(4 + 2\sqrt{3})}{(4 + 2\sqrt{3})}$$

$$\frac{12\sqrt{2} + 6\sqrt{6}}{16 + 8\sqrt{3} - 8\sqrt{3} - 4\sqrt{9}}$$

$$\frac{\cancel{12\sqrt{2} + 6\sqrt{6}}}{\cancel{4}} = \frac{-12}{\boxed{\frac{6\sqrt{2} + 3\sqrt{6}}{2}}}$$

Ex. 8

$$\frac{4}{5 - \sqrt{2}}$$

$$\frac{2\sqrt{7}}{4 + 3\sqrt{5}}$$

Wrap-Up

What we've covered:

- Simplifying Single Radicals
- Adding and subtracting
- Multiplying and Dividing

Where we're heading:

- Operations on complex numbers (imaginary numbers)

(2, -4) (2, 6)

$$\frac{6 - (-4)}{2 - 2} = \frac{10}{0} \quad \text{undefined}$$

Undefined

$$x=2$$

