

## Adding and Subtracting Radicals

You can only add and subtract like-radicals. In other words, they must be **exactly the same underneath the radical**. Then, just combine like-terms!

**Examples** Simplify the following expressions by adding or subtracting.

1.  $3\sqrt{7} + 2\sqrt{7}$

2.  $\sqrt{3} - \sqrt{48}$

3.  $4\sqrt{2} + \sqrt{3} - \sqrt{2}$

4.  $\sqrt{90} - \sqrt{40}$

## Multiplying and Dividing Radicals

Product Property of Radicals:  $\sqrt{ab} = \sqrt{a} \cdot \sqrt{b}$

**Examples:** Simplify the following radical expressions using the Product Property.

5.  $2\sqrt{2} \cdot -4\sqrt{6}$

6.  $4\sqrt{7}(3\sqrt{2} - 2)$

Quotient Property of Radicals:

$$\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$$

**Examples:** Simplify the following perfect squares using the Quotient Property.

7.  $\sqrt{\frac{16}{49}}$

8.  $\sqrt{\frac{121}{25}}$

## Rationalizing the Denominator

It is not appropriate to leave a radical in the denominator of a fraction. Multiply by a form of 1 to get it out:

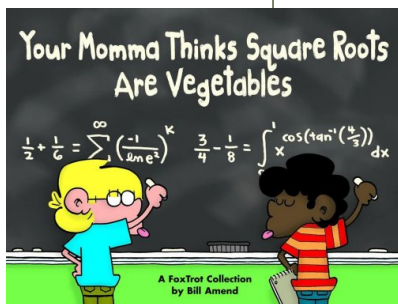
**Examples** Simplify the following expressions by rationalizing the denominator:

9.  $\frac{3}{\sqrt{11}}$

10.  $\frac{1}{\sqrt{4}}$

11.  $\sqrt{\frac{8}{5}}$

12.  $\sqrt{\frac{12}{6}}$



**Examples:** Simplify the following radical expressions.

13.  $3\sqrt{7} - 2\sqrt{28} + \sqrt{63}$

14.  $(3\sqrt{3} - 2\sqrt{2})^2$

*Bring The Pain!*

15.  $2\sqrt{5} + \sqrt{12} - \sqrt{27}$

16.  $(4\sqrt{5} - 3\sqrt{2})^2$

Now, summarize  
your notes here!

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**Practice 11.2****Simplify by adding and subtracting.**

1)  $-\sqrt{2} + 3\sqrt{2}$

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

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

4)  $2\sqrt{3} - 3\sqrt{2} - 2\sqrt{2}$

5)  $2\sqrt{54} - \sqrt{6}$

6)  $3\sqrt{20} + 3\sqrt{20}$

**Simplify by multiplying.**

7)  $\sqrt{15} \cdot \sqrt{5}$

8)  $\sqrt{2} \cdot \sqrt{10}$

9)  $5\sqrt{2} \cdot 5\sqrt{5}$

10)  $4\sqrt{10} \cdot -3\sqrt{15}$

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

12)  $5\sqrt{5}(2 - 5\sqrt{6})$

**Simplify by multiplying. (Hint: DOUBLE DISTRIBUTE!)**

13)  $(5 - 4\sqrt{5})(5 + 3\sqrt{5})$

14)  $(-5\sqrt{5} + 4)(-2\sqrt{5} - 4)$

**Simplify.**

15)  $\sqrt{\frac{5}{2}}$

16)  $\frac{4}{\sqrt{2}}$

17)  $\sqrt{\frac{6}{3}}$

18)  $\frac{3\sqrt{3}}{5\sqrt{75}}$

**Quick Review:** Solve the quadratic equations using the given method.

1. Solve by factoring:

$$3x^2 + 4x - 4 = 0$$

2. Solve by double factoring:

$$2x^2 - 4 = -2$$

3. Solve by factoring:

$$2x^2 + 3 = 7x$$

# Application and Extension

1. Simplify:  $\frac{12}{\sqrt{5}}$

2. Simplify:  $4\sqrt{3} + \sqrt{27} - \sqrt{12}$

For Number 3, you will have to graph several graphs on the same coordinate plane. Please graph extra neat and be precise!

3. a. b. Graph  $y = \sqrt{x}$  and  $y = -\sqrt{x}$  on the same graph by filling in Tables A and B and plotting the points. (Hint: Use different colors for each graph.)

- c. Graph  $y = x^2$  by filling in Table C and plotting the points.

- d. Graph the line  $y = x$  on the same graph. (Use a dotted line.)

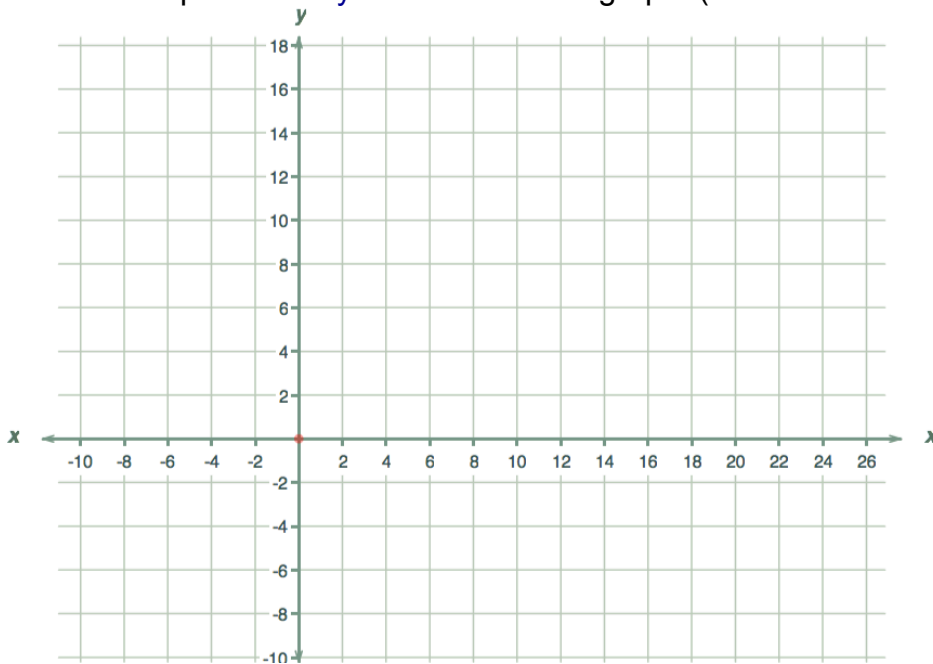


Table A

x	$\sqrt{x}$
0	
1	
4	
9	
16	
25	

Table B

x	$-\sqrt{x}$
0	
1	
4	
9	
16	
25	

Table C

x	$x^2$
-4	
-2	
0	
1	
3	
4	

- e. Now, find the solutions to the following system of equations:

$$\begin{cases} y = \sqrt{x} \\ y = x^2 \\ y = x \end{cases}$$

(*Hint: You already did! You solved it by graphing.!*)