

Warm Up:

Simplify the following square roots giving an exact answer:

$$\sqrt{54}$$

$$\sqrt{9} \cdot \sqrt{6}$$

$$3\sqrt{6}$$

$$\sqrt{\frac{81}{9}}$$

$$\sqrt{9}$$

$$3$$

$$2\sqrt{72} + -\sqrt{4}$$

$$2 \cdot \sqrt{9} \cdot \sqrt{8} - 2$$

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

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

$$12\sqrt{2} - 2$$

### 1-3 Square Roots

If a fraction has a denominator that is a square root, you can simplify it by **rationalizing the denominator**. To do this, multiply both the numerator and denominator by a number that produces a perfect square under the radical sign in the denominator.

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

### 1-3 Square Roots

#### Example 3A: Rationalizing the Denominator

Simplify by rationalizing the denominator.

$$\frac{3\sqrt{5}}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}}$$

$$\frac{3\sqrt{10}}{\sqrt{4}}$$

$$\frac{3\sqrt{10}}{2}$$

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### 1-3 Square Roots

#### Example 3B: Rationalizing the Denominator

Simplify the expression.

$$\frac{\sqrt{2}}{\sqrt{8}} \cdot \frac{\sqrt{8}}{\sqrt{8}}$$

$$\frac{\sqrt{16}}{\sqrt{64}} = \frac{4}{8} = \frac{1}{2}$$

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**1-3** Square Roots**Check It Out! Example 3a**

Simplify by rationalizing the denominator.

$$\frac{3\sqrt{5}}{\sqrt{7}} \cdot \frac{\sqrt{7}}{\sqrt{7}}$$
$$\frac{3\sqrt{35}}{\sqrt{49}} = \frac{3\sqrt{35}}{7}$$

**1-3** Square Roots**Check It Out! Example 3b**

Simplify by rationalizing the denominator.

$$\frac{5}{\sqrt{10}}$$

Write your own fraction, rationalize your denominator, make sure that you simplify as much as possible. Check with your partner.

### 1-3 Square Roots

$$3\sqrt{2} + 2\sqrt{2} = 5\sqrt{2}$$

Square roots that have the same radicand are called **like radical terms**.

Like Radicals	$\sqrt{2}$ and $3\sqrt{2}$	$-6\sqrt{15}$ and $7\sqrt{15}$	$\sqrt{ab^2}$ and $4\sqrt{ab^2}$
Unlike Radicals	$2\sqrt{5}$ and $\sqrt{2}$	$\sqrt{x}$ and $\sqrt{3x}$	$\sqrt{xy^2}$ and $\sqrt{x^2y}$

To add or subtract square roots, first simplify each radical term and then combine like radical terms by adding or subtracting their coefficients.

**1-3 Square Roots****Example 4A: Adding and Subtracting Square Roots**

Add.

$$9\sqrt{3} + 7\sqrt{3}$$

$$16\sqrt{3}$$

**1-3 Square Roots****Example 4B: Adding and Subtracting Square Roots**

Subtract.

$$6\sqrt{5} - \sqrt{20}$$

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

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

$$4\sqrt{5}$$

**1-3** Square Roots**Check It Out! Example 4a**

Add or subtract.

$$3\sqrt{5} + 10\sqrt{5}$$
$$13\sqrt{5}$$

**1-3** Square Roots**Check It Out! Example 4b**

Add or subtract.

$$\sqrt{16} \cdot \sqrt{5}$$
$$\sqrt{80} - 5\sqrt{5}$$
$$- \sqrt{5}$$

Write your own problem involving combining radicals. Have your partner solve it...

## 1-4 Simplifying Algebraic Expressions

### *Objective*

Simplify and evaluate algebraic expressions.

## 1-4 Simplifying Algebraic Expressions

There are three different ways in which a basketball player can score points during a game. There are 1-point free throws, 2-point field goals, and 3-point field goals. An algebraic expression can represent the total points scored during a game.

**Total Points Scored**

$$f + 2g + 3t$$

Number of 1-point free throws    
 Number of 2-point field goals    
 Number of 3-point field goals

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## 1-4 Simplifying Algebraic Expressions

To translate a real-world situation into an algebraic expression, you must first determine the action being described. Then choose the operation that is indicated by the type of action and the context clues.

Action	Operation	Possible Context Clues
Combine	Add	How many total?
Combine equal groups	Multiply	How many altogether?
Separate	Subtract	How many more? How many remaining?
Separate into equal groups	Divide	How many in each group?

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## 1-4 Simplifying Algebraic Expressions

### Example 1: Translating Words into Algebraic Expressions

Write an algebraic expression to represent each situation.

- A. the number of apples in a basket of 12 after  $n$  more are added

$$12 + n$$

- B. the number of days it will take to walk 100 miles if you walk  $M$  miles per day

$$\frac{100}{m}$$

## 1-4 Simplifying Algebraic Expressions

### Check It Out! Example 1

Write an algebraic expression to represent each situation.

- a. Lucy's age  $y$  years after her 18<sup>th</sup> birthday

$$y + 18$$

- b. the number of seconds in  $h$  hours

$$3600 \times$$

$$3600h$$

Write your own situation that can be translated into a mathematical expression. Be as creative as possible. When done switch with your partner and see if they can write the expression to match your situation.

## 1-4 Simplifying Algebraic Expressions

To evaluate an algebraic expression, substitute a number for each variable and simplify by using the order of operations. One way to remember the order of operations is by using the mnemonic **PEMDAS**.

### Order of Operations

1. **P**arentheses and grouping symbols.
2. **E**xponents.
3. **M**ultiply and **D**ivide from left to right.
4. **A**dd and **S**ubtract from left to right.

## 1-4 Simplifying Algebraic Expressions

### Example 2A: Evaluating Algebraic Expressions

Evaluate the expression for the given values of the variables.

$$2x - xy + 4y \text{ for } x = 5 \text{ and } y = 2$$

$$\begin{aligned} &2 \cdot 5 - 5 \cdot 2 + 4 \cdot 2 \\ &10 - 10 + 8 \\ &0 + 8 \\ &8 \end{aligned}$$

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## 1-4 Simplifying Algebraic Expressions

### Example 2B: Evaluating Algebraic Expressions

Evaluate the expression for the given values of the variables.

$$q^2 + 4qr - r^2 \text{ for } r = 3 \text{ and } q = 7$$

$$\begin{aligned} &7^2 + 4 \cdot 7 \cdot 3 - 3^2 \\ &49 + 84 - 9 \\ &133 - 9 \\ &124 \end{aligned}$$

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## 1-4 Simplifying Algebraic Expressions

### Check It Out! Example 2

Evaluate  $x^2y - xy^2 + 3y$  for  $x = 2$  and  $y = 5$ .

## 1-4 Simplifying Algebraic Expressions

Recall that the terms of an algebraic expression are separated by addition or subtraction symbols. *Like terms* have the same variables raised to the same exponents. Constant terms are like terms that always have the same value.

$$3x^2 - 9xy + 2 + 4x^2 - 1$$

$5x^2 + 2x$   
 Like terms

Constant terms

## 1-4 Simplifying Algebraic Expressions

To simplify an algebraic expression, combine like terms by adding or subtracting their coefficients. Algebraic expressions are equivalent if they contain exactly the same terms when simplified.

### Remember!

Terms that are written without a coefficient have an understood coefficient of 1.

$$x^2 = 1x^2$$

Steps:

- 1) Simplify the equation ie: distributive property
- 2) Find all the like terms ie: same letter and exponent!
- 3) Add/Subtract them as the problem asks

## 1-4 Simplifying Algebraic Expressions

### Example 3A: Simplifying Expressions

Simplify the expression.

$$\underline{3x^2} + 2x - 3y + \underline{4x^2}$$

$$7x^2 + 2x - 3y$$

## 1-4 Simplifying Algebraic Expressions

### Example 3B: Simplifying Expressions

Simplify the expression.

$$j(6k^2 + 7k) + 9jk^2 - 7jk$$

$$6jk^2 + 7jk + 9jk^2 - 7jk$$

$$15jk^2$$

## 1-4 Simplifying Algebraic Expressions

### Check It Out! Example 3

Simplify the expression  $-3(2x - xy + 3y) - 11xy$ .

$$-6x - 8xy - 9y$$

## 1-4 Simplifying Algebraic Expressions

### Example 4A: Application

Apples cost \$2 per pound, and grapes cost \$3 per pound.

Write and simplify an expression for the total cost if you buy 10 lb of apples and grapes combined.

$$2p + 3p$$

$$5p$$

Write your own expression that has like-terms. Make sure to include at least 2 pairs of them and then simplify.

Homework

p. 24 #30-41

p. 30 #9-18, 27-28, 34

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