

# **Mukilteo School District**

# Sixth Grade Advanced Mathematics

**Review & Practice** 



Dear families,

As our community works to understand and respond to the effects of COVID-19, the Mukilteo School District sincerely appreciates your patience as we navigate this period of unprecedented school closures.

Attached to this letter is a packet of materials to help you supplement your child's education while away from the formal school environment. Please feel free to use the grade-level packets to review and practice previously taught skills in English/Language Arts, Mathematics and Science. They are not required, nor will they be graded. Answer keys are included in the packets so that your child can check their own work. Students are encouraged to skip around and find topics of interest and practice rather than complete them from beginning to end. If you find that your child's grade level is too challenging, or not challenging enough, you are welcome to work outside of their current grade level.

It is highly encouraged that your child continues to review and practice previously taught skills and remain engaged in learning. We hope these packets add to what you are already doing to support your child in learning during this challenging time.

Sincerely,

The Curriculum and Instruction Department Mukilteo School District

# **REVIEW:** Exponents

Name \_\_\_\_\_



**21. FLYING SAUCERS** You saw 5 flying saucers. Each flying saucer had 5 aliens. Each alien had 5 eyes. How many alien eyes were there altogether? Explain your reasoning.

# **REVIEW:** Order of Operations

Name \_\_\_\_\_

Key Concept and Vocabulary ————	
"Please Excuse My Dear Aunt Sally"	Simplify $4^2 \div 2 + 3(9 - 5)$ . Order of
1st Parentheses	$4^2 \div 2 + 3(9 - 5) = 4^2 \div 2 + 3 \cdot 4$
2nd Exponents	$= 16 \div 2 + 3 \cdot 4$
<i>3rd</i> <b>M</b> ultiplication and <b>D</b> ivision (from left to right	t) $= 8 + 12$
<i>4th</i> <b>A</b> ddition and <b>S</b> ubtraction (from left to right)	
Skill Examples A	Application Example
<b>1.</b> $18 \div 2 - 4 = 9 - 4 = 5$	6. At a museum, 4 adults pay \$5 each and
<b>2.</b> $12 \cdot (6-2) = 12 \cdot 4 = 48$	6 children pay \$3 each. What is the total cost of the tickets?
<b>3.</b> $14 \cdot 3 - 19 = 42 - 19 = 23$	$4 \cdot 5 + 6 \cdot 3 = 20 + 18$
<b>4.</b> $20 \div 10 + 21 \cdot 5 = 2 + 105 = 107$	= 38
5. $(2+3)^2 - 5 = 25 - 5 = 20$	The total cost is \$38.
PRACTICE MAKES PURR-FECT	Check your answers at BigIdeasMath.com. —
Simplify.	
<b>7.</b> $3^2 + 5(4 - 2) = $ <b>8.</b> $3 + 4 \div 2 = $	<b>9.</b> $10 \div 5 \cdot 3 =$
<b>10.</b> $4(3^3 - 8) \div 2 = $ <b>11.</b> $3 \cdot 6 - 4 \div 2 = $	<b>12.</b> $12 + 7 \cdot 3 - 24 =$
Insert parentheses to make the statement true.	
<b>13.</b> $5^2 - 15 \div 5 = 2$ <b>14.</b> $12 \cdot 2^3 + 4 = 144$	4 <b>15.</b> $91 - 21 \div 7 = 10$
Write an expression for the total area of the two rect	angles. Evaluate your expression.
	17. +
<b>18. ADMISSION</b> At a baseball game, 6 adults pay \$20 What is the total cost of the tickets?	each and 4 children pay \$10 each.

**19. INSERTING PARENTHESES** Insert parentheses in the expression  $4 + 2^3 - 5 \cdot 2$  in two ways: (a) so that the value is 10 and (b) so that the value is 14.

(a) \_\_\_\_\_

# **REVIEW:** Greatest Common Factor

Key Concept and VocabularyThe greatest common factor (GCF) of two<br/>or more positive monomials is the product<br/>of their common prime factors.Prime factorization:<br/> $165 = 3 \cdot 5 \cdot 11$ <br/> $210 = 2 \cdot 3 \cdot 5 \cdot 7$ The GCF of 165 and 210<br/>is  $3 \cdot 5 = 15$ .

### **Skill Examples**

- **1.**  $15 = 3 \cdot 5$  $30 = 2 \cdot 3 \cdot 5$  $GCF = 3 \cdot 5 = 15$
- **2.**  $20 = 2 \cdot 2 \cdot 5$  $28 = 2 \cdot 2 \cdot 7$  $GCF = 2 \cdot 2 = 4$
- **3.**  $48 = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 3$  $90 = 2 \cdot 3 \cdot 3 \cdot 5$  $GCF = 2 \cdot 3 = 6$
- 4.  $18x^3 = 2 \cdot 3 \cdot 3 \cdot x \cdot x \cdot x$   $21x^2 = 3 \cdot 7 \cdot x \cdot x$ GCF =  $3 \cdot x \cdot x = 3x^2$

# **PRACTICE** MAKES *PURR*-FECT<sup>™</sup>

#### Find the greatest common factor.

- 6.  $36 = \_$  GCF = \\_
   7.  $70 = \_$  GCF = \\_

    $45 = \_$   $98 = \_$   $98 = \_$  

   8.  $42 = \_$  GCF = \\_
   9.  $154 = \_$  GCF = \\_

    $105 = \_$  GCF = \\_
    $231 = \_$  GCF = \\_

   10.  $27y = \_$  GCF = \\_
   11.  $56m^5 = \_$  GCF = \\_

    $54y^3 = \_$  GCF = \\_
    $68m^4 = \_$  GCF = \\_
- 12. CLOTH You have two pieces of cloth. One piece is 80 inches wide and the other is 96 inches wide. You want to cut both pieces into strips of equal width that are as wide as possible. How wide should you cut each strip?width = \_\_\_\_\_

# Visual Model

Name



 $GCF = 2 \cdot 3 \cdot 6$ 

# **Application Example**

**5.** You have 48 red flowers, 60 yellow flowers, and 84 white flowers. You want to make flower arrangements that have the same number of each color. What is the greatest number of arrangements that you can make if every flower is used?

$$\begin{array}{l}
48 = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 3 \\
60 = 2 \cdot 2 \cdot 3 \cdot 5 \\
84 = 2 \cdot 2 \cdot 3 \cdot 7
\end{array}$$

$$GCF = 2 \cdot 2 \cdot 3 \\
= 12$$

You can make 12 arrangements.

Check your answers at BigIdeasMath.com.

# **REVIEW:** Least Common Multiple

Key Concept and VocabularyThe least common multiple (LCM) of two or<br/>more positive monomials is the product of<br/>their factors, using each common prime factor<br/>only once.Prime factorization: $30 = 2 \cdot 3 \cdot 5$ <br/> $42 = 2 \cdot 3 \cdot 7$ 

The LCM of 30 and 42 is  $2 \cdot 3 \cdot 5 \cdot 7 = 210$ .

# **Skill Examples**

- **1.**  $15 = 3 \cdot 5$  $30 = 2 \cdot 3 \cdot 5$  $LCM = 2 \cdot 3 \cdot 5 = 30$
- 2.  $20 = 2 \cdot 2 \cdot 5$   $28 = 2 \cdot 2 \cdot 7$ LCM =  $2 \cdot 2 \cdot 5 \cdot 7 = 140$
- **3.**  $48 = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 3$  $90 = 2 \cdot 3 \cdot 3 \cdot 5$ LCM =  $2 \cdot 2 \cdot 2 \cdot 2 \cdot 3 \cdot 3 \cdot 5 = 720$
- 4.  $18x^3 = 2 \cdot 3 \cdot 3 \cdot x \cdot x \cdot x$   $21x^2 = 3 \cdot 7 \cdot x \cdot x$ LCM =  $2 \cdot 3 \cdot 3 \cdot 7 \cdot x \cdot x \cdot x = 126x^3$

# PRACTICE MAKES PURR-FECT™

#### Find the least common multiple.



Name \_\_\_\_



# **Application Example**

5. Hot dogs come in packages of 10 and hot dog buns come in packages of 8. What is the least number of packages of each that you need to buy to have the same number of hot dogs and hot dog buns?

 $\begin{array}{c}
10 = 2 \cdot 5 \\
8 = 2 \cdot 2 \cdot 2
\end{array}$ LCM = 2 \cdot 2 \cdot 2 \cdot 5 \\
= 40

 $40 \div 10 = 4$  packages of hot dogs  $40 \div 8 = 5$  packages of hot dog buns

You must buy 4 packages of hot dogs and 5 packages of hot dog buns.

Check your answers at BigIdeasMath.com. ——

6.	36 =	LCM =	7.	70 =	LCM =
	45 =			98 =	
8.	42 =	LCM =	9.	154 =	LCM =
	105 =			231 =	
10.	27 <i>y</i> =	LCM =	11.	$56m^5 = $	LCM =
	$54y^3 = $			$68m^4 = $	

**12. BOXES** Boxes that are 12 inches tall are being stacked next to boxes that are 18 inches tall. What is the shortest height at which the two stacks will be the same height? height = \_\_\_\_\_

# **REVIEW:** Multiplying Fractions



### **Skill Examples**





**3.** 
$$\left(\frac{2}{5}\right)\left(\frac{1}{4}\right) = \frac{2 \cdot 1}{5 \cdot 4} = \frac{2}{20} = \frac{1}{10}$$

**4.**  $\frac{1}{7} \cdot \frac{3}{5} = \frac{1 \cdot 3}{7 \cdot 5} = \frac{3}{35}$ 

Name

**Visual Model** 



# **Application Example**

**5.** A recipe calls for three-fourths cup of flour. You want to make one-half of the recipe. How much flour should you use?

Check your answers at BigIdeasMath.com. -

$$\frac{1}{2} \cdot \frac{3}{4} = \frac{1 \cdot 3}{2 \cdot 4} = \frac{3}{8}$$

You should use  $\frac{3}{8}$  cup flour.

# PRACTICE MAKES PURR-FECT

Find the product. Write your answer in simplified form.



#### Find the area of the rectangle or parallelogram.



#### **REVIEW:** Multiplying Mixed Numbers Name

Key Concept and Vocabulary Nultip  $2\frac{1}{2} \times 1\frac{1}{2} = \frac{5}{2} \times \frac{3}{2} = \frac{15}{4}$ Rewrite as improper fractions.

#### **Skill Examples**





 $2\frac{1}{2}$  in.

**18.**  $\frac{3}{2}$  in.

# **REVIEW:** Dividing Fractions



### **Skill Examples**

- **1.**  $\frac{2}{5} \div \frac{1}{5} = \frac{2}{5} \cdot \frac{5}{1} = \frac{2 \cdot 5}{5 \cdot 1} = 2$
- **2.**  $\frac{2}{5} \div 5 = \frac{2}{5} \cdot \frac{1}{5} = \frac{2 \cdot 1}{5 \cdot 5} = \frac{2}{25}$
- **3.**  $\frac{9}{4} \div \frac{3}{4} = \frac{9}{4} \cdot \frac{4}{3} = \frac{9 \cdot 4}{4 \cdot 3} = 3$
- **4.**  $6 \div \frac{1}{2} = \frac{6}{1} \cdot \frac{2}{1} = \frac{6 \cdot 2}{1 \cdot 1} = 12$

Name

### **Visual Model**

There are 2 "one-thirds" in two-thirds.



# **Application Example**

**5.** You drive 25 miles in one-half hour. What is your average rate?

$$25 \div \frac{1}{2} = \frac{25}{1} \cdot \frac{2}{1} = 50 \text{ mi/h} \qquad r = \frac{d}{t}$$

Your average rate is 50 miles per hour.

Check your answers at BigIdeasMath.com -

# PRACTICE MAKES PURR-FECT

Find the quotient. Write your answer in simplified form.

 6.  $\frac{3}{5} \div \frac{1}{5} =$  7.  $4 \div \frac{1}{2} =$  8.  $\frac{2}{3} \div \frac{1}{6} =$  9.  $\frac{1}{6} \div \frac{2}{3} =$  

 10.  $\frac{2}{3} \div 2 =$  11.  $\frac{3}{4} \div 4 =$  12.  $\frac{3}{7} \div \frac{3}{7} =$  13.  $\frac{3}{7} \div \frac{7}{3} =$  

 14.  $5 \div \frac{1}{2} =$  15.  $\frac{9}{4} \div \frac{1}{4} =$  16.  $\frac{1}{4} \div \frac{1}{2} =$  17.  $\frac{3}{11} \div 11 =$ 

Find the height of the rectangle or parallelogram.



**22. SPEED** You drive 15 miles in one-fourth hour. What is your average speed? \_\_\_\_\_

**23. MAGNETIC TAPE** A refrigerator magnet uses  $\frac{5}{8}$  inch of magnetic tape. How many refrigerator magnets can you make with 10 inches of magnetic tape? Explain.

# **REVIEW:** Dividing Mixed Numbers



### **Skill Examples**

**1.** 
$$5 \div 2\frac{1}{2} = \frac{5}{1} \div \frac{5}{2} = \frac{5}{1} \times \frac{2}{5} = 2$$

**2.** 
$$3\frac{3}{4} \div 2\frac{1}{2} = \frac{15}{4} \div \frac{5}{2} = \frac{15}{4} \times \frac{2}{5} = \frac{3}{2} = 1\frac{1}{2}$$

- **3.**  $4\frac{1}{6} \div 1\frac{2}{3} = \frac{25}{6} \div \frac{5}{3} = \frac{25}{6} \times \frac{3}{5} = \frac{5}{2} = 2\frac{1}{2}$
- **4.**  $7\frac{1}{3} \div 11 = \frac{22}{3} \div \frac{11}{1} = \frac{22}{3} \times \frac{1}{11} = \frac{2}{3}$

Name\_

# Visual Model



# **Application Example**

5. You need  $2\frac{1}{2}$  inches of ribbon to make a Blue-Ribbon award. How many awards can you make with 35 inches of ribbon?

$$35 \div 2\frac{1}{2} = \frac{35}{1} \div \frac{5}{2} = \frac{35}{1} \times \frac{2}{5} = 14$$

You can make 14 awards.

# PRACTICE MAKES PURR-FECT

Check your answers at BigIdeasMath.com. —

Find the quotient. Write your answer as a whole or mixed number in simplest form.

 6.  $4\frac{1}{2} \div 9 =$  7.  $3\frac{3}{7} \div 8 =$  8.  $4\frac{2}{3} \div 7 =$  9.  $1\frac{7}{9} \div 4 =$  

 10.  $8 \div 1\frac{1}{3} =$  11.  $32 \div 3\frac{1}{5} =$  12.  $11 \div 2\frac{3}{4} =$  13.  $9 \div 1\frac{1}{2} =$  

 14.  $5\frac{1}{2} \div \frac{1}{2} =$  15.  $\frac{1}{2} \div 1\frac{1}{2} =$  16.  $1\frac{1}{4} \div 1\frac{1}{4} =$  17.  $3\frac{1}{2} \div 1\frac{1}{3} =$ 

#### Find the missing dimension.



- **20. RED RIBBONS** You need  $3\frac{1}{2}$  inches of ribbon to make a Red-Ribbon award. How many awards can you make with 35 inches of ribbon?
- **21. SHIPPING** You are stacking books into a shipping box that is 15 inches high. Each book is  $1\frac{1}{4}$  inches thick. How many books can you fit in a stack?



# **REVIEW:** Multiplying Decimals



### **Skill Examples**

<b>1.</b> 4 3.8	<b>2.</b> 0.327	<b>3.</b> 3 2.5
$\times 1.5$	$\times 24$	$\times$ 1.1 3
2190	1 308	975
438	6 54	325
65.7 0	7.848	325
		3 6.7 2 5

Name \_\_\_

## **Visual Model**



Area =  $2.5 \times 1.5 = 3.75$ 

2.4 ft

Check your answers at BigIdeasMath.com. —

4.1 ft

## **Application Example**

**4.** Find the area of the rectangle.

 $2.4 \times 4.1 = 9.84$ 

The area is 9.84 square feet.

PRACTICE MAKES PURR-FECT<sup>™</sup>

#### Find the product.

5.	3.02 × 5.2 =	6.	1.75 × 1 =		<b>7.</b> (9.004)(0) =
8.	$(4.05)^2 = $	9.	2.25 × 4 =		<b>10.</b> (100.5)(90) =
11.	19.4 × 5.05 =	12.	(1.2)(1.3)(1.4) =		<b>13.</b> 115 × 3.2 =
14.	16(0.375) =	15.	(2.347)(1.8) =		<b>16.</b> $(1.5)^3 = $
Find	the area of the rectangle.				
17.			18.		
	4.3 cm			9.3 in.	
	6.5 cm				15.6 in.
				Area =	

Area =

**19. APPLES** Apples cost \$3.45 per pound. Find the cost of 2.6 pounds of apples. \_\_\_\_\_

**20. PEACHES** Peaches cost \$4.29 per pound. Find the cost of two and a quarter pounds of peaches. Show your work. \_\_\_\_\_\_

# **REVIEW:** Dividing Decimals



#### **Skill Examples**

Find the quotient.

- **1.**  $65.3 \div 10 = 6.53$
- **2.**  $65.3 \div 100 = 0.653$
- **3.**  $65.3 \div 1000 = 0.0653$
- **4.**  $65.3 \div 10,000 = 0.00653$

Name \_\_\_\_

#### Visual Model





When you divide 12.5 into 5 equal parts, each part will be 2.5.

### **Application Example**

**5.** A prize of \$104.32 is divided equally among four people. How much does each person get?

 $104.32 \div 4 = 26.08$ 

••• Each person gets \$26.08.



Divide by a power

the decimal point.

of 10 by moving

Check your answers at BigIdeasMath.com.

<b>6.</b> 5.2 ÷ 10 =	<b>7.</b> 73.1 ÷ 100 =	<b>8.</b> 1500 ÷ 1000 =
<b>9.</b> 18.98 ÷ 3.65 =	<b>10.</b> 0.598 ÷ 2 =	<b>11.</b> 19.003 ÷ 1 =
<b>12.</b> 3.42 ÷ 0.36 =	<b>13.</b> 78.4 ÷ 1.4 =	<b>14.</b> 1000 ÷ 12.5 =
<b>15.</b> 0.45 ÷ 0.0125 =	<b>16.</b> 29.45 ÷ 4.75 =	<b>17.</b> 19.7 ÷ 0.1 =

#### Find the width of the rectangle.



- 20. DRIVING TRIP You drive 1400 miles in 3.5 days. What is the average number of miles you drive per day?
- **21. METRIC SYSTEM** There are 2.54 centimeters in one inch. How many inches are there in 51.78 centimeters? Round your answer to the nearest tenth of an inch.

# **REVIEW:** Ratios



Name \_\_\_\_

**13. CLASS RATIO** The ratio of boys to girls in a class is 5 to 4. There are 12 girls in the class. How many boys are in the class?

# **REVIEW:** Rates



#### **Skill Examples**

- 1. You drive 100 miles in 2 hours. Your unit rate is 50 miles per hour.
- **2.** You earn \$40 in 5 hours. Your unit rate is \$8 per hour.
- **3.** You save \$240 in 6 months. Your unit rate is \$40 per month.

Name \_

### Visual Model



### **Application Example**

**4.** Janice was 44 inches tall when she was 8 years old. She was 52 inches tall when she was 12 years old. What was her unit rate?

She grew 8 inches in 4 years:  $\frac{8}{4} = \frac{2}{1}$ .

Her unit rate is 2 inches per year.

Check your answers at BigIdeasMath.com.

# PRACTICE MAKES PURR-FECT

#### Write the unit rate in words and as a fraction for each situation.

5.	You fly 2000 miles in 4 hours.		
		Words	Fraction
6.	You pay 15 dollars for 3 pizzas.		
		Words	Fraction
7.	You pay \$4 sales tax on a \$50 purchase.		
		Words	Fraction
8.	You earn \$25 for mowing 5 lawns.		
		Words	Fraction

#### Circle the name of the person with the greater unit rate.

- 9. Maria saves \$50 in 4 months. Ralph saves \$60 in 5 months.
- **11.** Kim earns \$400 for working 40 hours. Sam earns \$540 for working 45 hours.

#### Convert the unit rate.

**13.**  $\frac{60 \text{ miles}}{1 \text{ hour}} = \frac{\boxed{1 \text{ feet}}}{1 \text{ second}}$ 

- 10. John rides his bicycle 36 miles in 3 hours. Randy rides his bicycle 30 miles in 2.5 hours.
- **12.** Arlene scores 450 points on 5 tests. Jolene scores 180 points on 2 tests.



# **REVIEW:** Direct Variation



#### **Skill Example**

**1. Equation:** y = 2xTable:

x	0	1	2	3	4	5
у	0	2	4	6	8	10

**Words:** *y* is twice the value of *x*.

Name \_

# Visual Model

For positive values of *x* and *y*, as *x* increases, *y* increases.





# **Application Example**

2. The amount *y* of gasoline a car uses is  $\frac{1}{20}$  times the number *x* of miles it travels. Make a table to show this relationship.

*y* is directly proportional to *x*.

Check your answers at BigIdeasMath.com. -

x	0	20	40	60	80	100
y	0	1	2	3	4	5

# PRACTICE MAKES PURR-FECT

#### Complete the table. Then sketch the graph.

**3.** y = 1.5x

V X y 7 6 0 5 4 1 3 2 1 2 0 L 0 1 2 3 4 5 6 7 8 9 x 3 4





#### WRITING AN EQUATION Write a direct variation equation for the table.

5.	x	0	1	2	3	4	
	у	0	3	6	9	12	

6.	x	0	1	2	3	4	
	у	0	0.4	0.8	1.2	1.6	

**7. WALRUS** The amount *y* that a walrus eats is directly proportional to its weight *x*. A 4000 pound walrus eats 20 pounds each day. How much does a 2000 pound walrus eat each day?

# **REVIEW:** Proportions



# Skill E

KII	li Examp	Dies
1.	$\frac{3}{5} = \frac{12}{20}$	is a proportion because the cross products are equal.
2.	$\frac{1}{7} = \frac{7}{48}$	is <i>not</i> a proportion because the cross products are not equal.
	10 5	is a proportion because the

**3.**  $\frac{10}{2} = \frac{5}{1}$  is a proportion because the cross products are equal.

Name \_\_\_\_

# Visual Model

The ratio "2 to 3" is equal to the ratio "4 to 6."



# Application Example

4. You spend \$5 for 3 tennis balls. Your friend spends \$6.25 for 4 tennis balls. Are the two rates proportional?

 $\frac{\$5}{3 \text{ balls}} \stackrel{?}{=} \frac{\$6.25}{4 \text{ balls}} \qquad 5(4) \neq 3(6.25)$ 

Check your answers at BigIdeasMath.com.

The rates are *not* proportional.

# **PRACTICE** MAKES *PURR*-FECT<sup>™</sup>

#### Decide whether the statement is a proportion.



#### Complete the proportion.







Write the proportion that compares the circumference to the radii of the two circles.



16. COMPARING RATES You spend \$20 for 5 T-shirts. Your friend spends \$15 for 3 T-shirts. Are the two rates proportional?



**7.** 150 g  $\approx$  \_\_\_\_\_ oz

**10.** 12 ft ≈ m

### **Skill Examples**



**3.** 8 oz 
$$\approx$$
 8 oz  $\cdot \frac{30 \text{ g}}{1 \text{ oz}} = 240 \text{ g}$ 

**4.** 
$$2 c \approx 2 c \cdot \frac{200 \text{ mL}}{1 c} = 400 \text{ mL}$$

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# **Application Example**

5. A person is 63 inches tall. How many centimeters is that?

63 in. 
$$\approx$$
 63 in. •  $\frac{3 \text{ cm}}{1 \text{ in.}}$ 

= 189 cm

The height of the person is ••• about 189 centimeters.

# **PRACTICE MAKES PURR-FECT**

#### Complete the unit conversion.

- **6.**  $26 \text{ mi} \approx \text{ km}$
- **9.** 70 lb  $\approx$  kg
- **13.**  $7 \text{ gal} \approx \_\_\_\_ L$ **12.**  $36 \text{ cm} \approx \_$ \_\_\_\_\_ in.
- **15.**  $800 \text{ mL} \approx$  c **16.**  $5 \text{ gal} \approx$  cm<sup>3</sup>
- **18. WEIGHT** How much does the wolf weigh in pounds?



**19. SPEED** A hummingbird flies at a speed of 33 feet per second. What is the speed of the hummingbird in meters per second?

Check your answers at BigIdeasMath.com.

- **8.** 2 L ≈ \_\_\_\_\_ qt
  - **11.** 16 km ≈ mi
  - **14.** 9 qt  $\approx$  \_\_\_\_\_ L
- **17.**  $12 \text{ m}^3 \approx \text{gal}$









#### **Skill Examples**



Name

Visual Model  $\frac{1}{4} = 0.25$ 



### **Application Example**

5. You put 16.75 gallons of gas in your car. Write this decimal as a mixed number.

$$16.75 = 16 + 0.75 = 16\frac{3}{4}$$

You put  $16\frac{3}{4}$  gallons of gas in your car.

Check your answers at BigIdeasMath.com.

# **PRACTICE MAKES PURR-FECT**

#### Write the fraction as a decimal.



**14.** 0.4 =

**15.** 0.35 = \_\_\_\_ **16.** 0.6 = \_\_\_\_ **17.** 1.5 = \_\_\_\_

Write the number represented by the model as a decimal and as a simplified fraction.



21. GAS You put 9.25 gallons of gas in your car. Write this decimal as a mixed number.

22. MULTIPLE FORMS Write the decimal 0.35 in two ways. One with a denominator of 100 and one with a denominator of 1000.



**22. SPANISH LANGUAGE** Twelve of the 40 students in your class can speak Spanish. What percent is this? \_\_\_\_\_\_

# **REVIEW:** Percents and Decimals

Name \_\_\_\_



- **21. BUDGET** You have set aside two twenty-fifths of your monthly budget for clothing. What percent is this? \_\_\_\_\_
- **22. SUMMER SCHOOL** Eighty-seven percent of the students in your class do not plan to attend summer school. What percent of your class plans to attend summer school?

# **REVIEW:** Finding the Percent of a Number



Name \_\_\_\_

# Visual Model



#### **Skill Examples**

- **1.** 30% of 50:  $0.3 \times 50 = 15$
- **2.** 45% of 80:  $0.45 \times 80 = 36$
- **3.** 110% of 40:  $1.1 \times 40 = 44$
- **4.** 25% of 240:  $0.25 \times 240 = 60$

### **Application Example**

**5.** 28% of the 200 people who answered a survey own a dog. How many of the 200 people in the survey own a dog?

 $0.28 \times 200 = 56$ 

56 of the 200 people own a dog.

Check your answers at BigIdeasMath.com.

# PRACTICE MAKES PURR-FECT

#### Find the percent of the number.

6. 25% of 40 =\_\_\_\_\_ 7. 20% of 35 =\_\_\_\_\_ 8. 65% of 110 =\_\_\_\_ 9. 125% of 20 =\_\_\_\_\_ 10.  $33\frac{1}{3}\% \text{ of } 60 =$ \_\_\_\_\_ 11. 95% of 400 =\_\_\_\_\_ 12. 200% of 31 =\_\_\_\_ 13. 18% of 90 =\_\_\_\_\_ 14. 1% of 800 =\_\_\_\_\_ 15. 60% of 60 =\_\_\_\_\_ 16. 100% of 59 =\_\_\_\_\_ 17. 1000% of 59 =\_\_\_\_\_

#### Write the question represented by the model. Then answer the question.

18.	0%	20%	40%	60%	80%	100%	19.	0%	20%	40%	60%	80%	100%
	0	18	36	54	72	90		0	24	48	72	96	120
	Quest	ion:						Quest	tion:				
	Answe	er:						Answ	er:				

- **20. ENDANGERED SPECIES** Sixty percent of a species of butterfly died due to loss of habitat. Originally, there were 10,000 butterflies. How many are left? \_\_\_\_\_
- **21. SALES TAX** You buy 4 breakfast sandwiches at \$2.59 each, 4 hashbrowns at \$1.10 each, and 4 bottles of orange juice at \$1.25 each. The sales tax is 6%. Find the total cost of the 4 meals, including sales tax.

# **REVIEW:** Percents and Proportions



### **Skill Examples**

1. 
$$\frac{36}{50} = \frac{p}{100}$$
  
 $100 \cdot \frac{36}{50} = 100 \cdot \frac{p}{100}$   
 $72 = p$ 

So, 36 is 72% of 50.

2. 
$$\frac{a}{36} = \frac{20}{100}$$
  
 $36 \cdot \frac{a}{36} = 36 \cdot \frac{20}{100}$ 

$$a = 7.2$$

So, 7.2 is 20% of 36.

Name \_

# Visual Model



# **Application Example**

**3.** A basketball player makes 45%, or 9 shots, of her attempted shots. How many shots did the basketball player attempt?

$$\frac{9}{w} = \frac{45}{100}$$
$$9 \cdot 100 = w \cdot 45$$
$$900 = 45w$$
$$\frac{900}{45} = \frac{45w}{45}$$
$$20 = w$$
The basketball



player attempted 20 shots.

-

Check your answers at BigIdeasMath.com. **–** 

#### Write and solve a proportion to answer the question.

**PRACTICE** MAKES PURR-FECT

- **4.** 68 is what percent of 80?
- **6.** 36 is 16% of what number?
- **8.** What number is 64% of 40?

- **5.** What number is 25% of 116?
- 7. 48 is what percent of 128?
- **9.** 77 is 55% of what number?
- **10. PLAY** Students are auditioning for a play. Of the 60 students auditioning, 12 will get a part in the play. What percent of the students who audition will get a part in the play?
- **11. HOMEWORK** You have completed 60% of your English homework. The assignment has 25 questions. How many questions are left? \_\_\_\_\_

# **REVIEW:** Estimating and Finding a Tip

Key Concept and Vocabulary – To find the tip on a food bill at a restaurant, write the percent as a decimal or fraction and multiply it by the cost of the food bill.



# **Application Examples**

1. Your food bill at a restaurant is \$8.49. You leave a 15% tip.

Estimate: Round 8.49 to 10.

 $0.15\times10=1.5$ 

The estimate for the tip is \$1.50.

Actual:  $0.15 \times 8.49 \approx 1.27$ 

• The actual tip is \$1.27.

# Visual Model

Name \_\_\_\_\_

0%	20%	40%	60%	80%	100%
0	8	16	24	32	40

A 20% tip on a food bill of \$40 is \$8.

**2.** Your food bill at a restaurant is \$15.83. You leave a 20% tip.

Estimate: Round 15.83 to 16.

 $0.2 \times 16 = 3.2$ 

The estimate for the tip is \$3.20.

#### **Actual:** $0.2 \times 15.83 \approx 3.17$

The actual tip is \$3.17.

Check your answers at BigIdeasMath.com.

#### Estimate the tip. Then find the actual tip.

**PRACTICE MAKES PURR-FEC** 

3.	Food bill: \$33.65; Tip: 15%
4.	Food bill: \$44.28; Tip: 20%
5.	Food bill: \$11.17; Tip: 15%
6.	Food bill: \$12.37; Tip: 20%
7.	Food bill: \$23.16; Tip: 15%
8.	Food bill: \$16.21; Tip: 20%
9.	Food bill: \$37.54; Tip: 25%
10.	Food bill: \$25.96; Tip: 20%
11.	Food bill: \$28.93; Tip: 15%
12.	Food bill: \$72.79; Tip: 25%
13.	Food bill: \$19.82; Tip: 23%
14.	Food bill: \$51.56; Tip: 30%

# **REVIEW:** Estimating and Finding a Sales Tax

- Key Concept and Vocabulary -To find the sales tax on an Sales Tax item, write the percent as a decimal or fraction and multiply it by the price of



### **Application Examples**

the item.

**1.** A DVD costs \$20 before tax. The sales tax is 7%.

Estimate: Round 7% to 5%.

 $0.05 \times 20 = 1$ 

The estimate for the sales tax is \$1.

Actual:  $0.07 \times 20 = 1.4$ 

The actual sales tax is \$1.40.

Name \_\_\_\_

# **Visual Model**

5	5%									
0%		20%	6	40%	6	60%	ó	80%	6	100%
0	2.5	5	7.5	10	12.5	15	17.5	20	22.5	25
1.	25									

Using a sales tax of 5%, the sales tax on a \$25 shirt is \$1.25.

**2.** A bicycle costs \$115 before tax. The sales tax is 9%.

**Estimate:** Round 9% to 10% and 115 to 120.  $0.1 \times 120 = 12$ 

The estimate for the sales tax is \$12.

#### Actual: $0.09 \times 115 = 10.35$

The actual sales tax is \$10.35.

Check your answers at BigIdeasMath.com.

# **PRACTICE MAKES PURR-FECT**

#### Estimate the sales tax. Then find the actual sales tax.

- **3. BASEBALL CARDS** The pack of baseball cards costs \$3.75 before tax. The sales tax is 4%.
- **4. TELEVISION** A television costs \$400 before tax. The sales tax is 8%.
- 5. MP3 PLAYER An MP3 player costs \$89 before tax. The sales tax is 6%.
- 6. COUCH A couch costs \$675 before tax. The sales tax is 5%.
- **7. GUITAR** A guitar costs \$299 before tax. The sales tax is 9%.
- **8. TABLE** A table costs \$50 before tax. The sales tax is 4.5%.
- 9. JEANS A pair of jeans costs \$39 before tax. The sales tax is 5.5%.

# **REVIEW:** Estimating and Finding a Discount

- Key Concept and Vocabulary

A discount is a decrease in the original price of an item. To find the discount, write the percent as a decimal or fraction and multiply it by the original price of the item.



# **Application Examples**

**1.** The original price of a book is \$18.79. The discount is 20%.

Estimate: Round 18.79 to 20.

 $0.2 \times 20 = 4$ 

The estimate for the discount is \$4.

**Actual:**  $0.2 \times 18.79 \approx 3.76$ 

The actual discount is \$3.76. The sale price of the book is \$18.79 - \$3.76 = \$15.03.

# Name \_

# Visual Model



**2.** The original price of a pair of in-line skates is \$209.99. The discount is 15%.

**Estimate:** Round 209.99 to 200.

 $0.15\times 200=30$ 

The estimate for the discount is \$30.

**Actual:**  $0.15 \times 209.99 \approx 31.50$ 

The actual discount is \$31.50. The sale price of the pair of in-line skates is \$209.99 - \$31.50 = \$178.49.

# PRACTICE MAKES PURR-FECT

Check your answers at BigIdeasMath.com. —

#### Estimate the discount. Then find the actual discount and the sale price.

- **3. TRUMPET** The original price of a trumpet is \$319.29. The discount is 25%.
- **4. SHOES** The original price of a pair of shoes is \$47.99. The discount is 40%.
- **5.** LAMP The original price of a lamp is \$17.09. The discount is 15%.
- **6. RING** The original price of a ring is \$96.75. The discount is 60%.
- **7. ELECTRONICS** The original price of a home theater system is \$243.89. The discount is 75%.
- **8. BASEBALL** The original price of a baseball glove is \$26.99. The discount is 30%.
- **9. SEWING MACHINE** The original price of a sewing machine is \$182.96. The discount is 20%.

Name

# **REVIEW:** Properties of Addition and Multiplication

Key Concept and Vocabulary -

**Associative Properties:** (a + b) + c = a + (b + c) $(a \bullet b) \bullet c = a \bullet (b \bullet c)$ **Distributive Property:** 

a(b+c) = ab + ac

a(b-c) = ab - ac

**Inverse Properties:** a + (-a) = -a + a = 0

# **Skill Examples**

#### Identify the property illustrated.

- **1.**  $-2 \cdot (7 \cdot 5) = -2 \cdot (5 \cdot 7)$ Commutative Property of Multiplication
- **3.** 3(6x + 2) = 18x + 6**Distributive Property**

- **2.**  $(-8) \cdot 1 = -8$ Identity Property of Multiplication
- **4.** (w + 3) + 7 = w + (3 + 7)Associative Property of Addition

Check your answers at BigIdeasMath.com. —

# **PRACTICE MAKES PURR-FEC1**

#### Identify the property illustrated.

- **5.**  $(9 \cdot 4) \cdot 5 = 9 \cdot (4 \cdot 5)$
- 7. 2a + (-2a) = 0
- **9.**  $9m \cdot 0 = 0$
- **11.** 7n 4n = (7 4)n

**8.** 0 + 11c = 11c

**6.**  $(-1) \cdot (-12) = 12$ 

- **10.** (5-2b)+3 = (-2b+5)+3
- **12.**  $\frac{1}{15d} \cdot 15d = 1$
- **14.**  $\left(\frac{1}{16}k\right)(-32) = (-32)\left(\frac{1}{16}k\right)$

**13.** x + (y + 6) = (x + y) + 6

**Commutative Properties:** So many a + b = b + a $a \cdot b = b \cdot a$ **Identity Properties:** a + 0 = 0 + a = a $a \cdot 1 = 1 \cdot a = a$ Multiplication Properties of 0 and -1:  $a \bullet 0 = 0 \bullet a = 0$  $a \cdot (-1) = (-1) \cdot a = -a$  $a \cdot \frac{1}{-} = \frac{1}{-} \cdot a = 1, a \neq 0$ 



# $2 \cdot 5$ 2 • 3 +

6. You buy 3 hot dogs for \$1.25 each and 3 sodas for \$0.75 each. Find the total cost.

3(1.25) + 3(0.75) = 3(1.25 + 0.75)

$$= 3(2.00)$$

= 6

The total cost is \$6.00.

Check your answers at BigIdeasMath.com.

#### Use the Distributive Property to rewrite the expression.

**PRACTICE MAKES PURR-FECT** 

7.	3(4 + 5) =	<b>8.</b> 5(8 - 3) =		<b>9.</b> 9(11 + 7	/) =
10.	8(27 - 9) =	<b>11.</b> 6(17 – 7) =		<b>12.</b> 4(7 + 3	+ 2) =
13.	5 • 7 + 5 • 3	<b>14.</b> 2 • 9 − 2 • 6 =		<b>15.</b> 7 • 4 + 7	Ø • 8 =
16.			17.	=	+

- **18. MENTAL MATH** You buy 5 hot dogs for \$1.29 each and 5 sodas for \$0.71 each. Show how you can use mental math to find the total cost.
- **19. EXTENSION** Does the Distributive Property apply to a combination of addition *and* subtraction? Decide using the expression 3(7 + 5 - 4).







## **Skill Examples**

- **1.** 5 + (-3) = 5 3 = 2
- **2.** 5 (-2) = 5 + 2 = 7
- **3.** -2+4=2
- **4.**  $-3 (-2) = -3 + 2 = -1 \leftarrow$  change the sign and add.
- **5.** 8 (-3) = 8 + 3 = 11

Name \_\_\_\_\_

# Visual Model

To add a positive number, move to the *right*.



To subtract a positive number, move to the *left*.

# **Application Example**

**6.** The temperature is  $8^{\circ}$ F in the morning and drops to  $-5^{\circ}$ F in the evening. What is the difference between these temperatures?

Check your answers at BigIdeasMath.com.

$$8 - (-5) = 8 + 5$$

The difference is 13 degrees.

# PRACTICE MAKES PURR-FECT

Find the sum or difference.

<b>7.</b> -2 + 3 =	<b>8.</b> -4 - 5 =	<b>9.</b> 8 – 2 =	<b>10.</b> 8 - (-2) =
<b>11.</b> -4 - (-1) =	<b>12.</b> -5 + (-5) =	<b>13.</b> 4 - (-8) =	<b>14.</b> 4 - 8 =
<b>15.</b> -4 + (-6) =	<b>16.</b> -4 -(-6) =	<b>17.</b> 10 - 13 =	<b>18.</b> 13 - (-10) =

#### Write the addition or subtraction shown by the number line.

19.		<b>—</b>						→		20.							-	
	<+	<b>♦</b> ──┼─							→	<	+							+→
	-5 -4 -	3 -2	-1	0	1	2	3	4	5	-5 -	-4 -3	3 -2 -1	0	1	2	3	4	5

**21. TEMPERATURE** The temperature is 16°F in the morning and drops to -15°F in the evening. What is the difference between these temperatures?

To subtract,

**22. SUBMARINE** A submarine is 450 feet below sea level. It descends 300 feet. What is its new position? Show your work.





**<sup>26.</sup>** TEMPERATURE The low temperatures for a week in Edmonton, Alberta are -15 C,  $-12^{\circ}$ C,  $-10^{\circ}$ C,  $-12^{\circ}$ C,  $-18^{\circ}$ C,  $-20^{\circ}$ C, and  $-25^{\circ}$ C. What is the mean low temperature for the week? Show your work.

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# **Operations with Rational Numbers**

To add, subtract, multiply, or divide rational numbers, use the same rules for signs as you used for integers.

Example 1 Find (a)  $-\frac{5}{6} + \frac{2}{3}$  and (b) 7.3 - (-4.8).

**a.** Write the fractions with the same denominator, then add.

 $-\frac{5}{6} + \frac{2}{3} = -\frac{5}{6} + \frac{4}{6} = \frac{-5+4}{6} = \frac{-1}{6} = -\frac{1}{6}$ 

**b.** To subtract a rational number, add its opposite.

7.3 - (-4.8) = 7.3 + 4.8 = 12.1 The opposite of -4.8 is 4.8.

Example 2 Find (a) 2.25 • 8, (b) -2.25 • (-8), and (c) -2.25 • 8.

**a.** 
$$2.25 \cdot 8 = 18$$
 **b.**  $-2.25 \cdot (-8) = 18$  **c.**  $-2.25 \cdot 8 = -18$ 

Example 3 Find  $-\frac{4}{9} \div \frac{3}{4}$ .

To divide by a fraction, multiply by its reciprocal.

Add, subtract, multiply, or divide.

 $-\frac{4}{9} \div \frac{3}{4} = -\frac{4}{9} \cdot \frac{4}{3} = -\frac{4 \cdot 4}{9 \cdot 3} = -\frac{16}{27}$  The reciprocal of  $\frac{3}{4}$  is  $\frac{4}{3}$ .

### **Practice**

Check your answers at BigIdeasMath.com.

THERMOMETER

<b>1.</b> -7.5 + 3.8	<b>2.</b> $-18.3 + (-6.7)$	<b>3.</b> 0.6 - 0.85	<b>4.</b> 6.13 - (-2.82)
<b>5.</b> -6 • 4.75	<b>6.</b> −3.2 • (−4.8)	<b>7.</b> −1.8 ÷ (−9)	<b>8.</b> 3.6 ÷ (−1.5)
<b>9.</b> $-\frac{1}{6} + \frac{5}{6}$	<b>10.</b> $-\frac{7}{10} + \left(-\frac{3}{5}\right)$	<b>11.</b> $\frac{4}{9} - \frac{2}{3}$	<b>12.</b> $-\frac{5}{6} - \frac{1}{4}$
<b>13.</b> $-\frac{3}{2} \cdot \left(-\frac{1}{8}\right)$	<b>14.</b> $-\frac{3}{4} \cdot \frac{7}{12}$	<b>15.</b> $\frac{5}{8} \div \left(-\frac{1}{4}\right)$	<b>16.</b> $-\frac{4}{7} \div \frac{2}{5}$

- **17. TEMPERATURE** The temperature at midnight is shown. The outside temperature decreases 2.3°C over the next two hours. What is the outside temperature at 2 A.M.?
- **18. SNOWFALL** In January, a city's snowfall was  $\frac{5}{8}$  foot below the historical average. In February, the snowfall was  $\frac{3}{4}$  foot above the historical average. Was the city's snowfall in the two-month period above or below the historical average? By how much?

Topic 3.2

# **REVIEW:** Writing and Graphing Inequalities



## **Skill Examples**

- **1.** x > 0: All positive numbers
- **2.**  $x \ge 0$ : All nonnegative numbers
- **3.** x < 0: All negative numbers
- **4.**  $x \le 0$ : All nonpositive numbers

# **PRACTICE** MAKES *PURR*-FECT<sup>™</sup>

#### Write an inequality for the statement.

- 6. All numbers that are less than 24
- **8.** All numbers greater than 10
- **10.** All numbers that are at least 11

-5 -4 -3 -2 -1 0

-4 -3 -2 -1

Graph the inequality.

**12.** x > -1

**14.** *x* ≤ 3

-

1.

- **9.** All numbers that are no more than 5
- **11.** All numbers less than or equal to 8

#### **13.** *x* < 4 -5 -4 -3 -2 -1 0 **15.** $x \ge 0$ 0 -5 -4 -3 -2 -1 1 2

#### **16.** A sign at a shoe store reads "Savings up to 60%." Let *P* represent the percent of savings. Write an inequality to describe *P*.

1

0



Name

Visual Model

#### 0 2 -3 -2 -1



x > 2

# **Application Example**

**5.** A sign at a clothing store reads "Savings up to 70%." Let S represent the percent of savings. Write an inequality to describe *S*.

> *S* can be equal to 70%. Or *S* can be less than 70%.

An inequality is  $S \leq 70\%$ .

Check your answers at BigIdeasMath.com.

- 7. All numbers that are at most 3

4 5

5

3

2

# **REVIEW:** Writing Expressions and Equations

**Key Concept and Vocabulary Phrase:** Two more than a number **Expression:** 2 + n **Sentence:** Two more than a number is equal to six. **Equation:** 2 + n = 6

### **Skill Examples**

- **1.** Five times a number: 5*n*
- **2.** Six less than three times a number: 3n 6
- **3.** The sum of a number and one: n + 1
- **4.** A number divided by three:  $n \div 3$

Name \_\_\_

# Visual Model



# **Application Example**

**5.** Write an equation for the following. *"The price of \$15 is the wholesale cost plus a markup of fifty percent."* 

• An equation is 15 = C + 0.5C.

Let *C* be the wholesale cost. 50% of *C* is 0.5*C*.



#### Write the verbal phrase as a mathematical expression.

- 6. The product of a number and two
- **8.** 19 less than twice a number
- **10.** Five times the sum of a number and two

#### Write the sentence as an equation.

- **12.** Three times a number equals nine.
- **14.** Twelve divided by a number is four.

- 7. 10 subtracted from a number
- **9.** The sum of a number and three, divided by four
- **11.** Seven less than four times a number
- **13.** The difference of a number and nine is four.
- **15.** The sum of a number and seven is eighteen.

16. The volume of a cone is one-third the area of the base times the height. A cone has a volume of  $20\pi$  cubic inches. Write an equation that can be used to solve for the height of the cone.



# **REVIEW:** Evaluating Expressions

Name \_



#### **Skill Examples**

- 1. When x = 5, 3x + 4 is 3(5) + 4 = 19.
- **2.** When x = -1, 5x + 7 is 5(-1) + 7 = 2.
- **3.** When x = 3,  $4x^2$  is  $4(3^2) = 36$ .
- 4. When x = 4,  $x^3 + 1$  is  $4^3 + 1 = 65$ .

## Visual Model

X	2 <i>x</i> + 3	Value of Expression
1	2(1) + 3	5
2	2(2) + 3	7
3	2(3) + 3	9
4	2(4) + 3	11

### **Application Example**

C =

**5.** For a Celsius temperature *C* the Fahrenheit temperature *F* is  $\frac{9}{5}C + 32$ . Find *F* when

25°.  

$$\frac{9}{5}C + 32 = \frac{9}{5}(25) + 32$$
  
 $= 45 + 32$   
 $= 77$ 

The Fahrenheit temperature is 77°.

Check your answers at BigIdeasMath.com.

7. When x = -1, 3x + 9 = \_\_\_\_\_.

**9.** When  $x = \frac{1}{2}$ ,  $3x^2 =$  \_\_\_\_\_.

**11.** When x = 0,  $4x^2 + 5 =$  \_\_\_\_\_.

**13.** When  $x = 2\frac{1}{2}$ , 6x + 3 =\_\_\_\_\_.

#### Evaluate the expression.

- **6.** When x = 2, 3x 1 = \_\_\_\_\_.
- **8.** When x = 4,  $x^2 5 =$  \_\_\_\_\_.

**PRACTICE MAKES PURR-FEC1** 

- **10.** When x = 3.1, 5x + 0.5 = \_\_\_\_\_.
- **12.** When x = 10,  $x^2 8x + 11 =$  \_\_\_\_\_.

#### Evaluate the perimeter when x = 3.



**15.** x + 1 2x - 1 P = \_\_\_\_\_



**16. CARDINAL** The weight of the cardinal (in ounces) is 0.6x + 11 after its eats *x* ounces of bird seed. How much does it weigh after it eats 2 ounces of bird seed?

# **REVIEW:** Simplifying Expressions



#### **Skill Examples**

- **1.** 2x + 5x = 7x
- **2.** 1 + n + 4 = n + 5
- **3.** (2x+3) (x+2) = x+1
- **4.** 2(y-1) + 3(y+2) = 5y + 4

Name\_

# Visual Model

**Algebra Tiles** 



# **Application Example**

5. The original cost of a shirt is *x* dollars. The shirt is on sale for 30% off. Write a simplifed expression for the sale cost.



x - 0.3x = 0.7x

• The sale cost is 0.7x.

# PRACTICE MAKES PURR-FECT

Simplify the expression. (Remove parentheses and combine like terms.)

- 6. 4x + 6x = \_\_\_\_\_\_ 8. 9x + 3 - 6x - 2 = \_\_\_\_\_ 10. 7m - 2m + 5m = \_\_\_\_\_ 12. (3x + 6) - x = \_\_\_\_\_ 14. (x + 6) - (x + 6) = \_\_\_\_\_ 16. (5x + 4) - 2(x + 1) = \_\_\_\_\_
- 7. 3n + 5 2n = \_\_\_\_\_ 9. 3(x + 2) = \_\_\_\_\_ 11. 2 - (x + 1) = \_\_\_\_\_ 13. 5 - (1 - n) = \_\_\_\_\_ 15. (4x - 2) + 3(x + 1) = \_\_\_\_\_ 17. 5(x + 2) - 2(x + 2) = \_\_\_\_\_

Check your answers at BigIdeasMath.com.

#### Write a simplified expression for the perimeter of the rectangle or triangle.



**21.** The original cost of a cell phone is *x* dollars. The phone is on sale for 35% off. Write a simplified expression for the sale cost.

# **REVIEW:** Exponents

Name \_\_\_\_\_



**21. FLYING SAUCERS** You saw 5 flying saucers. Each flying saucer had 5 aliens. Each alien had 5 eyes. How many alien eyes were there altogether? Explain your reasoning. 125 alien eyes;  $5^3 = 5 \cdot 5 \cdot 5 = 125$ 

# **REVIEW:** Order of Operations

Name \_\_\_\_



- **18. ADMISSION** At a baseball game, 6 adults pay \$20 each and 4 children pay \$10 each. What is the total cost of the tickets? \$160
- **19. INSERTING PARENTHESES** Insert parentheses in the expression  $4 + 2^3 5 \cdot 2$  in two ways: (a) so that the value is 10 and (b) so that the value is 14.

(a) 
$$4 + (2^3 - 5) \cdot 2$$

(b) \_\_\_\_  $(4+2^3-5) \cdot 2$ 

# **REVIEW:** Greatest Common Factor

- Key Concept and Vocabulary — The greatest common factor (GCF) of two or more positive monomials is the product of their common prime factors. Prime factorization:  $165 = 3 \cdot 5 \cdot 11$  $210 = 2 \cdot 3 \cdot 5 \cdot 7$ The GCF of 165 and 210 is  $3 \cdot 5 = 15$ .

### **Skill Examples**

- **1.**  $15 = 3 \cdot 5$  $30 = 2 \cdot 3 \cdot 5$  $GCF = 3 \cdot 5 = 15$
- **2.**  $20 = 2 \cdot 2 \cdot 5$  $28 = 2 \cdot 2 \cdot 7$  $GCF = 2 \cdot 2 = 4$
- **3.**  $48 = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 3$  $90 = 2 \cdot 3 \cdot 3 \cdot 5$  $GCF = 2 \cdot 3 = 6$
- **4.**  $18x^3 = 2 \cdot 3 \cdot 3 \cdot x \cdot x \cdot x$  $21x^2 = 3 \cdot 7 \cdot x \cdot x$  $GCF = 3 \cdot x \cdot x = 3x^2$

# **PRACTICE** MAKES PURR-FECT

#### Find the greatest common factor.

- **6.**  $36 = 2 \cdot 2 \cdot 3 \cdot 3$  GCF = 9 **7.**  $70 = 2 \cdot 5 \cdot 7$  GCF = 14  $45 = 3 \cdot 3 \cdot 5$
- **8.**  $42 = 2 \cdot 3 \cdot 7$  GCF = 21 **9.**  $154 = 2 \cdot 7 \cdot 11$  GCF = 77  $105 = 3 \cdot 5 \cdot 7$
- **10.**  $27y = \frac{3 \cdot 3 \cdot 3 \cdot y}{54y^3 = 2 \cdot 3 \cdot 3 \cdot 3 \cdot y \cdot y} GCF = \frac{27y}{y}$  **11.**  $56m^5 = \frac{2 \cdot 2 \cdot 2 \cdot 7 \cdot m}{m \cdot m \cdot m \cdot m \cdot m \cdot m} GCF = 4m^4$
- 12. CLOTH You have two pieces of cloth. One piece is 80 inches wide and the other is 96 inches wide. You want to cut both pieces into strips of equal width that are as wide as possible. How wide should you cut each strip? width = 16 inches

Visual Model

Name \_\_\_\_



 $GCF = 2 \cdot 3 \cdot 6$ 

# **Application Example**

5. You have 48 red flowers, 60 yellow flowers, and 84 white flowers. You want to make flower arrangements that have the same number of each color. What is the greatest number of arrangements that you can make if every flower is used?

$$\begin{array}{l}
48 = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 3 \\
60 = 2 \cdot 2 \cdot 3 \cdot 5 \\
84 = 2 \cdot 2 \cdot 3 \cdot 7
\end{array}$$

$$GCF = 2 \cdot 2 \cdot 3 \\
= 12$$

You can make 12 arrangements.

 $98 = 2 \cdot 7 \cdot 7$ 

 $231 = \underline{3 \cdot 7 \cdot 11}$ 

Check your answers at BigIdeasMath.com.

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# **REVIEW:** Least Common **Multiple**

- Key Concept and Vocabulary ——— The least common multiple (LCM) of two or more positive monomials is the product of their factors, using each common prime factor only once. Prime factorization:  $30 = 2 \cdot 3 \cdot 5$ 

The LCM of 30 and 42 is  $2 \cdot 3 \cdot 5 \cdot 7 = 210.$ 

 $42 = 2 \cdot 3 \cdot 7$ 

# **Skill Examples**

- **1.**  $15 = 3 \cdot 5$  $30 = 2 \cdot 3 \cdot 5$  $LCM = 2 \cdot 3 \cdot 5 = 30$
- **2.**  $20 = 2 \cdot 2 \cdot 5$  $28 = 2 \cdot 2 \cdot 7$  $LCM = 2 \cdot 2 \cdot 5 \cdot 7 = 140$
- **3.**  $48 = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 3$  $90 = 2 \cdot 3 \cdot 3 \cdot 5$  $LCM = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 3 \cdot 3 \cdot 5 = 720$
- **4.**  $18x^3 = 2 \cdot 3 \cdot 3 \cdot x \cdot x \cdot x$  $21x^2 = 3 \cdot 7 \cdot x \cdot x$  $LCM = 2 \cdot 3 \cdot 3 \cdot 7 \cdot x \cdot x \cdot x = 126x^3$

# **PRACTICE** MAKES *PURR*-FECT<sup>™</sup>

#### Find the least common multiple.

- $45 = 3 \cdot 3 \cdot 5$
- **8.**  $42 = 2 \cdot 3 \cdot 7$  LCM = 210
- $54v^3 = 2 \cdot 3 \cdot 3 \cdot 3 \cdot y \cdot v \cdot v$



# **Application Example**

5. Hot dogs come in packages of 10 and hot dog buns come in packages of 8. What is the least number of packages of each that you need to buy to have the same number of hot dogs and hot dog buns?

 $10 = 2 \cdot 5$  ) LCM =  $2 \cdot 2 \cdot 2 \cdot 5$  $8 = 2 \cdot 2 \cdot 2 \quad = 40$ 

 $40 \div 10 = 4$  packages of hot dogs  $40 \div 8 = 5$  packages of hot dog buns

You must buy 4 packages of hot dogs and 5 packages of hot dog buns.

Check your answers at BigIdeasMath.com. —

- **6.**  $36 = 2 \cdot 2 \cdot 3 \cdot 3$  LCM = 180 **7.**  $70 = 2 \cdot 5 \cdot 7$  LCM = 490  $98 = 2 \cdot 7 \cdot 7$ **9.**  $154 = 2 \cdot 7 \cdot 11$  LCM = 462  $105 = \underline{3 \cdot 5 \cdot 7} \\ 10. \ 27y = \underline{3 \cdot 3 \cdot 3 \cdot y} \\ LCM = \underline{54y^3} \\ 11. \ 56m^5 = \underline{11} \\ LCM = \underline{952m^5} \\ LCM = \underline{9$  $68m^4 = 2 \cdot 2 \cdot 17 \cdot m \cdot m \cdot m \cdot m$
- 12. BOXES Boxes that are 12 inches tall are being stacked next to boxes that are 18 inches tall. What is the shortest height at which the two stacks will be the same height? height = <u>36 inches</u>

# **REVIEW:** Multiplying Fractions



### **Skill Examples**

**1.**  $\frac{2}{3} \cdot \frac{1}{4} = \frac{2 \cdot 1}{3 \cdot 4} = \frac{2}{12} = \frac{1}{6}$ 

**2.** 
$$\frac{3}{8} \times \frac{2}{9} = \frac{3 \cdot 2}{8 \cdot 9} = \frac{6}{72} = \frac{1}{12}$$

**3.** 
$$\left(\frac{2}{5}\right)\left(\frac{1}{4}\right) = \frac{2 \cdot 1}{5 \cdot 4} = \frac{2}{20} = \frac{1}{10}$$

**4.** $\quad \frac{1}{7} \cdot \frac{3}{5} = \frac{1 \cdot 3}{7 \cdot 5} = \frac{3}{35}$ 

Name

**Visual Model** 



# **Application Example**

**5.** A recipe calls for three-fourths cup of flour. You want to make one-half of the recipe. How much flour should you use?

Check your answers at BigIdeasMath.com.

$$\frac{1}{2} \cdot \frac{3}{4} = \frac{1 \cdot 3}{2 \cdot 4} = \frac{3}{8}$$

• You should use 
$$\frac{3}{8}$$
 cup flour.

# PRACTICE MAKES PURR-FECT

Find the product. Write your answer in simplified form.

6.  $\frac{1}{3} \cdot \frac{2}{7} = \frac{\frac{2}{21}}{\frac{3}{16}}$ 7.  $\frac{1}{2} \times \frac{1}{4} = \frac{\frac{1}{8}}{\frac{2}{25}}$ 8.  $\frac{1}{10} \cdot \frac{3}{10} = \frac{\frac{3}{100}}{\frac{100}{10}}$ 9.  $\frac{3}{2} \times \frac{2}{5} = \frac{\frac{3}{5}}{\frac{5}{5}}$ 10.  $\frac{3}{8} \times \frac{1}{2} = \frac{\frac{3}{16}}{\frac{16}{16}}$ 11.  $\left(\frac{1}{5}\right)\left(\frac{2}{5}\right) = \frac{\frac{2}{25}}{\frac{25}{5}}$ 12.  $\left(\frac{2}{3}\right)^2 = \frac{\frac{4}{9}}{\frac{9}{5}}$ 13.  $\frac{3}{2} \cdot \frac{2}{3} = \frac{1}{\frac{1}{5}}$ 14.  $\left(\frac{3}{1}\right)\left(\frac{1}{3}\right) = \underline{1}$ 15.  $2 \cdot \frac{1}{4} = \underline{\frac{1}{2}}$ 16.  $3 \times \frac{3}{4} = \underline{\frac{21}{4}}$ 17.  $\frac{1}{3} \cdot \frac{3}{4} \cdot \frac{4}{5} = \underline{\frac{1}{5}}$ 

#### Find the area of the rectangle or parallelogram.



#### 22. OPEN-ENDED Find three different pairs of fractions that have the same product.



# **REVIEW:** Multiplying Mixed Numbers

Key Concept and Vocabulary  $2\frac{1}{2} \times 1\frac{1}{2} = \frac{5}{2} \times \frac{3}{2} = \frac{15}{4}$ Rewrite as improper fractions.

#### **Skill Examples**



- **2.**  $1\frac{3}{4} \cdot 4\frac{1}{2} = \frac{7}{4} \cdot \frac{9}{2} = \frac{63}{8} = 7\frac{7}{8}$
- **3.**  $2\frac{2}{5} \times 1\frac{2}{3} = \frac{12}{5} \times \frac{5}{3} = \frac{60}{15} = 4$
- **4.**  $\left(1\frac{1}{2}\right)\left(1\frac{1}{2}\right) = \left(\frac{3}{2}\right)\left(\frac{3}{2}\right) = \frac{9}{4} = 2\frac{1}{4}$

Name \_



# **PRACTICE** MAKES *PURR*-FECT<sup>™</sup>

#### Find the product. Write your answer as a whole number or mixed number in simplified form.

6.  $2\frac{1}{3} \times 1\frac{1}{3} = \frac{3\frac{1}{9}}{9}$ 7.  $4\frac{2}{3} \times 1\frac{1}{2} = \frac{7}{8}$ 8.  $1\frac{1}{2} \times 3 = \frac{4\frac{1}{2}}{2}$ 9.  $5\frac{1}{6} \times \frac{1}{3} = \frac{1\frac{13}{18}}{18}$ 10.  $\frac{3}{4} \cdot 3\frac{1}{2} = \frac{2\frac{5}{8}}{8}$ 11.  $5 \cdot 4\frac{1}{2} = \frac{22\frac{1}{2}}{2}$ 12.  $2\frac{1}{7} \cdot \frac{7}{15} = \frac{1}{13}$ 13.  $1\frac{3}{5} \cdot \frac{3}{8} = \frac{\frac{3}{5}}{5}$ 14.  $(1\frac{1}{3})^2 = \frac{1\frac{7}{9}}{19}$ 15.  $(1\frac{1}{4})^3 = \frac{1\frac{61}{64}}{164}$ 16.  $(2\frac{1}{2})(3\frac{1}{3}) = \frac{8\frac{1}{3}}{18}$ 17.  $(3\frac{1}{2})(\frac{1}{2})^2 = \frac{7}{8}$ 

#### Find the area of the triangle.



**20. RECIPE** Rewrite the recipe so that each item is one-third of the full recipe.





# **REVIEW:** Dividing Fractions



### **Skill Examples**

- **1.**  $\frac{2}{5} \div \frac{1}{5} = \frac{2}{5} \cdot \frac{5}{1} = \frac{2 \cdot 5}{5 \cdot 1} = 2$
- **2.**  $\frac{2}{5} \div 5 = \frac{2}{5} \cdot \frac{1}{5} = \frac{2 \cdot 1}{5 \cdot 5} = \frac{2}{25}$
- **3.**  $\frac{9}{4} \div \frac{3}{4} = \frac{9}{4} \cdot \frac{4}{3} = \frac{9 \cdot 4}{4 \cdot 3} = 3$
- **4.**  $6 \div \frac{1}{2} = \frac{6}{1} \cdot \frac{2}{1} = \frac{6 \cdot 2}{1 \cdot 1} = 12$

Name

### **Visual Model**

There are 2 "one-thirds" in two-thirds.



# **Application Example**

**5.** You drive 25 miles in one-half hour. What is your average rate?

$$25 \div \frac{1}{2} = \frac{25}{1} \cdot \frac{2}{1} = 50 \text{ mi/h} \qquad r = \frac{d}{t}$$

Your average rate is 50 miles per hour.

Check your answers at BigIdeasMath.com -

# PRACTICE MAKES PURR-FECT

Find the quotient. Write your answer in simplified form.

6.  $\frac{3}{5} \div \frac{1}{5} = \underline{3}$ 7.  $4 \div \frac{1}{2} = \underline{8}$ 8.  $\frac{2}{3} \div \frac{1}{6} = \underline{4}$ 9.  $\frac{1}{6} \div \frac{2}{3} = \frac{\frac{1}{4}}{4}$ 10.  $\frac{2}{3} \div 2 = \underline{\frac{1}{3}}$ 11.  $\frac{3}{4} \div 4 = \underline{\frac{3}{16}}$ 12.  $\frac{3}{7} \div \frac{3}{7} = \underline{1}$ 13.  $\frac{3}{7} \div \frac{7}{3} = \underline{\frac{9}{49}}$ 14.  $5 \div \frac{1}{2} = \underline{10}$ 15.  $\frac{9}{4} \div \frac{1}{4} = \underline{9}$ 16.  $\frac{1}{4} \div \frac{1}{2} = \underline{\frac{1}{2}}$ 17.  $\frac{3}{11} \div 11 = \underline{\frac{3}{121}}$ 

Find the height of the rectangle or parallelogram.



**22.** SPEED You drive 15 miles in one-fourth hour. What is your average speed?  $\underline{60 \text{ mi/h}}$ 

**23. MAGNETIC TAPE** A refrigerator magnet uses  $\frac{5}{8}$  inch of magnetic tape. How many refrigerator magnets can you make with 10 inches of magnetic tape? Explain.

# **REVIEW:** Dividing Mixed Numbers



### **Skill Examples**

**1.** 
$$5 \div 2\frac{1}{2} = \frac{5}{1} \div \frac{5}{2} = \frac{5}{1} \times \frac{2}{5} = 2$$

**2.** 
$$3\frac{3}{4} \div 2\frac{1}{2} = \frac{15}{4} \div \frac{5}{2} = \frac{15}{4} \times \frac{2}{5} = \frac{3}{2} = 1\frac{1}{2}$$

- **3.**  $4\frac{1}{6} \div 1\frac{2}{3} = \frac{25}{6} \div \frac{5}{3} = \frac{25}{6} \times \frac{3}{5} = \frac{5}{2} = 2\frac{1}{2}$
- **4.**  $7\frac{1}{3} \div 11 = \frac{22}{3} \div \frac{11}{1} = \frac{22}{3} \times \frac{1}{11} = \frac{2}{3}$

Name\_

# Visual Model



# **Application Example**

5. You need  $2\frac{1}{2}$  inches of ribbon to make a Blue-Ribbon award. How many awards can you make with 35 inches of ribbon?

$$35 \div 2\frac{1}{2} = \frac{35}{1} \div \frac{5}{2} = \frac{35}{1} \times \frac{2}{5} = 14$$

You can make 14 awards.

# PRACTICE MAKES PURR-FECT

Check your answers at BigIdeasMath.com. —

Find the quotient. Write your answer as a whole or mixed number in simplest form.

 6.  $4\frac{1}{2} \div 9 =$  7.  $3\frac{3}{7} \div 8 =$  8.  $4\frac{2}{3} \div 7 =$  9.  $1\frac{7}{9} \div 4 =$  

 10.  $8 \div 1\frac{1}{3} =$  11.  $32 \div 3\frac{1}{5} =$  12.  $11 \div 2\frac{3}{4} =$  13.  $9 \div 1\frac{1}{2} =$  

 14.  $5\frac{1}{2} \div \frac{1}{2} =$  15.  $\frac{1}{2} \div 1\frac{1}{2} =$  16.  $1\frac{1}{4} \div 1\frac{1}{4} =$  17.  $3\frac{1}{2} \div 1\frac{1}{3} =$ 

#### Find the missing dimension.



- **20. RED RIBBONS** You need  $3\frac{1}{2}$  inches of ribbon to make a Red-Ribbon award. How many awards can you make with 35 inches of ribbon?
- **21. SHIPPING** You are stacking books into a shipping box that is 15 inches high. Each book is  $1\frac{1}{4}$  inches thick. How many books can you fit in a stack?



# **REVIEW:** Multiplying Decimals



### **Skill Examples**

<b>1.</b> 4 3.8	<b>2.</b> 0.327	3.	3 2.5
$\times 1.5$	$\times 24$		$\times$ 1.1 3
2190	1 308		975
438	6 54		325
65.7 0	7.848	3	325
		2	3 6.7 2 5

Name

# **Visual Model**



Area =  $2.5 \times 1.5 = 3.75$ 

4.1 ft

## **Application Example**

**4.** Find the area of the rectangle.

...

2.4 ft

 $2.4 \times 4.1 = 9.84$ 

The area is 9.84 square feet.

Check your answers at BigIdeasMath.com. —

# **PRACTICE MAKES PURR-FEC1**

#### Find the product.

5.	$3.02 \times 5.2 = 15.704$	<b>6.</b> $1.75 \times 1 = 1.75$	<b>7.</b> $(9.004)(0) = 0$
8.	$(4.05)^2 = \underline{16.4025}$	<b>9.</b> $2.25 \times 4 = 9$	<b>10.</b> (100.5)(90) = <u>9045</u>
11.	$19.4 \times 5.05 = 97.97$	<b>12.</b> $(1.2)(1.3)(1.4) = \underline{2.184}$	<b>13.</b> 115 × 3.2 = <u>368</u>
14.	16(0.375) = <u>6</u>	<b>15.</b> $(2.347)(1.8) = 4.2246$	<b>16.</b> $(1.5)^3 = 3.375$

#### Find the area of the rectangle.



\$8.97 19. APPLES Apples cost \$3.45 per pound. Find the cost of 2.6 pounds of apples.

	4.29
<b>20. PEACHES</b> Peaches cost \$4.29 per pound. Find the	$\times 2.25$
cost of two and a quarter pounds of peaches.	2145
Show your work. $39.00$	858
	858
Copyright © Big Ideas Learning, LLC	9.6525

# **REVIEW:** Dividing Decimals



#### **Skill Examples**

Find the quotient.

- **1.**  $65.3 \div 10 = 6.53$
- **2.**  $65.3 \div 100 = 0.653$
- **3.**  $65.3 \div 1000 = 0.0653$
- **4.**  $65.3 \div 10,000 = 0.00653$

Name \_

#### Visual Model





When you divide 12.5 into 5 equal parts, each part will be 2.5.

### **Application Example**

**5.** A prize of \$104.32 is divided equally among four people. How much does each person get?

 $104.32 \div 4 = 26.08$ 

Each person gets \$26.08.



Divide by a power

the decimal point.

of 10 by moving

Check your answers at BigIdeasMath.com.

<b>6.</b> $5.2 \div 10 = 0.52$	<b>7.</b> $73.1 \div 100 = 0.731$	<b>8.</b> 1500 ÷ 1000 = <u>1.5</u>
<b>9.</b> 18.98 ÷ 3.65 = <u>5.2</u>	<b>10.</b> $0.598 \div 2 = 0.299$	<b>11.</b> 19.003 ÷ 1 = $\underline{19.003}$
<b>12.</b> $3.42 \div 0.36 = 9.5$	<b>13.</b> 78.4 ÷ 1.4 = <u>56</u>	<b>14.</b> 1000 ÷ 12.5 = <u>80</u>
<b>15.</b> $0.45 \div 0.0125 = 36$	<b>16.</b> $29.45 \div 4.75 = 6.2$	<b>17.</b> 19.7 ÷ 0.1 = <u>197</u>

#### Find the width of the rectangle.



- 20. DRIVING TRIP You drive 1400 miles in 3.5 days. What is the average number of miles you drive per day? \_\_\_\_\_400 mi
- **21. METRIC SYSTEM** There are 2.54 centimeters in one inch. How many inches are there in 51.78 centimeters? Round your answer to the nearest tenth of an inch. 20.4 in.

# **REVIEW:** Ratios



Name \_

**13. CLASS RATIO** The ratio of boys to girls in a class is 5 to 4. There are 12 girls in the class. How many boys are in the class? <u>15 boys</u>

# **REVIEW:** Rates



#### **Skill Examples**

- **1.** You drive 100 miles in 2 hours. Your unit rate is 50 miles per hour.
- **2.** You earn \$40 in 5 hours. Your unit rate is \$8 per hour.
- **3.** You save \$240 in 6 months. Your unit rate is \$40 per month.

Name \_

## Visual Model



## **Application Example**

.

**4.** Janice was 44 inches tall when she was 8 years old. She was 52 inches tall when she was 12 years old. What was her unit rate?

She grew 8 inches in 4 years:  $\frac{8}{4} = \frac{2}{1}$ .

Her unit rate is 2 inches per year.

Check your answers at BigIdeasMath.com. -

# PRACTICE MAKES PURR-FECT

Write the unit rate in words and as a fraction for each situation. 500 mi 500 miles per hour 1 h 5. You fly 2000 miles in 4 hours. Fraction \$5 Words 5 dollars per pizza 1 pizza 6. You pay 15 dollars for 3 pizzas. Fraction \$0.08 Words 7. You pay \$4 sales tax on a \$50 purchase. <u>0.08 dollar per 1 dollar purchase</u> \$1 purchase Words Fraction \$5 5 dollars per lawn 1 lawn 8. You earn \$25 for mowing 5 lawns. Words Fraction

#### Circle the name of the person with the greater unit rate.

- **9.** Maria saves \$50 in 4 months. Ralph saves \$60 in 5 months.
- **11.** Kim earns \$400 for working 40 hours. (Sam)earns \$540 for working 45 hours.

#### Convert the unit rate.

**13.**  $\frac{60 \text{ miles}}{1 \text{ hour}} = \frac{88 \text{ feet}}{1 \text{ second}}$ 

10. John rides his bicycle 36 miles in 3 hours.

Randy rides his bicycle 30 miles in 2.5 hours. Unit rates are the same.

**12.** Arlene scores 450 points on 5 tests.

Jolene scores 180 points on 2 tests. Unit rates are the same.



# **REVIEW:** Direct Variation



#### **Skill Example**

**1. Equation:** y = 2xTable:

x	0	1	2	3	4	5
у	0	2	4	6	8	10

**Words:** *y* is twice the value of *x*.

Name \_

# Visual Model

For positive values of *x* and *y*, as *x* increases, *y* increases.





# **Application Example**

2. The amount *y* of gasoline a car uses is  $\frac{1}{20}$  times the number *x* of miles it travels. Make a table to show this relationship.

*y* is directly proportional to *x*.

Check your answers at BigIdeasMath.com. -

x	0	20	40	60	80	100
y	0	1	2	3	4	5

# PRACTICE MAKES PURR-FECT<sup>™</sup> ↓

#### Complete the table. Then sketch the graph.

**3.** y = 1.5x





#### WRITING AN EQUATION Write a direct variation equation for the table.

4 5 6 7 8 9 x

5.	x	0	1	2	3	4	6.	x	0	1	2	3	4	
	y	0	3	6	9	12	y = 3x	У	0	0.4	0.8	1.2	1.6	y = 0.4x

**7. WALRUS** The amount *y* that a walrus eats is directly proportional to its weight *x*. A 4000 pound walrus eats 20 pounds each day. How much does a 2000 pound walrus eat each day? \_\_\_\_\_10 lb

# **REVIEW:** Proportions



### **Skill Examples**

1.	$\frac{3}{5} = \frac{12}{20}$	is a proportion because the cross products are equal.
2.	$\frac{1}{7} = \frac{7}{48}$	is <i>not</i> a proportion because the cross products are not equal.

2	10 _ 5	is a proportion because the
э.	$\frac{2}{2}$ 1	cross products are equal.

Name \_\_\_\_

# Visual Model

The ratio "2 to 3" is equal to the ratio "4 to 6."



# **Application Example**

**4.** You spend \$5 for 3 tennis balls. Your friend spends \$6.25 for 4 tennis balls. Are the two rates proportional?

 $\frac{\$5}{3 \text{ balls}} \stackrel{?}{=} \frac{\$6.25}{4 \text{ balls}} \qquad 5(4) \neq 3(6.25)$ 

Check your answers at BigIdeasMath.com.

The rates are *not* proportional.

# PRACTICE MAKES PURR-FECT

#### Decide whether the statement is a proportion.

5.	$\frac{3}{7} = \frac{6}{14}$ proportion	<b>6.</b> $\frac{1}{4} = \frac{4}{1}$ <u>not a proportion</u> <b>7.</b> $\frac{3}{2} = \frac{9}{4}$ <u>r</u>	not a proportion
8.	$\frac{1.25}{3} = \frac{5}{12}  \text{proportion}$	<b>9.</b> $\frac{6}{18} = \frac{120}{360}$ proportion <b>10.</b> $\frac{4}{5} = \frac{4+4}{5+5}$	proportion

#### Complete the proportion.



#### Write the proportion that compares the circumference to the radii of the two circles.



**16. COMPARING RATES** You spend \$20 for 5 T-shirts. Your friend spends \$15 for 3 T-shirts. Are the two rates proportional? <u>no</u>



Length	Volume	$\sim$
1 in. $\approx$ 3 cm	$1 \text{ qt} \approx 1 \text{ L}$	Renchma
$1 \text{ m} \approx 3 \text{ ft}$	$1 \text{ gal} \approx 4 \text{ L}$	
$1 \text{ mi} \approx 2 \text{ km}$	$1 c \approx 200 mL$	ය ව
	$1 \text{ gal} \approx 4000 \text{ cm}^3$	-0-
Weight (Mass)	$1 \text{ m}^3 \approx 300 \text{ gal}$	( )
$1 \text{ kg} \approx 2 \text{ lb}$	0	
$1 \text{ oz} \approx 30 \text{ g}$		and h
_		

### **Skill Examples**



**3.** 
$$8 \text{ oz} \approx 8 \text{ oz} \cdot \frac{30 \text{ g}}{1 \text{ oz}} = 240 \text{ g}$$

**4.** 
$$2 c \approx 2 c' \cdot \frac{200 \text{ mL}}{1 c'} = 400 \text{ mL}$$

Name \_\_\_

# Visual Model

					111				
1111	lu.			lп	шĨ		III	шÌ	
Т	T	Т	1	T	T	T	1	Т	
						1	in	<b>.</b>	
1		1		1		1		1	

# **Application Example**

5. A person is 63 inches tall. How many centimeters is that?

63 in. 
$$\approx$$
 63 in. •  $\frac{3 \text{ cm}}{1 \text{ in.}}$ 

= 189 cm

The height of the person is ••• about 189 centimeters.

# **PRACTICE MAKES PURR-FECT**

#### Complete the unit conversion.

6.	$26mi\approx$	52	km
----	---------------	----	----

- **9.** 70 lb  $\approx$  35 kg
- **12.**  $36 \text{ cm} \approx 12$  in.
- **13.** 7 gal  $\approx$  <u>28</u> L

**10.**  $12 \text{ ft} \approx 4 \text{ m}$ 

**7.** 150 g  $\approx$  <u>5</u> oz

- **15.**  $800 \text{ mL} \approx \underline{4} \text{ c}$  **16.**  $5 \text{ gal} \approx \underline{20,000} \text{ cm}^3$
- **8.** 2 L ≈ 2 gt

Check your answers at BigIdeasMath.com.

- **11.**  $16 \text{ km} \approx 8 \text{ mi}$
- **14.** 9 qt  $\approx$  \_\_\_\_9 L
- **17.**  $12 \text{ m}^3 \approx 3600 \text{ gal}$

**18. WEIGHT** How much does the wolf weigh in pounds?

about 66 pounds



**19. SPEED** A hummingbird flies at a speed of 33 feet per second. What is the speed of the hummingbird in meters per second?

about 11 meters per second



# **REVIEW:** Fractions and Decimals



#### **Skill Examples**



Name

Visual Model



## **Application Example**

**5.** You put 16.75 gallons of gas in your car. Write this decimal as a mixed number.

$$16.75 = 16 + 0.75 = 16\frac{3}{4}$$

You put  $16\frac{3}{4}$  gallons of gas in your car.

Check your answers at BigIdeasMath.com. —

# PRACTICE MAKES PURR-FECT<sup>™</sup> <sub>4</sub>

#### Write the fraction as a decimal.

<b>6.</b> $\frac{3}{4} = 0.75$	<b>7.</b> $\frac{7}{10} = 0.7$	<b>8.</b> $\frac{3}{25} = 0.12$	<b>9.</b> $\frac{7}{20} = 0.35$
<b>10.</b> $\frac{19}{100} = 0.19$	<b>11.</b> $\frac{11}{50} = 0.22$	<b>12.</b> $\frac{2}{3} = \underline{0.\overline{6}}$	<b>13.</b> $\frac{1}{6} = 0.1\overline{6}$
Write the decimal as $\frac{2}{2}$	s a fraction. $\frac{7}{7}$	3	3
<b>14.</b> $0.4 = 5$	<b>15.</b> $0.35 = 20$	<b>16.</b> $0.6 = 5$	<b>17.</b> $1.5 = 2$

Write the number represented by the model as a decimal and as a simplified fraction.  $\overset{22}{_{22}}$ 



**22. MULTIPLE FORMS** Write the decimal 0.35 in two ways. One with a denominator of 100 and one with a denominator of 1000.  $35_{100}$ ,  $350_{1000}$ 





#### **Skill Examples**

- **1.** 40% =  $\frac{40}{100} = \frac{20 \cdot 2}{20 \cdot 5} = \frac{2}{5}$ **2.** 50% =  $\frac{50}{100} = \frac{50 \cdot 1}{50 \cdot 2} = \frac{1}{2}$
- **2.**  $35\% = \frac{1}{100} = \frac{50 \cdot 2}{50 \cdot 2} = \frac{2}{2}$ **3.**  $25\% = \frac{25}{100} = \frac{25 \cdot 1}{25 \cdot 4} = \frac{1}{4}$
- $100 \quad 25 \cdot 4 \quad 4$   $4. \quad 5\% = \frac{5}{100} = \frac{\cancel{5} \cdot 1}{\cancel{5} \cdot 20} = \frac{1}{20}$

Name

Visual Model

$$35\% = \frac{7}{20}$$

### **Application Example**

•••

**5.** Your school's softball team won 30% of its games. Did the team win more than one-fourth of its games?

$$30\% = \frac{3}{10} \qquad \qquad \frac{3}{10} > \frac{1}{4}$$

Yes, the team won more than one-fourth of its games.

Check your answers at BigIdeasMath.com.

# PRACTICE MAKES PURR-FECT

Write the percent as a fraction in simplest form. 6.  $20\% = \_ \_ \_ \frac{1}{5}$  7.  $45\% = \_ \_ \frac{9}{20}$  8.  $7\% = \_ \frac{7}{100}$  9.  $32.5\% = \_ \frac{13}{40}$ 10.  $15\% = \_ \frac{3}{20}$  11.  $1\% = \_ 100$  12.  $150\% = \_ \frac{3}{2}$  13.  $33\frac{1}{3}\% = \_ \frac{3}{3}$ 

#### Write the fraction as a percent.

**14.**  $\frac{3}{20} = \underline{15\%}$  **15.**  $\frac{6}{5} = \underline{120\%}$  **16.**  $\frac{5}{8} = \underline{62.5\%}$  **17.**  $\frac{3}{5} = \underline{60\%}$ 

#### Write the fraction represented by the model as a percent.



- **21. SURVEY** Eighteen out of twenty people in a survey said that vanilla ice cream is their favorite flavor of ice cream. What percent is this? <u>90%</u>
- **22. SPANISH LANGUAGE** Twelve of the 40 students in your class can speak Spanish. What percent is this? 30%

# **REVIEW:** Percents and Decimals

Name \_\_\_



- **22. SUMMER SCHOOL** Eighty-seven percent of the students in your class do not plan to attend
- summer school. What percent of your class plans to attend summer school? 13%

# **REVIEW:** Finding the Percent of a Number



#### **Skill Examples**

- **1.** 30% of 50:  $0.3 \times 50 = 15$
- **2.** 45% of 80:  $0.45 \times 80 = 36$
- **3.** 110% of 40:  $1.1 \times 40 = 44$

Find the percent of the number.

**4.** 25% of 240:  $0.25 \times 240 = 60$ 

# Visual Model

Name \_



### **Application Example**

**5.** 28% of the 200 people who answered a survey own a dog. How many of the 200 people in the survey own a dog?

 $0.28 \times 200 = 56$ 

56 of the 200 people own a dog.

PRACTICE MAKES PURR-FECT

Check your answers at BigIdeasMath.com.

6.	$25\% \text{ of } 40 = \_$	10	7.	$20\% \text{ of } 35 = \_$	7	8.	65% of 110 = _	71.5	9.	125% of $20 =$	25
10.	$33\frac{1}{3}\%$ of $60 = 1$	20	11.	95% of 400 =	380	12.	200% of 31 =	62	13.	18%  of  90 = 10	6.2
14.	1%  of  800 =	8	15.	60%  of  60 =	36	16.	100%  of  59 =	59	17.	1000%  of  59 =	590

Write the question represented by the model. Then answer the question.

18.	0%	20%	40%	60%	80%	100%	19.	0%	20%	40%	60%	80%	100%
	0	18	36	54	72	90		0	24	48	72	96	120
	Quest	ion: <u>W</u>	hat is 6	50% of 9	90?			Quest	tion: <u>W</u>	hat is 8	0% of 1	20?	
	Answe	er: <u>54</u>	ŀ					Answe	er: <u>96</u>				

- **20. ENDANGERED SPECIES** Sixty percent of a species of butterfly died due to loss of habitat. Originally, there were 10,000 butterflies. How many are left? <u>4000 butterflies</u>
- **21. SALES TAX** You buy 4 breakfast sandwiches at \$2.59 each, 4 hashbrowns at \$1.10 each, and 4 bottles of orange juice at \$1.25 each. The sales tax is 6%. Find the total cost of the 4 meals, including sales tax. \_\_\_\_\_\$20.95

# **REVIEW:** Percents and Proportions



### **Skill Examples**

1. 
$$\frac{36}{50} = \frac{p}{100}$$
  
 $100 \cdot \frac{36}{50} = 100 \cdot \frac{p}{100}$   
 $72 = p$ 

So, 36 is 72% of 50.

2. 
$$\frac{a}{36} = \frac{20}{100}$$
  
36  $\cdot \frac{a}{36} = 36 \cdot 100$ 

$$36 36 100$$
  
 $a = 7.2$ 

So, 7.2 is 20% of 36.

20

Name \_

# Visual Model



**Application Example** 

**3.** A basketball player makes 45%, or 9 shots, of her attempted shots. How many shots did the basketball player attempt?

$$\frac{9}{w} = \frac{45}{100}$$

$$9 \cdot 100 = w \cdot 45$$

$$900 = 45w$$

$$\frac{900}{45} = \frac{45w}{45}$$

$$20 = w$$
The basketball

The basketball player attempted 20 shots.

Check your answers at BigIdeasMath.com. **–** 

#### Write and solve a proportion to answer the question.

**PRACTICE** MAKES PURR-FECT

- 4. 68 is what percent of 80?
   5. What number is 25% of 116?

   85%
   29

   6. 36 is 16% of what number?
   7. 48 is what percent of 128?

   225
   37.5%

   8. What number is 64% of 40?
   9. 77 is 55% of what number?

   25.6
   140
- **10. PLAY** Students are auditioning for a play. Of the 60 students auditioning, 12 will get a part in the play. What percent of the students who audition will get a part in the play?
- **11. HOMEWORK** You have completed 60% of your English homework. The assignment has 25 questions. How many questions are left? <u>10</u>

# **REVIEW:** Estimating and Finding a Tip

Key Concept and Vocabulary – To find the tip on a food bill at a restaurant, write the percent as a decimal or fraction and

as a decimal or fraction and multiply it by the cost of the food bill.



# **Application Examples**

1. Your food bill at a restaurant is \$8.49. You leave a 15% tip.

Estimate: Round 8.49 to 10.

 $0.15\times10=1.5$ 

The estimate for the tip is \$1.50.

Actual:  $0.15 \times 8.49 \approx 1.27$ 

The actual tip is \$1.27.

Name \_\_\_\_

# Visual Model

0%	20%	40%	60%	80%	100%
0	8	16	24	32	40

A 20% tip on a food bill of \$40 is \$8.

**2.** Your food bill at a restaurant is \$15.83. You leave a 20% tip.

Estimate: Round 15.83 to 16.

 $0.2 \times 16 = 3.2$ 

The estimate for the tip is \$3.20.

#### **Actual:** $0.2 \times 15.83 \approx 3.17$

The actual tip is \$3.17.

Check your answers at BigIdeasMath.com.

# PRACTICE MAKES PURR-FECT

#### Estimate the tip. Then find the actual tip.

3.	Food bill: \$33.65; Tip: 15%	\$4.50; \$5.05
4.	Food bill: \$44.28; Tip: 20%	\$9; \$8.86
5.	Food bill: \$11.17; Tip: 15%	\$1.50; \$1.68
6.	Food bill: \$12.37; Tip: 20%	\$2; \$2.47
7.	Food bill: \$23.16; Tip: 15%	\$3; \$3.47
8.	Food bill: \$16.21; Tip: 20%	\$4; \$3.24
9.	Food bill: \$37.54; Tip: 25%	\$10; \$9.39
10.	Food bill: \$25.96; Tip: 20%	\$5; \$5.19
11.	Food bill: \$28.93; Tip: 15%	\$4.50; \$4.34
12.	Food bill: \$72.79; Tip: 25%	\$20; \$18.20
13.	Food bill: \$19.82; Tip: 23%	\$4.60; \$4.56
14.	Food bill: \$51.56: Tip: 30%	\$15; \$15.47

# **REVIEW:** Estimating and Finding a Sales Tax

Key Concept and Vocabulary —

To find the sales tax on an item, write the percent as a decimal or fraction and multiply it by the price of the item.



## **Application Examples**

1. A DVD costs \$20 before tax. The sales tax is 7%.

Estimate: Round 7% to 5%.

 $0.05 \times 20 = 1$ 

• The estimate for the sales tax is \$1.

**Actual:**  $0.07 \times 20 = 1.4$ 

The actual sales tax is \$1.40.

**PRACTICE MAKES PURR-FECT** 

Name \_\_\_\_

# Visual Model

5	5%									
0%		20%	ó	40%	6	60%	<b>6</b>	80%	6	100%
0	2.5	5	7.5	10	12.5	15	17.5	20	22.5	25
1.	25									

Using a sales tax of 5%, the sales tax on a \$25 shirt is \$1.25.

**2.** A bicycle costs \$115 before tax. The sales tax is 9%.

**Estimate:** Round 9% to 10% and 115 to 120.  $0.1 \times 120 = 12$ 

The estimate for the sales tax is \$12.

#### Actual: $0.09 \times 115 = 10.35$

The actual sales tax is \$10.35.

Check your answers at BigIdeasMath.com.

### Estimate the sales tax. Then find the actual sales tax.

- **3. BASEBALL CARDS** The pack of baseball cards costs \$3.75 before tax. The sales tax is 4%. \$0.20; \$0.15
- **4. TELEVISION** A television costs \$400 before tax. The sales tax is 8%. \$40; \$32
- **5. MP3 PLAYER** An MP3 player costs \$89 before tax. The sales tax is 6%. \$5; \$5.34
- 6. COUCH A couch costs \$675 before tax. The sales tax is 5%. \$35; \$33.75
- **GUITAR** A guitar costs \$299 before tax. The sales tax is 9%.\$30; \$26.91
- **8. TABLE** A table costs \$50 before tax. The sales tax is 4.5%. \$2.50; \$2.25
- **9. JEANS** A pair of jeans costs \$39 before tax. The sales tax is 5.5%. \$2; \$2.15

# **REVIEW:** Estimating and Finding a Discount

- Key Concept and Vocabulary -

A discount is a decrease in the original price of an item. To find the discount, write the percent as a decimal or fraction and multiply it by the original price of the item.



# **Application Examples**

**1.** The original price of a book is \$18.79. The discount is 20%.

Estimate: Round 18.79 to 20.

 $0.2 \times 20 = 4$ 

The estimate for the discount is \$4.

**Actual:**  $0.2 \times 18.79 \approx 3.76$ 

The actual discount is \$3.76. The sale price of the book is \$18.79 - \$3.76 = \$15.03.

# Name \_\_\_\_

# Visual Model



**2.** The original price of a pair of in-line skates is \$209.99. The discount is 15%.

**Estimate:** Round 209.99 to 200.

 $0.15\times 200=30$ 

The estimate for the discount is \$30.

**Actual:**  $0.15 \times 209.99 \approx 31.50$ 

The actual discount is \$31.50. The sale price of the pair of in-line skates is \$209.99 - \$31.50 = \$178.49.

# PRACTICE MAKES PURR-FECT

Check your answers at BigIdeasMath.com. —

#### Estimate the discount. Then find the actual discount and the sale price.

- **3. TRUMPET** The original price of a trumpet is \$319.29. The discount is 25%. \$75; \$79.82; \$239.47
- **4. SHOES** The original price of a pair of shoes is \$47.99. The discount is 40%. \$20; \$19.20; \$28.79
- **5. LAMP** The original price of a lamp is \$17.09. The discount is 15%. \$3; \$2.56; \$14.53
- **6. RING** The original price of a ring is \$96.75. The discount is 60%. \$60; \$58.05; \$38.70
- **7. ELECTRONICS** The original price of a home theater system is \$243.89. The discount is 75%. \$187.50; \$182.92; \$60.97
- **8. BASEBALL** The original price of a baseball glove is \$26.99. The discount is 30%. <u>\$9; \$8.10; \$18.89</u>
- **9. SEWING MACHINE** The original price of a sewing machine is \$182.96. The discount is 20%. \$40; \$36.59; \$146.37

Name

Multiplication Properties of 0 and -1:

**Commutative Properties:** 

a + b = b + a

**Identity Properties:** 

a + 0 = 0 + a = a

 $a \cdot 1 = 1 \cdot a = a$ 

 $a \cdot 0 = 0 \cdot a = 0$ 

 $a \cdot (-1) = (-1) \cdot a = -a$ 

 $a \cdot b = b \cdot a$ 

# **REVIEW:** Properties of Addition and Multiplication

- Key Concept and Vocabulary -

Associative Properties: (a + b) + c = a + (b + c) $(a \cdot b) \cdot c = a \cdot (b \cdot c)$ 

**Distributive Property:** a(b + c) = ab + ac

a(b-c) = ab - ac

**Inverse Properties:** 

a + (-a) = -a + a = 0 $a \cdot \frac{1}{a} = \frac{1}{a} \cdot a = 1, a \neq 0$ 

# **Skill Examples**

#### Identify the property illustrated.

- **1.**  $-2 \cdot (7 \cdot 5) = -2 \cdot (5 \cdot 7)$ Commutative Property of Multiplication
- **3.** 3(6x + 2) = 18x + 6Distributive Property

**2.**  $(-8) \cdot 1 = -8$ Identity Property of Multiplication

So manv

**4.** (w + 3) + 7 = w + (3 + 7)Associative Property of Addition

Check your answers at BigIdeasMath.com. —

# **PRACTICE** MAKES *PURR*-FECT<sup>™</sup>

#### Identify the property illustrated.

- **5.**  $(9 \cdot 4) \cdot 5 = 9 \cdot (4 \cdot 5)$ Assoc. Prop. of Mult.
- 7. 2a + (-2a) = 0Inverse Prop. of Add.
- **9.**  $9m \cdot 0 = 0$ Mult. Prop. of 0
- **11.** 7n 4n = (7 4)nDistributive Prop.
- **13.** x + (y + 6) = (x + y) + 6Assoc. Prop. of Add.

- **6.**  $(-1) \cdot (-12) = 12$ Mult. Prop. of -1
- 8. 0 + 11c = 11cIdentity Prop. of Add.
- **10.** (5-2b) + 3 = (-2b + 5) + 3Comm. Prop. of Add.
- **12.**  $\frac{1}{15d} \cdot 15d = 1$ Inverse Prop. of Mult.
- **14.**  $\left(\frac{1}{16}k\right)(-32) = (-32)\left(\frac{1}{16}k\right)$ Comm. Prop. of Mult.

# **REVIEW:** Distributive Property

**Distributive Property** 

Key Concept and Vocabulary —

. Distribute Name \_\_\_\_

Visual Model

2(3+5)

 $2 \cdot 3$ 

=

+

 $2 \cdot 5$ 



**18. MENTAL MATH** You buy 5 hot dogs for \$1.29 each and 5 sodas for \$0.71 each. Show how you can use mental math to find the total cost.

5(1.29) + 5(0.71) = 5(1.29 + 0.71) = 5(2.00) =

**19. EXTENSION** Does the Distributive Property apply to a combination of addition *and* subtraction? Decide using the expression 3(7 + 5 - 4).

yes; 3(7 + 5 - 4) = 3(8) = 24 and  $3(7 + 5 - 4) = 3 \cdot 7 + 3 \cdot 5 - 3 \cdot 4 = 21 + 15 - 12 = 24$ 



-\$7, -\$6, (-\$5,) -\$4, -\$3, -\$2, -\$1, \$0, \$1, \$2, \$3, \$4, \$5, \$6, \$7

# **REVIEW:** Adding and Subtracting Integers



## **Skill Examples**

- **1.** 5 + (-3) = 5 3 = 2
- **2.** 5 (-2) = 5 + 2 = 7
- **3.** -2+4=2
- **4.**  $-3 (-2) = -3 + 2 = -1 \iff$  change the
- **5.** 8 (-3) = 8 + 3 = 11

Name \_\_\_\_

# Visual Model

To add a positive number, move to the *right*.



To subtract a positive number, move to the *left*.

# **Application Example**

**6.** The temperature is  $8^{\circ}$ F in the morning and drops to  $-5^{\circ}$ F in the evening. What is the difference between these temperatures?

Check your answers at BigIdeasMath.com.

$$8 - (-5) = 8 + 5$$

The difference is 13 degrees.

# PRACTICE MAKES PURR-FECT

#### Find the sum or difference.

<b>7.</b> $-2 + 3 = 1$ <b>8.</b> $-4 - 5 = -9$	<b>9.</b> $8 - 2 = 6$	<b>10.</b> $8 - (-2) = 10$
<b>11.</b> $-4 - (-1) = \underline{-3}$ <b>12.</b> $-5 + (-5) = \underline{-10}$	<b>13.</b> 4 - (-8) = <u>12</u>	<b>14.</b> $4 - 8 = -4$
<b>15.</b> $-4 + (-6) = -10$ <b>16.</b> $-4 - (-6) = 2$	<b>17.</b> $10 - 13 = -3$	<b>18.</b> $13 - (-10) = 23$

#### Write the addition or subtraction shown by the number line.

19.					_	3 +	7 =	4			20.	-	4	- 7	= -	-3		
	<b>∢</b> −5	-4	-3	-2	-1	0	1	2	3	 <u>→</u>	<del>≪  </del> _5 ·	-4 -3	-2 -1	0	 1	2	3	 - <b>→</b> 5

**21. TEMPERATURE** The temperature is  $16^{\circ}$ F in the morning and drops to  $-15^{\circ}$ F in the evening. What is the difference between these temperatures? <u>31 degrees</u>

To subtract,

sign and add.

**22. SUBMARINE** A submarine is 450 feet below sea level. It descends 300 feet. What is its new position? Show your work. 750 feet below sea level; -450 - 300 = -750





# **Operations with Rational Numbers**

To add, subtract, multiply, or divide rational numbers, use the same rules for signs as you used for integers.

Example 1 Find (a)  $-\frac{5}{6} + \frac{2}{3}$  and (b) 7.3 - (-4.8).

**a.** Write the fractions with the same denominator, then add.

 $-\frac{5}{6} + \frac{2}{3} = -\frac{5}{6} + \frac{4}{6} = \frac{-5+4}{6} = \frac{-1}{6} = -\frac{1}{6}$ 

b. To subtract a rational number, add its opposite.

7.3 - (-4.8) = 7.3 + 4.8 = 12.1 The opposite of -4.8 is 4.8.

Example 2 Find (a) 2.25 • 8, (b) -2.25 • (-8), and (c) -2.25 • 8.

**a.** 
$$2.25 \cdot 8 = 18$$
 **b.**  $-2.25 \cdot (-8) = 18$  **c.**  $-2.25 \cdot 8 = -18$ 

Example 3 Find  $-\frac{4}{9} \div \frac{3}{4}$ .

To divide by a fraction, multiply by its reciprocal.

 $-\frac{4}{9} \div \frac{3}{4} = -\frac{4}{9} \cdot \frac{4}{3} = -\frac{4 \cdot 4}{9 \cdot 3} = -\frac{16}{27}$  The reciprocal of  $\frac{3}{4}$  is  $\frac{4}{3}$ .

# **Practice**

Check your answers at BigIdeasMath.com.

Add, subtract, multiply, or divide.

 1. -7.5 + 3.8 - 3.7 2. -18.3 + (-6.7) - 25 3. 0.6 - 0.85 - 0.25 4. 6.13 - (-2.82) 8.95

 5.  $-6 \cdot 4.75 - 28.5$  6.  $-3.2 \cdot (-4.8)$  15.36
 7.  $-1.8 \div (-9)$  0.2
 8.  $3.6 \div (-1.5)$  -2.4

 9.  $-\frac{1}{6} + \frac{5}{6} - \frac{2}{3}$  10.  $-\frac{7}{10} + \left(-\frac{3}{5}\right) - 1\frac{3}{10}$  11.  $\frac{4}{9} - \frac{2}{3} - \frac{2}{9}$  12.  $-\frac{5}{6} - \frac{1}{4} - 1\frac{1}{12}$  

 13.  $-\frac{3}{2} \cdot \left(-\frac{1}{8}\right)$   $\frac{3}{16}$  14.  $-\frac{3}{4} \cdot \frac{7}{12} - \frac{7}{16}$  15.  $\frac{5}{8} \div \left(-\frac{1}{4}\right) - 2\frac{1}{2}$  16.  $-\frac{4}{7} \div \frac{2}{5} - 1\frac{3}{7}$  

 17. TEMPERATURE The temperature at midnight is shown. The outside temperature decreases 2.3°C over the next two hours. What is the outside temperature at 2 A.M.? -33.2°C
 18. SNOWFALL In January, a city's snowfall was  $\frac{5}{8}$  foot below the historical average. Was the city's snowfall in the two-month period above or below the historical average. Was the city's nowfall in the two-month period above or below the historical average. Was the city's nowfall in the two-month period above or below the historical average. Was the city's nowfall in the two-month period above or below the historical average. Was the city's nowfall in the two-month period above or below the historical average.
 Image: Image:

above average;  $\frac{1}{8}$  foot

# **REVIEW:** Writing Expressions and Equations

Key Concept and Vocabulary -Writing Expressions, Phrase: Two more than a number **Expression:** 2 + n**Sentence:** Two more than a number is equal to six. Equation: 2 + n = 6

### **Skill Examples**

- **1.** Five times a number: 5*n*
- **2.** Six less than three times a number: 3n 6
- **3.** The sum of a number and one: n + 1
- **4.** A number divided by three:  $n \div 3$

#### Name

# Visual Model



# **Application Example**

**5.** Write an equation for the following. "The price of \$15 is the wholesale cost plus a markup of fifty percent."

Let *C* be the wholesale cost. 50% of *C* is 0.5*C*.



# **PRACTICE** MAKES *PURR*-FECT<sup>™</sup>

#### Write the verbal phrase as a mathematical expression.

**6.** The product of a number and two

2n

**8.** 19 less than twice a number

2n - 19

**10.** Five times the sum of a number and two 5(n+2)

#### Write the sentence as an equation.

**12.** Three times a number equals nine.

3n = 9

**14.** Twelve divided by a number is four.  $\frac{12}{2} = 4$ 

**7.** 10 subtracted from a number

n - 10

- **9.** The sum of a number and three, divided by four n+3
- **11.** Seven less than four times a number 4n - 7
- **13.** The difference of a number and nine is four.

n - 9 = 4

**15.** The sum of a number and seven is eighteen.

n + 7 = 18

 $B = 4\pi \, in.^2$ 



$$20\pi = \frac{1}{3} \cdot 4\pi \cdot h$$

**Topic 17.2** 

# **REVIEW:** Writing and Graphing Inequalities



## **Skill Examples**

- **1.** x > 0: All positive numbers
- **2.**  $x \ge 0$ : All nonnegative numbers
- **3.** x < 0: All negative numbers
- **4.**  $x \le 0$ : All nonpositive numbers

# **PRACTICE** MAKES *PURR*-FECT<sup>™</sup> ∠

#### Write an inequality for the statement.

**6.** All numbers that are less than 24

*x* < 24

**8.** All numbers greater than 10

*x* > 10

**10.** All numbers that are at least 11

$$x \ge 11$$

#### Graph the inequality.





Name



x > 2

# **Application Example**

**5.** A sign at a clothing store reads "Savings up to 70%." Let *S* represent the percent of savings. Write an inequality to describe *S*.

*S* can be equal to 70%. Or *S* can be less than 70%.

An

An inequality is  $S \leq 70\%$ .

Check your answers at BigIdeasMath.com. —

7. All numbers that are at most 3

 $x \le 3$ 

**9.** All numbers that are no more than 5

 $x \le 5$ 

**11.** All numbers less than or equal to 8  $x \le 8$ 



Shoe Sale

Savings up to 60%

**16.** A sign at a shoe store reads "Savings up to 60%." Let *P* represent the percent of savings. Write an inequality to describe *P*.

 $P \le 60\%$ 



# **REVIEW:** Evaluating Expressions

Name\_



#### **Skill Examples**

- 1. When x = 5, 3x + 4 is 3(5) + 4 = 19.
- **2.** When x = -1, 5x + 7 is 5(-1) + 7 = 2.
- **3.** When x = 3,  $4x^2$  is  $4(3^2) = 36$ .
- 4. When x = 4,  $x^3 + 1$  is  $4^3 + 1 = 65$ .

## Visual Model

x	2 <i>x</i> + 3	Value of Expression
1	2(1) + 3	5
2	2(2) + 3	7
3	2(3) + 3	9
4	2(4) + 3	11

### **Application Example**

C =

**5.** For a Celsius temperature *C* the Fahrenheit temperature *F* is  $\frac{9}{5}C$  + 32. Find *F* when

25°.  

$$\frac{9}{5}C + 32 = \frac{9}{5}(25) + 32$$
  
 $= 45 + 32$   
 $= 77$ 

The Fahrenheit temperature is 77°.

Check your answers at BigIdeasMath.com.

7. When x = -1,  $3x + 9 = \frac{6}{3}$ .

**9.** When  $x = \frac{1}{2}$ ,  $3x^2 = \frac{-4}{4}$ .

**11.** When x = 0,  $4x^2 + 5 = 5$ .

**13.** When  $x = 2\frac{1}{2}$ , 6x + 3 = 18.

PRACTICE MAKES PURR-FECT

#### Evaluate the expression.

- 6. When x = 2, 3x 1 = 5.
- 8. When x = 4,  $x^2 5 = 11$ .
- **10.** When x = 3.1, 5x + 0.5 = 16.
- **12.** When x = 10,  $x^2 8x + 11 = 31$ .

#### Evaluate the perimeter when x = 3.





**16. CARDINAL** The weight of the cardinal (in ounces) is 0.6x + 11 after its eats *x* ounces of bird seed. How much does it weigh after it eats 2 ounces of bird seed? <u>12.2 oz</u>



**Topic 17.1** 

# **REVIEW:** Simplifying Expressions



#### **Skill Examples**

- **1.** 2x + 5x = 7x
- **2.** 1 + n + 4 = n + 5
- **3.** (2x+3) (x+2) = x+1
- **4.** 2(y-1) + 3(y+2) = 5y + 4

Name \_

# Visual Model

**Algebra Tiles** 



# **Application Example**

5. The original cost of a shirt is *x* dollars. The shirt is on sale for 30% off. Write a simplifed expression for the sale cost.





The sale cost is 0.7x.

# PRACTICE MAKES PURR-FECT

Simplify the expression. (Remove parentheses and combine like terms.)

6. 4x + 6x = 10x8. 9x + 3 - 6x - 2 = 3x + 110. 7m - 2m + 5m = 10m12. (3x + 6) - x = 2x + 614. (x + 6) - (x + 6) = 016. (5x + 4) - 2(x + 1) = 3x + 2

7.	3n+5-2n = .	n+5
9.	3(x+2) =	3x + 6
11.	2 - (x + 1) =	1 - x
13.	5 - (1 - n) =	n+4
15.	(4x - 2) + 3(x +	-1) = -7x + 1
17.	5(x+2) - 2(x+1)	-2) = 3x + 6

Check your answers at BigIdeasMath.com.

#### Write a simplified expression for the perimeter of the rectangle or triangle.



**21.** The original cost of a cell phone is *x* dollars. The phone is on sale for 35% off. Write a simplified expression for the sale cost. 0.65x

