

### • Arithmetic with Units of Measure

- If units are not the same, convert first.

**Example:**  $2 \text{ ft} + 12 \text{ in.} \longrightarrow 24 \text{ in.} + 12 \text{ in.}$  or  $2 \text{ ft} + 1 \text{ ft}$

- To add or subtract measures, keep the unit.

**Example:**  $24 \text{ in.} + 12 \text{ in.} = 36 \text{ in.}$  or  $2 \text{ ft} + 1 \text{ ft} = 3 \text{ ft}$

- To multiply measures, multiply the units.

**Example:**  $2 \text{ cm} \times 3 \text{ cm} = 2 \cdot 3 \text{ cm} \cdot \text{cm}$

$$\underbrace{\quad\quad}_6 \quad \underbrace{\quad\quad}_{\text{cm}^2}$$

- To divide measures, divide the units.

**Example:**  $\frac{21 \text{ cm}^2}{7 \text{ cm}} = \frac{\overset{3}{\cancel{21}}}{\underset{1}{\cancel{7}}} \frac{\cancel{\text{cm}} \cdot \text{cm}}{\cancel{\text{cm}}} = 3 \text{ cm}$

- Some units will not reduce.

**Example:**  $\frac{300 \text{ mi}}{6 \text{ hr}} = \frac{\overset{50}{\cancel{300}}}{\underset{1}{\cancel{6}}} \frac{\text{mi}}{\text{hr}} = 50 \frac{\text{mi}}{\text{hr}}$

### **Practice:**

Simplify 1–6.

1.  $3 \text{ ft} - 4 \text{ in.} =$  (Write the difference in inches.) \_\_\_\_\_

2.  $2 \text{ ft} - 10 \text{ in.} =$  (Write the difference in inches.) \_\_\_\_\_

3.  $4 \text{ ft} + 6 \text{ in.} =$  (Write the sum in inches.) \_\_\_\_\_

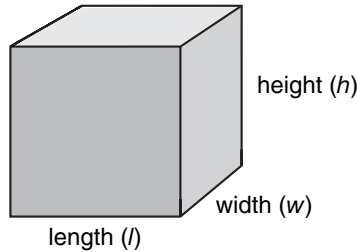
4.  $3 \text{ ft} \times 6 \text{ ft} =$  \_\_\_\_\_

5.  $\frac{25 \text{ cm}^2}{5 \text{ cm}} =$  \_\_\_\_\_

6.  $\frac{500 \text{ mi}}{10 \text{ hr}} =$  \_\_\_\_\_

• **Volume of a Rectangular Prism**

- The **volume** of a shape is the amount of space the shape occupies. Volume is measured in **cubic width**.



- $V = lwh$  (volume = length  $\times$  width  $\times$  height)

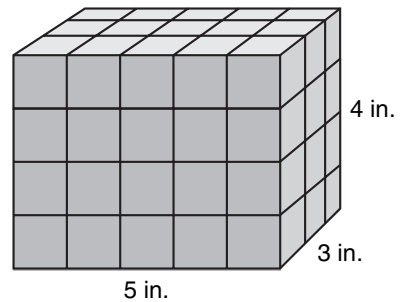
**Example:** What is the volume of this rectangular prism?

$$V = lwh$$

$$V = (5)(3)(4)$$

$$V = 60 \text{ in.}^3$$

(in.<sup>3</sup> means cubic inches)

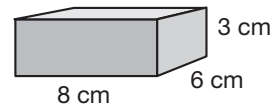


**Practice:**

1. What is the volume of a shoe box that is 11 inches long, 6 inches wide, and 4 inches high? \_\_\_\_\_

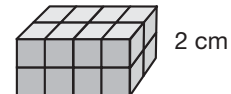


2. What is the volume of this rectangular prism? \_\_\_\_\_

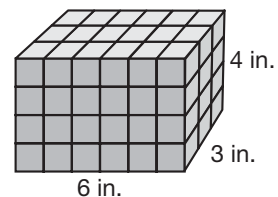


3. What is the volume of a cube that has edges 5 inches long? \_\_\_\_\_

4. How many 1-centimeter sugar cubes would be needed to form this rectangular prism? \_\_\_\_\_



5. What is the volume of this rectangular prism? \_\_\_\_\_



• **Proportions**

A **proportion** is a true statement that two ratios are equal.

$$\frac{3}{4} = \frac{6}{8} \quad \text{Three is to four as six is to eight.}$$

- To find a missing term in a proportion, find the number that is multiplied by the first term to get the second term.
- Whatever has been done to the numerator, do to the denominator (and vice versa).

**Example:**  $\frac{3}{5} = \frac{6}{a}$       $3 \times 2 = 6$   
                                 so  $5 \times 2 = 10$       $\frac{3}{5} \times \frac{2}{2} = \frac{6}{10}$   
                                  $a = 10$

**Practice:**

1. Which ratio forms a proportion with  $\frac{4}{5}$ ? \_\_\_\_\_

- A.  $\frac{8}{9}$                   B.  $\frac{16}{20}$                   C.  $\frac{14}{15}$                   D.  $\frac{16}{25}$

2. Write and complete this proportion:  
 Three is to seven as nine is to what number?

\_\_\_\_\_

3. Write and complete this proportion:  
 Nine is to five as eighteen is to what number?

\_\_\_\_\_

4. Write and complete this proportion:  
 Six is to five as what number is to twenty-five?

\_\_\_\_\_

**• Order of Operations, Part 2****Order of Operations**

1. Parentheses
2. Multiply and divide, in order, left to right.
3. Add and subtract, in order, left to right.

<b>Example:</b>	$2(8 + 6) + 15 \div 5$	original problem
	$\underline{2(14)} + \underline{15 \div 5}$	simplified parentheses
	$28 + 3$	multiplied and divided
	31	added

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**Practice:**

Simplify 1–6.

1.  $3 \times 3 + 4 \times 5 = \underline{\hspace{2cm}}$

2.  $6 \times 5 - 7 \times 2 = \underline{\hspace{2cm}}$

3.  $2 + 8 \times 2 - 5 = \underline{\hspace{2cm}}$

4.  $10 + 9 \div 3 - 6 = \underline{\hspace{2cm}}$

5.  $6 \times 4 + 3 \times 2 = \underline{\hspace{2cm}}$

6.  $3 \times (3 + 4) \div 4 = \underline{\hspace{2cm}}$

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**• Using Cross Products to Solve Proportions**

- Equal fractions have equal cross products.

$$\frac{3}{4} \swarrow \searrow \frac{6}{8}$$

$$8 \times 3 = \mathbf{24} \qquad 4 \times 6 = \mathbf{24}$$

- Another way to complete proportions:

1. Cross-multiply.
2. Divide by known factor.

**Example:**  $\frac{3}{5} = \frac{6}{w}$

$$(5 \times 6) \div 3 = 10 \quad \text{or} \quad \frac{5 \cdot \overset{2}{\cancel{6}}}{\underset{1}{\cancel{3}}} = 10$$

Cancel.

**Example:**  $\frac{15}{21} = \frac{w}{70}$

$$\frac{\overset{5}{\cancel{15}} \cdot \overset{10}{\cancel{70}}}{\underset{7}{\cancel{21}}} = w$$

$$w = 50$$

**Practice:**

1. Complete this proportion:

$$\frac{5}{8} = \frac{10}{n}$$

$$n = \underline{\hspace{2cm}}$$

2. Complete this proportion:

$$\frac{7}{k} = \frac{2}{10}$$

$$k = \underline{\hspace{2cm}}$$

Solve 3–4.

3.  $\frac{2}{6} = \frac{9}{w}$

$$w = \underline{\hspace{2cm}}$$

4.  $\frac{4}{20} = \frac{x}{100}$

$$x = \underline{\hspace{2cm}}$$

5. Solve this proportion:

$$\frac{8}{10} = \frac{y}{35}$$

$$y = \underline{\hspace{2cm}}$$

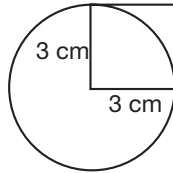
6. Solve the proportion:

$$\frac{m}{15} = \frac{10}{25}$$

$$m = \underline{\hspace{2cm}}$$

### • Area of a Circle

- The radius of a circle is 3 cm. What is the area of the circle?
  - Find the area of a square whose sides equal the radius.
  - Multiply that area by 3.14.



$$\text{Area of square: } 3 \text{ cm} \times 3 \text{ cm} = 9 \text{ cm}^2$$

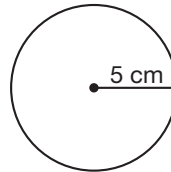
$$\text{Area of circle: } (3.14)(9 \text{ cm}^2) = 28.26 \text{ cm}^2$$

$$A = \pi \cdot r^2$$

**Remember:** radius =  $\frac{1}{2}$  of the diameter  
 $\pi = 3.14$

### Practice:

1. What is the area of the circle? \_\_\_\_\_



2. If the radius of a circle is 4 cm, what is its area? (Use 3.14 for  $\pi$ ) \_\_\_\_\_

3. If the radius of a circle is 2 cm, what is its area? (Use 3.14 for  $\pi$ ) \_\_\_\_\_

4. The diameter of a circle target is 14 inches.

What is the area of the target? (Use 3.14 for  $\pi$ ) \_\_\_\_\_

5. The diameter of a circular tray is 24 inches.

What is the area of the tray? (Use 3.14 for  $\pi$ ) \_\_\_\_\_

Name \_\_\_\_\_

### • Finding Unknown Factors

- To find a missing factor, **divide** the product by the known factor.  
Write answers as mixed numbers (unless there are decimals in the problem).

**Examples:**  $5n = 21$       $4\frac{1}{5}$

$$\begin{array}{r} 5 \overline{)21} \\ \underline{20} \phantom{0} \\ 10 \\ \underline{10} \\ 0 \end{array}$$

$$n = 4\frac{1}{5}$$

$0.6m = 0.048$       $0.08$

$$\begin{array}{r} 0.6 \overline{)0.048} \\ \underline{0.036} \phantom{00} \\ 0.0120 \\ \underline{0.0120} \\ 0 \end{array}$$

$$m = 0.08$$

### **Practice:**

Solve 1–6.

1.  $6n = 0.84$

$n = \underline{\hspace{2cm}}$

2.  $4y = 7$

$y = \underline{\hspace{2cm}}$

3.  $8f = 36$

$f = \underline{\hspace{2cm}}$

4.  $5.5t = 22$

$t = \underline{\hspace{2cm}}$

5.  $5m = 0.95$

$m = \underline{\hspace{2cm}}$

6.  $1.2 = 0.2k$

$k = \underline{\hspace{2cm}}$

## • Using Proportions to Solve Ratio Problems

- Proportions can be used to solve many types of word problems. Use a ratio table to organize the numbers.

**Example:** The ratio of salamanders to frogs was 5 to 7. If there were 20 salamanders, how many frogs were there?

	Ratio	Actual Count
<b>Salamanders</b>	5	20
<b>Frogs</b>	7	<i>f</i>

- Two ways to solve:
  - Multiply by a fractional name for 1.

$$\frac{5}{7} = \frac{20}{f} \longrightarrow \frac{5}{7} \times \frac{4}{4} = \frac{20}{28} \longrightarrow 28 \text{ frogs}$$

- Cross-multiply. Then divide by known factor.

$$\frac{5}{7} = \frac{20}{f} \longrightarrow (7 \times 20) \div 5 = 28 \text{ or } \frac{7 \cdot 20}{\cancel{5}^4} = 28 \text{ frogs}$$

### **Practice:**

- The ratio of boys to girls on the team was 3 to 2.

If there were 9 boys, how many girls were there? \_\_\_\_\_

- The ratio of boys to girls in the class was 4 to 5.

If there were 10 girls, how many boys were there? \_\_\_\_\_

- The ratio of A's to B's on the last test was 5 to 3.

If there were 10 A's, how many B's were there? \_\_\_\_\_

- The ratio of goldfish to angelfish in the fish tank was 6 to 4.

If there were 16 angelfish, how many goldfish were there? \_\_\_\_\_



Name \_\_\_\_\_

Math Course 1, Lesson 89

### • Estimating Square Roots

- To find the square root of a perfect square greater than 100, use the “Guess and Check” method. Think of square roots that you know.

**Example:** Simplify:  $\sqrt{400}$

Think:  $\sqrt{4} = 2$  and  $\sqrt{100} = 10$ . So, try 20.

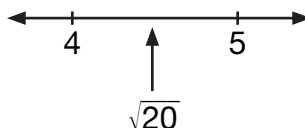
$$20 \times 20 = 400$$

$$\sqrt{400} = 20$$

- To estimate the square root of numbers that are **not** perfect squares, find the perfect square on either side of the given number.

**Example:** Between which two consecutive whole numbers is  $\sqrt{20}$ ?

$\sqrt{20}$  is between  $4(\sqrt{16})$  and  $5(\sqrt{25})$



- Irrational numbers** cannot be exactly expressed as fractions or decimals.

$\sqrt{20} \approx 4.5$  The wavy equals sign means “approximately equal to.”

### Practice:

1. Between which 2 numbers is  $\sqrt{14}$ ? \_\_\_\_\_

- A.** 2 and 3      **B.** 3 and 4      **C.** 4 and 5      **D.** 13 and 15

2. Between which 2 numbers is  $\sqrt{27}$ ? \_\_\_\_\_

- A.** 3 and 4      **B.** 4 and 5      **C.** 5 and 6      **D.** 26 and 28

Simplify 3–6.

3.  $\sqrt{2500} =$  \_\_\_\_\_

4.  $\sqrt{3600} =$  \_\_\_\_\_

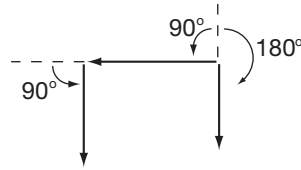
5.  $\sqrt{6400} =$  \_\_\_\_\_

6.  $\sqrt{196} =$  \_\_\_\_\_

**• Measuring Turns**

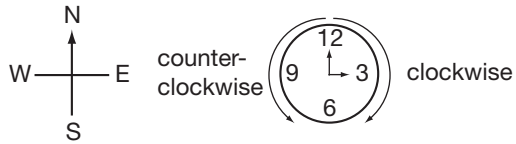
Turns can be measured in degrees.

- A full turn is  $360^\circ$ .
- A half turn is  $180^\circ$ .
- A quarter turn is  $90^\circ$ .



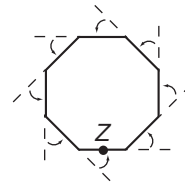
Direction can be described as:

- left or right.
- clockwise or counterclockwise.
- north, south, east, or west.



**Practice:**

Use the figure on the right for Problems 1 and 2.



1. Eddie began at point Z and ran around the field making the turns shown. In those eight turns, Eddie turned a total of how many degrees?

\_\_\_\_\_

2. What was the average number of degrees in each of Eddie's turns? \_\_\_\_\_

3. Angelina was heading north. She made a half turn clockwise.

What direction was Angelina now heading? \_\_\_\_\_

4. Ryan rode his bike east. He turned  $90^\circ$  to the right and rode some more. Then he turned  $90^\circ$  to the right and rode some more.

What direction was Ryan now heading? \_\_\_\_\_