

Unit **5**

Multiplicative Comparison and Measurement

Essential Questions

- What does it mean to compare numbers or amounts using multiplication?
- How can we use multiplication to rewrite a measurement using a different unit?



Unit Story: Just for Fun

You can read the Unit Story with your student by visiting the Unit Story page on the Caregiver Hub.



Unit Investigation

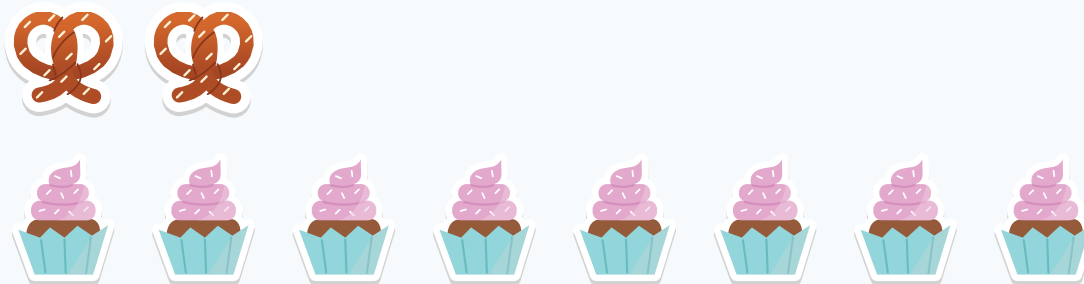
Lesson 1 is the Unit Investigation. Students design their own measurement system with 3 invented units to measure length to build curiosity and apply their own knowledge in a variety of ways. Use the **Caregiver Connection** to help students continue to explore the math they will see in the unit.

Caregiver Connection

Students may enjoy using the units from their invented systems of measurement to measure and describe the lengths of objects around their homes.

Summary | Lesson 2

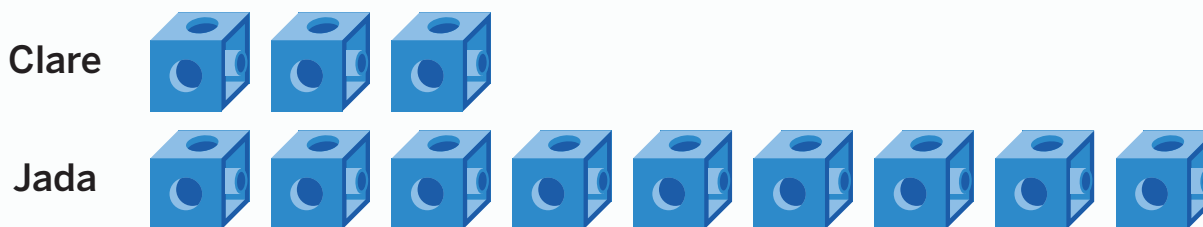
There are different ways to compare 2 quantities. One way is to compare how many times greater 1 quantity is than the other. A second way is to compare how much more 1 quantity is than the other.



There are 4 times as many cupcakes as pretzels.
There are 6 more cupcakes than pretzels.

Try This

- 1 Clare has 3 cubes. Jada has 9 cubes. Complete the comparison statements.



Jada has _____ *times as many* cubes as Clare.

Jada has _____ *more* cubes than Clare.

Summary | Lesson 3

In a multiplication equation representing a comparison of 2 quantities, one of the factors is the multiplier, which represents “times as many.” The other factor is the lesser quantity, and the product is the greater quantity.

$$55 = 5 \times 11$$

greater quantity multiplier lesser quantity

Shawn has 11 strawberries.
Diego has 5 times as many strawberries.

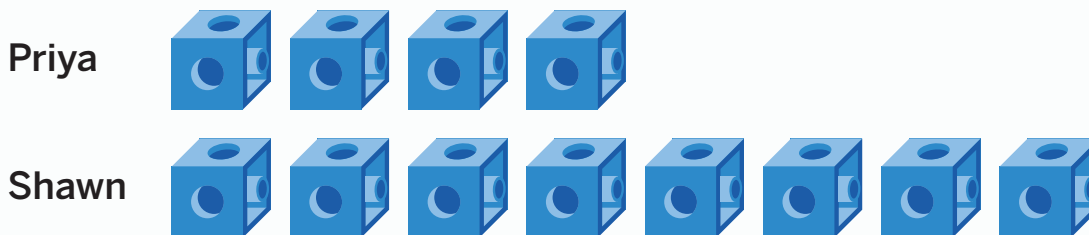
$$55 = 5 \times 11$$

greater quantity lesser quantity multiplier

Shawn has 5 strawberries.
Diego has 11 times as many strawberries.

Try This

- 1 Write a statement using “times as many” that describes Priya’s and Shawn’s cubes.



Summary | Lesson 4

A comparison relationship can be represented using a tape diagram, a statement, and an equation. The same tape diagram can be used to represent any pair of numbers that are related by the same multiplier.

Diego 

Han 

Diego has 5 oranges. Han has 8 times as many.
 $5 \times 8 = 40$

Diego has 7 oranges. Han has 8 times as many.
 $7 \times 8 = 56$

Try This

- 1 Draw a diagram to represent the story problem. Write an equation with a ? to represent the unknown value and then solve the story problem.

story problem: A brown rat has 16 teeth. A giraffe has twice as many teeth as a brown rat. How many teeth does a giraffe have?

diagram:

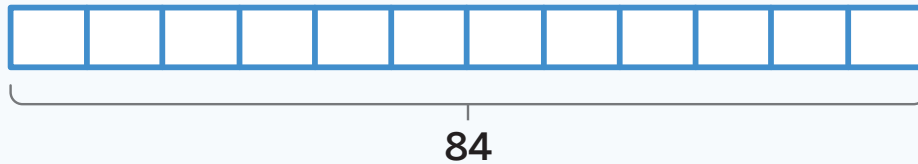
equation: _____

answer: _____

Summary | Lesson 5

Multiplication and division are related operations that can be used to solve some types of comparison story problems.

$$\underline{\hspace{1cm}} \times 12 = 84$$



$$84 \div 12 = ?$$

Try This

Use the story problem for Problems 1–3. Priya practiced the clarinet 6 times as many minutes as Jada. Jada practiced for 15 minutes. How many minutes did Priya practice?

- 1 Write 1 multiplication equation to represent the story problem. Use a ? to represent the unknown value.

- 2 Write 1 division equation to represent the story problem. Use a ? to represent the unknown value.

- 3 Solve the story problem to determine the unknown value.

 Show your thinking.

answer: _____

Summary | Lesson 6

Two-step story problems that involve comparison may require the use of addition, subtraction, multiplication, or division to determine the missing values and can be represented with 1 or 2 equations.

At a book fair, the school collected \$10 on Monday morning. That afternoon, the school collected 8 times as much as they did in the morning. How much money did they collect altogether?

$$10 \times 8 = 80$$

$$(10 \times 8) + 10 = 90$$

$$80 + 10 = 90$$

They collected \$90 altogether.

Try This

- 1 Diego donated 54 canned goods to a food drive. Diego donated 6 times as many canned goods as Priya. How many canned goods did Diego and Priya donate altogether?

 Show your thinking.

answer: _____

When comparing different quantities, using “times as many” language indicates a comparison that involves multiplication.

Jada has 4 times as many cubes as Han.



Try This

- 1 Shawn donated 72 books to a book drive. This was 9 times as many books as Han donated. How many more books did Shawn donate than Han?



Show your thinking.

answer: _____

Sub-Unit 1 | Summary

In this sub-unit . . .

- We learned to use multiplication and the phrase “times as many” for comparing 2 quantities. We interpreted and created diagrams representing these comparison situations.

Diego 

Priya 

Diego has 5 cubes.
Priya has 3 times as many cubes as Diego.

starfish group 

crab group 

The starfish group has 7 kids in it. The crab group has 4 times as many kids as the starfish group.

- We saw how equations can represent “times as many” statements.

40 is 8 times as many as 5.

$$40 = 8 \times 5$$

7 times as many as 3 is 21.

$$7 \times 3 = 21$$

 **Math tip:** If you reverse the order of the factors in a multiplication equation, the product is the same because multiplication is commutative.

- We solved story problems involving comparison and represented unknown values in equations with symbols.

Penny swam 8 times as many laps as Lucas. Lucas swam 7 laps. How many laps did Penny swim?

$$8 \times 7 = ?$$

$$8 \times 7 = 56$$

Penny swam 56 laps.

Lucas swam some laps. Penny swam 72 laps, which is 12 times as many laps as Lucas swam. How many laps did Lucas swim?

$$12 \times ? = 72$$

$$72 \div 12 = 6$$

Lucas swam 6 laps.

Summary | Lesson 8

Meters (m) and centimeters (cm) are units of length in the metric system. 1 meter is equivalent to 100 centimeters, so you can multiply any length in meters by 100 to determine the equivalent length in centimeters.

$$1 \text{ m} = 100 \text{ cm}$$

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

$$2 \times 100 = 200$$

$$2 \text{ m} = 200 \text{ cm}$$

$$10 \text{ m} = \underline{\hspace{2cm}} \text{ cm}$$

$$10 \times 100 = 1,000$$

$$10 \text{ m} = 1,000 \text{ cm}$$

Try This

- 1** Which is longer — 50 centimeters or 1 meter? Explain your thinking.

- 2** Which is longer — 3,000 centimeters or 3 meters? Explain your thinking.

Kilometers (km) are units of length in the metric system. 1 kilometer is equivalent to 1,000 meters, so you can multiply any length in kilometers by 1,000 to determine the equivalent length in meters.

$$1 \text{ km} = 1,000 \text{ m}$$

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

$$2 \times 1,000 = 2,000$$

$$2 \text{ km} = 2,000 \text{ m}$$

$$7 \text{ km} = \underline{\hspace{2cm}} \text{ m}$$

$$7 \times 1,000 = 7,000$$

$$7 \text{ km} = 7,000 \text{ m}$$

Try This

For Problems 1–5, use mental math to determine the value of the expression.

1 5×100 _____

2 $5 \times 1,000$ _____

3 12×100 _____

4 $12 \times 1,000$ _____

5 $20 \times 1,000$ _____

6 Clare bikes for 9 kilometers. How many meters did Clare bike?

Summary | Lesson 10

You can compare distances in different units by using reasoning or converting the distances to the same unit.

Order the distances from shortest to longest.

9 km

9,500 m

90 cm

$$9 \times 1,000 = 9,000$$

There are 100 cm in 1 m,
so $90 \text{ cm} < 9,000 \text{ m}$.

$$9 \text{ km} = 9,000 \text{ m}$$

$$9 \text{ km} < 9,500 \text{ m}$$

shortest to longest: 90 cm, 9 km, 9,500 m

Try This

For Problems 1–5, complete the comparison statement using $<$, $>$, or $=$.

1 15 meters _____ 150 centimeters

2 1 kilometer _____ 10,000 meters

3 $2\frac{1}{2}$ meters _____ 300 centimeters

4 5,000 meters _____ 5 kilometers

5 16,000 centimeters _____ 16 meters

Summary | Lesson 11

Inches (in.), feet (ft), and **yards** (yd) are U.S. Customary units of length. You can convert from one unit to another using the relationship between the units.

$$1 \text{ yard} = 3 \text{ feet}$$

$$1 \text{ foot} = 12 \text{ inches}$$

$$2 \text{ yards} = \underline{\hspace{1cm}} \text{ feet}$$

$$6 \text{ feet} = \underline{\hspace{1cm}} \text{ inches}$$

$$2 \times 3 = 6$$

$$6 \times 12 = 72$$

$$2 \text{ yards} = 6 \text{ feet}$$

$$6 \text{ feet} = 72 \text{ inches}$$

Try This

- 1** The height of the Mona Lisa, a painting by Leonardo da Vinci, is $2\frac{1}{2}$ feet tall. How tall is the Mona Lisa in inches?

- 2** A reticulated python, the world's longest snake, can grow to be 10 yards long. What is 10 yards in inches?

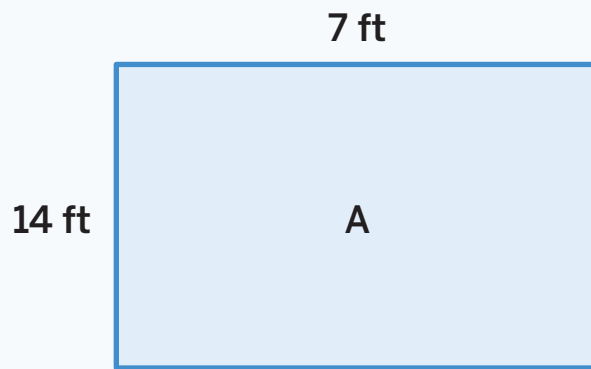


Show your thinking.

answer: _____

Summary | Lesson 12

The perimeter of any rectangle is 2 times the sum of the length and the width.

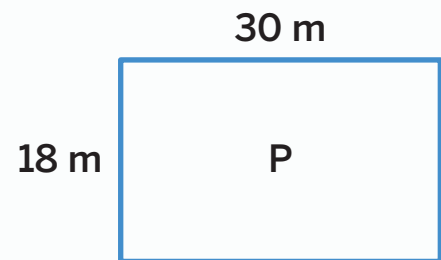


Perimeter is $2 \times (\ell + w)$.
The perimeter of Rectangle A is $2 \times (7 + 14)$.
 $P = 2 \times 21$
 $P = 42$ feet

Try This

- 1 Select *all* the expressions that represent the perimeter of Rectangle P.

- (A) $2 \times 18 + 30$
- (B) 2×48
- (C) 18×30
- (D) $18 + 30 + 18 + 30$
- (E) $(30 + 18) \times 2$
- (F) 38×2



Sub-Unit 2 | Summary

In this sub-unit . . .

- We worked with a length of 1 meter and compared it to the lengths of centimeters and kilometers.

1 meter is 100 times as long as 1 centimeter.

1 kilometer is 1,000 times as long as 1 meter.

-
- We solved problems about length and compared measurements in different units.

30 meters = 3,000 centimeters

3 kilometers = 3,000 meters

3,000 centimeters < 3 kilometers

 **Math tip:** You can compare measurements in different units by reasoning about the relationship between the units or converting them to the same unit.

-
- We used the relationship between yards, feet, and inches to compare and order distances.

1 yard = 3 feet

1 foot = 12 inches

17 ft	$21\frac{1}{3}$ ft	17 yd	$51\frac{1}{2}$ ft	64 ft	22 yd 2 ft
-------	--------------------	-------	--------------------	-------	------------

shortest

longest

Liters (L) and milliliters (mL) are units of liquid volume in the metric system. 1 liter is equivalent to 1,000 milliliters, so you can multiply any measurement in liters by 1,000 to determine the equivalent measurement in milliliters.

Bottle Z has 4 times the amount of water as Bottle H.

Bottle H has 2 liters of water.

How many milliliters of water are in each bottle?

$$1 \text{ L} = 1,000 \text{ mL}$$

$$4 \times 2,000 = 8,000$$

$$2 \times 1,000 = 2,000$$

Bottle Z has 8,000 milliliters
of water.

Bottle H has 2,000 milliliters
of water.

Try This

For Problems 1–5, complete the comparison statement using $<$, $>$, or $=$.

1 10 milliliters _____ 1 liter

2 200 milliliters _____ 2 liters

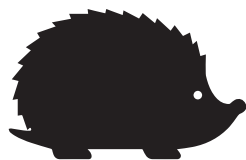
3 4,000 milliliters _____ $3\frac{1}{2}$ liters

4 5,000 milliliters _____ 5 liters

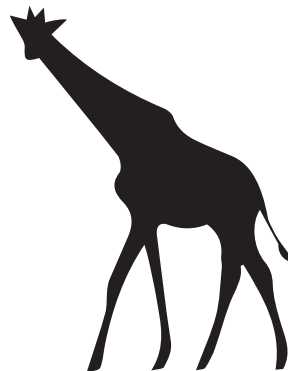
5 10,000 milliliters _____ 6 liters

Summary | Lesson 14

Grams and kilograms are measurement units for weight in the metric system. 1 kilogram (kg) is equal to 1,000 grams (g). The relationship between grams and kilograms can be used to compare weights given in different units.



hedgehog
800 g



giraffe
800 kg

$800 \times 1,000 = 800,000$, so $800 \text{ kg} = 800,000 \text{ g}$
A giraffe weighs more than a hedgehog.

Try This

- 1 Use the image in the Summary to solve the problem.
Which weighs more — 1,000 hedgehogs or 10 giraffes?

 Show or explain your thinking.

answer: _____

Pounds and **ounces** are measurement units for weight in the U.S. Customary system. 1 pound (lb) is equal to 16 ounces (oz) in weight.

$$1 \text{ lb} = 16 \text{ oz}$$

$$2 \text{ lb} = 32 \text{ oz}$$

$$3 \text{ lb} = 48 \text{ oz}$$

$$4 \text{ lb} = 64 \text{ oz}$$

$$5 \text{ lb} = 80 \text{ oz}$$

Try This

- 1 A granola recipe includes oats and coconut flakes. Han uses 2 pounds of old-fashioned oats. The weight of the oats is 4 times the weight of the coconut flakes that Han needs. How many ounces of coconut flakes does Han need?



Show or explain your thinking.

answer: _____

Hours, minutes, and **seconds** are measurement units of time. 1 hour is 60 times as long as 1 minute, and 1 minute is 60 times as long as 1 second. You can use the relationships between units of time to solve problems.

It took Diego $1\frac{1}{2}$ hours to get home from school yesterday.

How many minutes is that? How many seconds?

$$1 \text{ hour} = 60 \text{ minutes}$$

$$1 \text{ minute} = 60 \text{ seconds}$$

$$\frac{1}{2} \text{ hours} = 30 \text{ minutes}$$

$$90 \times 60 = 5,400$$

$$1\frac{1}{2} \text{ hours} = 90 \text{ minutes}$$

$$1\frac{1}{2} \text{ hours} = 5,400 \text{ seconds}$$

Try This

- 1** Jada and her brother did their weekly chores. Complete the table with the missing number of hours or minutes.

Activity	Hours	Minutes
pull weeds		90
mop		30
dust	$\frac{1}{4}$	
clean bedrooms	2	

When comparing 2 measurements given in different units, you can always convert the measurement given in the larger unit to the smaller unit. Sometimes, you can use what you know about the relationship between the units to compare without converting units.

Which is more: 10 kilometers or 100,000 centimeters?	Which is more: 5 hours or 50 minutes?
$1 \text{ km} = 1,000 \text{ m}$ $10 \times 1,000 = 10,000$ $10 \text{ km} = 10,000 \text{ m}$ $1 \text{ m} = 100 \text{ cm}$ $10,000 \times 100 = 1,000,000$ $10 \text{ km} = 1,000,000 \text{ cm}$ $10 \text{ km} > 100,000 \text{ cm}$	Because I know 1 hour is 60 minutes, I know 50 minutes is less than 5 hours. $5 \text{ hours} > 50 \text{ minutes}$

Try This

- Would you rather have 3,500 grams of quarters or 2 kilograms of quarters?



Show or explain your thinking.

I want (*more or less*) _____,

so I would rather have _____.

Sub-Unit 3 | Summary

In this sub-unit . . .

- We learned about various units for measuring liquid volume, weight, and time in the metric and U.S. Customary systems.

$$1 \text{ L} = 1,000 \text{ mL} \quad 1 \text{ kg} = 1,000 \text{ g} \quad 1 \text{ lb} = 16 \text{ oz} \quad 1 \text{ hr} = 60 \text{ min} \\ 1 \text{ min} = 60 \text{ sec}$$

 **Math tip:** To convert a measurement from a larger unit to a smaller unit, multiply by the number of smaller units that are equal to one of the larger units.

- We used what we know about the relationship between units to compare and order measurements.

Which weighs more — 100 river otters or 10 tigers?

river otter 9,000 g

tiger 120 kg

100 river otters:

$$1,000 \text{ g} = 1 \text{ kg}, \text{ so } 9,000 \text{ g} = 9 \text{ kg}$$

$$100 \times 9 = 900, \text{ so } 900 \text{ kg}$$

10 tigers:

$$10 \times 120 = 1,200, \text{ so } 1,200 \text{ kg}$$

$900 \text{ kg} < 1,200 \text{ kg}$, so 10 tigers weigh more.

- We solved multi-step problems involving comparisons and unit conversions.

Lucas found 2 cans of blue paint in his garage. Can G has 210 milliliters of blue paint. Can H has 4 times as much blue paint as Can G. Does Lucas have more or less than 1 liter of blue paint in total?

Can H: 4×210

$$4 \times 200 = 800$$

$$4 \times 10 = 40$$

$$800 + 40 = 840$$

Can G + Can H

$$840 + 210 = 1,050, \text{ so } 1,050 \text{ milliliters}$$

$$1 \text{ liter} = 1,000 \text{ milliliters}$$

$$1,050 \text{ milliliters} > 1,000 \text{ milliliters}$$

Lucas has more than 1 liter.

Lesson 2

1 Jada has 3 *times as many* cubes as Clare.

Jada has 6 *more* cubes than Clare.

Lesson 3

1 **Sample response:**
Priya has 4 cubes. Shawn has 2 times as many cubes as Priya.

Lesson 4

1 **Sample diagram and equation:**

diagram: brown rat ●●●●●●●●●●●●●●●●
giraffe ●●●●●●●●●●●●●●●●
●●●●●●●●●●●●●●●●

equation: $16 \times 2 = ?$

answer: 32 teeth

Lesson 5

1 $6 \times 15 = ?$ or $15 \times 6 = ?$

2 $? \div 6 = 15$ or $? \div 15 = 6$

3 **Sample work:**

$$6 \times 15 = 90$$

answer: 90 minutes

Lesson 6

1 **Sample work:**

Priya donated: $54 \div 6 = ?$

$$54 \div 6 = 9$$

Priya and Diego donated: $54 + 9 = 63$

answer: 63 canned goods

Lesson 7

1 Sample work:

Han donated: $72 \div 9 = ?$

$$72 \div 9 = 8$$

Shawn donated 72 books. Han donated 8 books.

$$72 - 8 = 64$$

answer: 64 books

Lesson 8

Sample explanations:

1 1 meter; 1 meter is 100 centimeters, which is longer than 50 centimeters.

2 3,000 centimeters; 3 meters is equal to 300 centimeters.
 $3,000 > 300$

Lesson 9

1 500

2 5,000

3 1,200

4 12,000

5 20,000

6 9,000 meters

Lesson 10

1 $>$

2 $<$

3 $<$

4 $=$

5 $>$

Lesson 11

1 30 inches

2 Sample work:

$$10 \times 3 = 30 \text{ or } 30 \text{ feet}$$

$$30 \times 12 = 360 \text{ or } 360 \text{ inches}$$

answer: 360 inches

Lesson 12

1 B, D, E

Lesson 13

1 <

2 <

3 >

4 =

5 >

Lesson 14

1

Sample work:

1,000 hedgehogs:

$$800 \times 1,000 = 800,000,$$

so 800,000 g

$$800,000 \text{ g} = 800 \text{ kg}$$

10 giraffes:

$$10 \times 800 = 8,000,$$

so 8,000 kg

answer: 10 giraffes

Lesson 15

1

Sample work:

2 lb oats

$$\text{oats} = 4 \times \text{coconut flakes}$$

oats:

$$2 \times 16 = 32$$

coconut flakes:

$$32 = 4 \times ?$$

$$32 \div 4 = 8$$

answer: 8 ounces

Lesson 16

1

Hours	Minutes
$1\frac{1}{2}$	90
$\frac{1}{2}$	30
$\frac{1}{4}$	15
2	120

Lesson 17

1 Sample response:

$1,000\text{ g} = 1\text{ kg}$, so $2,000\text{ g} = 2\text{ kg}$.

$3,500\text{ g} > 2,000\text{ g}$

I want (*more or less*) more,

so I would rather have 3,500 grams of quarters.