Lesson 1

UNDERSTAND RATIOS NY-6.RP.1, NY-6.RP.3b

INTRODUCTION

Real-World Connection

Santiago likes to draw monsters in his sketchbook. One page in his book has 14 monsters, as shown in the image. He wants to describe his collection of drawings based on the number of eyes of each monster. What is the ratio of one-eyed monsters to two-eyed monsters? What is the ratio of three-eyed monsters to all monsters? Let's practice the skills in the **Guided Instruction** and **Independent Practice** and, at the end of the lesson, see what the ratios are!
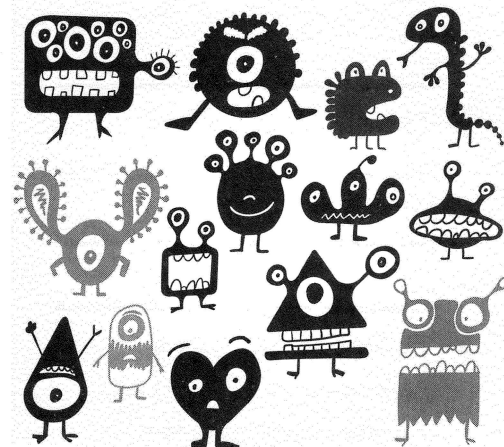
What I Am Going to Learn

- How to write ratios as part-to-part or part-to-whole

- How to write equivalent ratios

What I May Already Know

- I know how to show that fractions are equivalent.

- I know how to compare fractions.

Vocabulary in Action

A **ratio** compares the sizes of two quantities or measures.

- The ratio of a to b is written $a:b$, $\frac{a}{b}$, or a to b. We say, "For every a of one value, there is b of another value."

- You can write the ratio of a to b and the ratio of b to a but $a:b$ does not always equal $b:a$.

- Part-to-part ratios compare one quantity in a group to another quantity in the same group.

- Part-to-whole ratios compare one quantity in a group to the entire group.

- Ratios can be reduced to their simplest form, like fractions, by using **equivalent ratios**. For example, if there are 12 boys and 24 girls in a class, there is 1 boy for every 2 girls.

EXAMPLE

◇ ☆ ☆ ◇ ☆

You can write part-to-part ratios comparing one part to another.

- The ratio of stars to diamonds is 3:2. There are 3 stars for every 2 diamonds.

- The ratio of diamonds to stars is 2:3. There are 2 diamonds for every 3 stars.

EXAMPLE

◇ ☆ △ ◇ ☆ △

You can write part-to-whole ratios, comparing one shape to the whole group.

- The ratio of diamonds to shapes is 2:6. There are 2 diamonds for every 6 shapes.

- The ratio of stars to shapes is 2:6. There are 2 diamonds for every 6 shapes.

You can also write part-to-part ratios.

- The ratio of diamonds to stars is 2:2. There are 2 diamonds for every 2 stars.

- We could also simplify this ratio to 1:1. There is 1 diamond for every 1 star.

Sometimes, a drawing can help you understand the ratio better.

▶ **THINK ABOUT IT**

How are part-to-whole ratios similar to fractions?

▶ **TURN AND TALK**

A unit rate is a very special type of a ratio in its simplest form. A unit rate is written, "For every 1 of something, there is ___ of something." When have you heard of a unit rate?

▶ **SKETCH IT**

Draw a picture using diamonds to represent students in your class with hair longer than their chin and circles to represent students in your class with hair shorter than their chin. What is this part-to-part ratio in simplest form?

EXAMPLE

A classroom has 12 boys and 15 girls. What is the ratio of girls to boys in simplest form?

In the diagram, diamonds represent boys and circles represent girls.
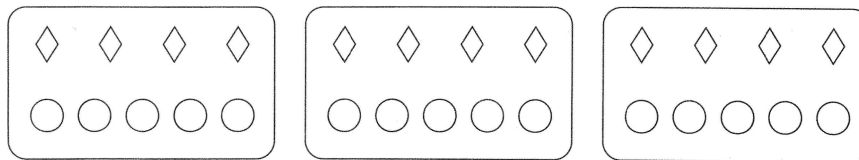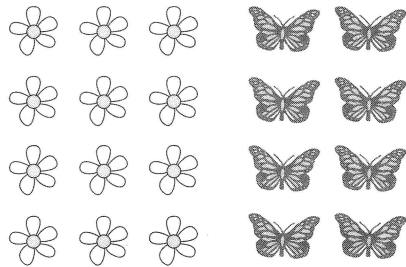

The ratio of girls to boys is $\frac{15}{12}$, but we can see from the drawing and from what we know about equivalent fractions that this simplifies to $\frac{5}{4}$.

So, there are 5 girls for every 4 boys.

GUIDED INSTRUCTION

1. What is the simplest form of the ratio of butterflies to flowers? Write the ratio in three different ways.
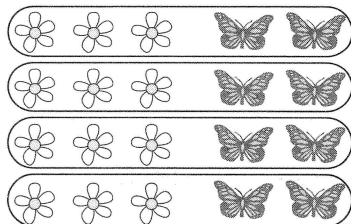
Step One Count the number of butterflies and the number of flowers in the diagram and write the part-to-part ratio in the correct order.

There are 8 butterflies and 12 flowers.

So, the ratio of butterflies to flowers is 8 to 12.

Step Two Simplify the ratio.

$$\frac{8}{12} = \frac{8 \div 4}{12 \div 4} = \frac{2}{3}$$

There are 2 butterflies for every 3 flowers.

Step Three Express the ratio in three different ways.

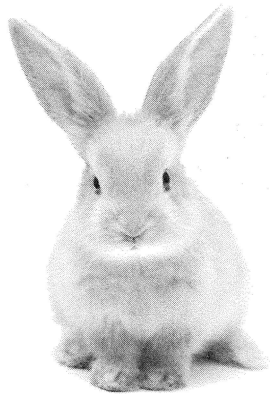For every 2 butterflies, there are 3 flowers.

2:3, $\frac{2}{3}$, or 2 to 3.

▶ TIPS AND HINTS

Ratios are similar to fractions and can be simplified the same way.

2. The local pet store has two kinds of bunnies. They have 5 spotted bunnies and 3 lop-eared bunnies. Write three different ratios about the bunnies.

Step One Find the part-to-part ratio of spotted bunnies to lop-eared bunnies in the correct order.

For every 5 spotted bunnies, there are 3 lop-eared bunnies.

5:3, $\frac{5}{3}$, or ⬚ to ⬚

Step Two Count the total number of bunnies.

$5 + 3 = 8$

There are ⬚ bunnies in the pet store.

Step Three Find the part-to-whole ratio of spotted bunnies to the total number of bunnies.

For every 5 spotted bunnies, there are 8 total bunnies.

5:8, ⬚, or 5 to 8

Step Four Find the part-to-whole ratio of lop-eared bunnies to the total number of bunnies.
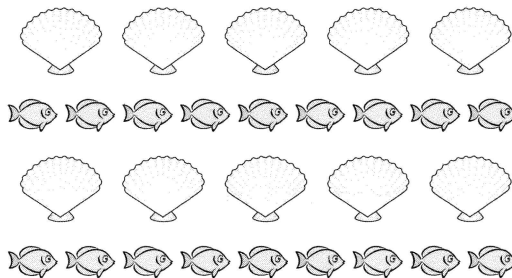
For every 3 lop-eared bunnies, there are 8 total bunnies.

⬚, $\frac{3}{8}$, or 3 to 8

3. Select the ratio that describes the picture.

Ⓐ 9 fish to 10 shells

Ⓑ 5 shells to 14 objects

Ⓒ 5 shells to 9 objects

Ⓓ 5 fish to 14 shells

Learning Together

Work in small groups. Write as many ratios based on content as you can in 3 minutes.

Examples:

- number of students with brown hair to number of students with red hair

- girls to boys

- boys to total

- total students to number of students with glasses

Present your ratios to the class. Which group was able to come up with the most ratios?

How Am I Doing?

_____

What questions do you have?

_____

_____

_____

How do you write a ratio comparing two amounts in a group? Use an

example to explain.

_____

_____

_____

What is an example of ratio that you see or hear every day?

_____

_____

_____

_____

Circle the sign that shows how you are doing with the skill.

STOP

I am stuck.

YIELD
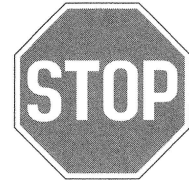
I almost have it.

I understand the skill.

INDEPENDENT PRACTICE 1

1 Which ratio is equal to 24:100?

    A   6:25
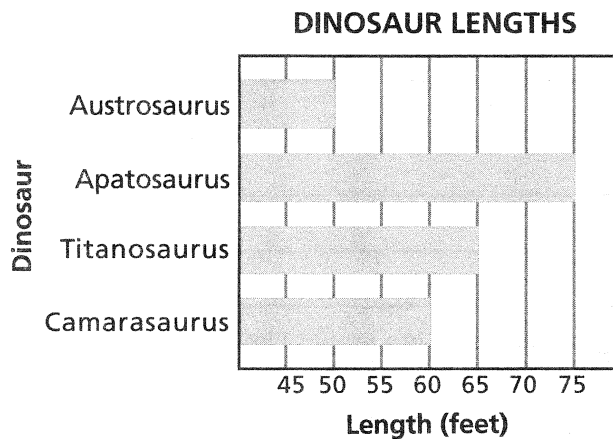
    B   1:4

    C   6:20

    D   20:6

◄ **TIPS AND HINTS**

It might help to write each ratio as a fraction and then compare the values.

2 The bar graph below shows the average lengths of four different dinosaurs.

DINOSAUR LENGTHS

What is the ratio of the average length of the *Camarasaurus* to that of the *Apatosaurus*?

    A $\frac{3}{1}$

    B $\frac{4}{5}$

    C $\frac{15}{13}$

    D $\frac{5}{4}$

◄ **THINK ABOUT IT**

Ratios both look and reduce similar to fractions, but a fraction such as $\frac{3}{1}$ is simplified to 3. Why can't you simplify the ratio $\frac{3}{1}$?
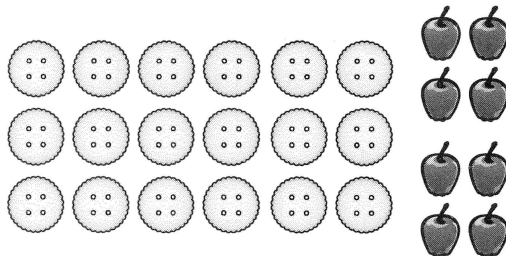
3 The ratio of desktop computers to laptop computers sold by a mail-order company last week was 8 to 3. What could be the numbers of computers sold by the company last week?

A   448 desktops, 168 laptops

B   448 desktops, 165 laptops

C   440 desktops, 168 laptops

D   400 desktops, 165 laptops

4 The image below shows snacks of crackers and apples.

◀ **TIPS AND HINTS**
Start with all of the items and then reduce.

Write four reduced ratios showing crackers to all snacks, all snacks to apples, apples to crackers, and crackers to apples.

Show your work.

Answer _____ crackers to all snacks

_____ all snacks to apples

_____ apples to crackers

_____ crackers to apples

INDEPENDENT PRACTICE 2

1 Gregory keeps school supplies in his locker. He has 24 pencils and 16 erasers.
Which is the ratio of pencils to erasers in his locker?

A   2:3

B   3:5

C   3:2

D   5:3

2 A teacher brings 8 birdies and 32 rackets to a physical education class of 30 students
playing badminton. What is the ratio of birdies to students for this class?

A   4:15   C   1:4

B   15:16   D   4:1

3 A sixth grade class has 29 students. There are 15 boys. What is the ratio of boys
to girls?

A   4:15

B   14:29

C   15:14

D   15:29

4 Which ratio is equivalent to 2:3?

A   2 dogs to 1 cat

B $\frac{40 \text{ miles}}{60 \text{ minutes}}$

C   birds to lizards when there are 5 birds and 10 total birds and lizards

D   For every 3 flower beds, there are 2 rosebushes.

5 The ratio of deciduous trees, those that shed their leaves, to evergreens in a forest is $\frac{11}{4}$. What could be the numbers of deciduous trees and evergreens in the forest?

A   108 deciduous, 297 evergreen

B   286 deciduous, 108 evergreen

C   297 deciduous, 104 evergreen

D   297 deciduous, 108 evergreen

6 In a package of green and blue straws, the ratio of green to blue straws is 2 to 5. Which could be the total number of straws in the package?

A   10

B   25

C   28

D   40

7 Margaret's chart of the whole numbers from 1 to 20 is shown below.

MARGARET'S CHART

1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20

Which of the following statements is **not** true?

A   The ratio of the numbers divisible by 5 to the numbers divisible by 4 is $\frac{4}{5}$.

B   The ratio of even numbers to odd numbers is 1:1.

C   The ratio of even numbers to all numbers is $\frac{1}{2}$.

D   The ratio of numbers divisible by 5 to the numbers divisible by 10 is 1:2.

8 A granola recipe calls for 3 cups of oats, 1 cup of almonds, 1 cup of pecans, and 1 cup of dried fruit. What is the ratio of fruit to oats?

Answer _____

Yolanda says that for every 2 cups of nuts, there are 2 cups of fruit. Explain why her answer is incorrect and give the correct ratio of nuts to fruit.

Explain your answer.

_____

_____

_____

_____

_____

_____

9 For a rugby match, a team uses 15 players on the field, with up to 8 substitute players standing on the sidelines. If a team has the maximum number of substitutes, what is the ratio of substitutes to players on the team?
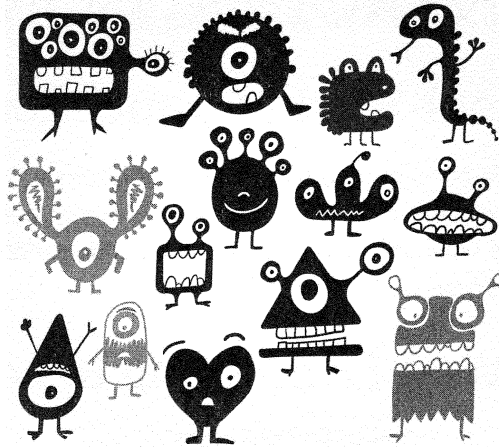
Answer _____

Explain your answer.

_____

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EXIT TICKET

Now that you have mastered ratios, let's solve the problem in the **Real-World Connection**.

Santiago likes to draw monsters in his sketchbook. One page in his book has 14 monsters. He wants to describe his collection of drawings based on the number of eyes each monster has.

What is the ratio of one-eyed monsters to two-eyed monsters?

_____

_____

_____

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What is the ratio of three-eyed monsters to all monsters?

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