4

A Trip to the Moon

Using Tables to Represent Equivalent Ratios

WARM UP

It takes 1 cup of milk to make a batch of 8 pancakes.

1. How many cups of milk does it take to make 16 pancakes?

2. How many cups of milk does it take to make 4 pancakes?

3. How many pancakes can be made with 4 cups of milk?

LEARNING GOALS

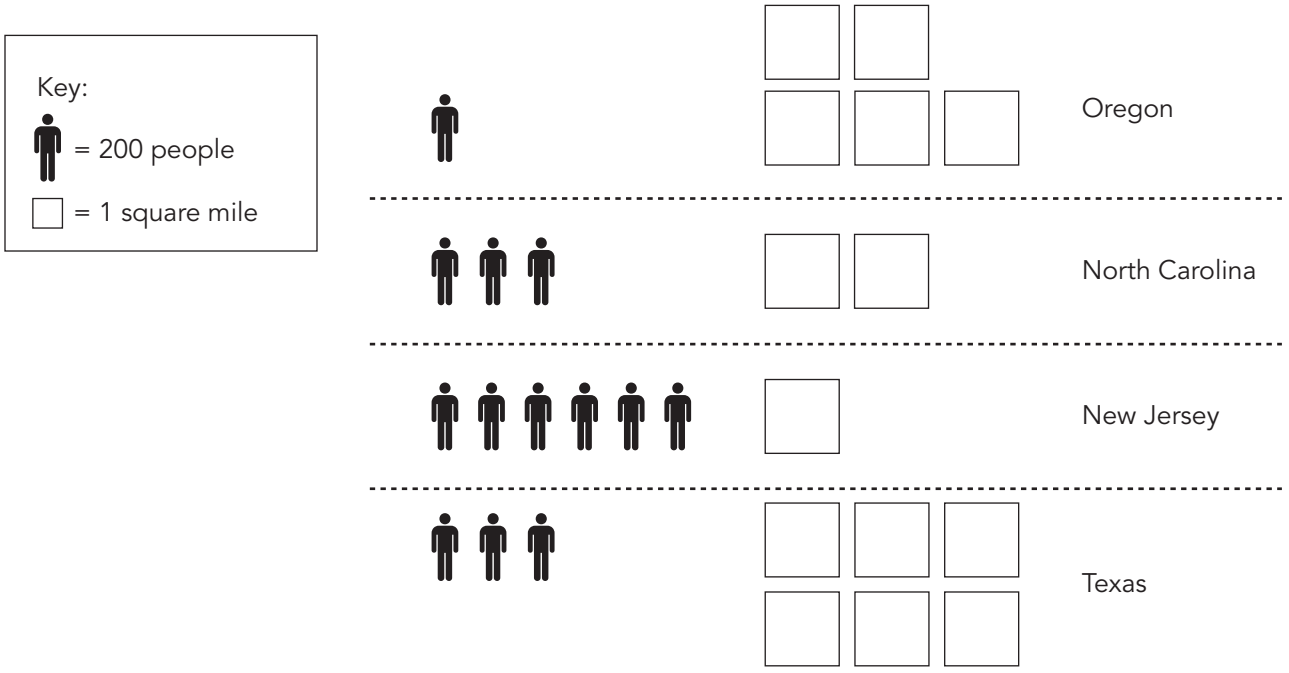
- Create and reason about tables of equivalent ratios.
- Use known values in a table to determine equivalent ratios.
- Solve problems by reasoning about graphs, diagrams, and tables of equivalent ratios.

You have created equivalent ratios using pictures, tape diagrams, double number, and scaling up or scaling down. Are there other strategies you can use to determine equivalent ratios?

I'm Your Density

Population density is a ratio that compares people to square miles. The graph shown gives the approximate population density of four U.S. states in 2015.

1. Which of the states shown has the greatest population density? Which state has the least population density? Explain what this means in your own words.



2. What is the population density of your state or your city? How does this compare with other states or cities?

ACTIVITY
4.1 Introduction to Ratio Tables

Gravity is a natural force that attracts objects to each other. Gravity is the pull toward the center of an object like the Earth, a planet, or the Moon. Your weight on the Earth is the measure of the amount of gravitational attraction exerted on you by the Earth. The Moon has a weaker gravitational force than the Earth.

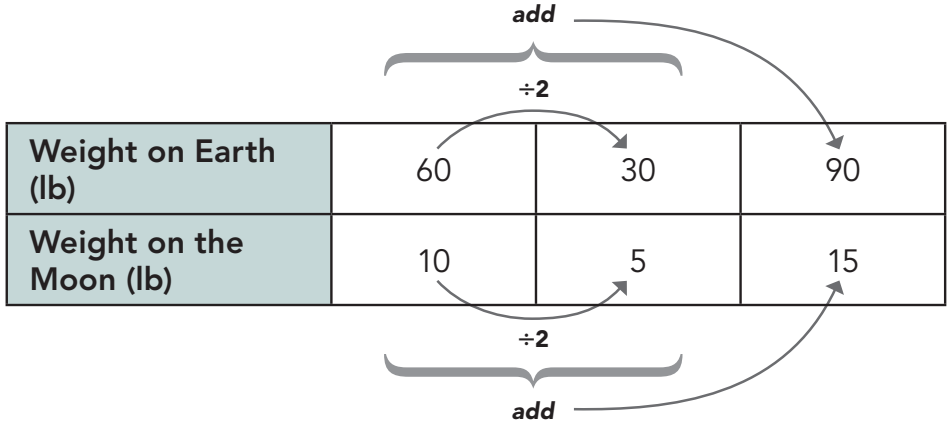
The ratio of *weight on Earth* : *weight on the Moon* is approximately 60 lb : 10 lb.

You can use ratio tables to show how two quantities are related. Ratio tables are another way to organize information.

WORKED EXAMPLE

The table represents three equivalent ratios of *weight on Earth (lb)* : *weight on the Moon (lb).*

The ratio of 60 lb on Earth : 10 lb on the Moon is given.



1. **Verify that adding the two existing equivalent ratios 60 lb on Earth : 10 lb on the Moon and 30 lb on Earth : 5 lb on the Moon produces the equivalent ratio 90 lb on Earth : 15 lb on the Moon by analyzing the quotient of each ratio. What do you notice?**

2. **Can you show a different strategy to determine the ratio of 90 lb on Earth : 15 lb on the Moon?**

3. **Howard, Carla, Mitsu, and Ralph each determined the weight of a 120-lb person on the Moon.**

   a. **Compare Howard's and Carla's strategies.**

Howard

I can scale 60 up to 120 by multiplying by 2, so then I must also multiply 10 by 2 to get 20.

×2

Weight on Earth (lb)	60	30	90	120
Weight on the Moon (lb)	10	5	15	20

×2

Carla

I also got the ratio of 120 lb on Earth : 20 lb on the Moon.

30 lb on Earth : 5 lb on the Moon

×4 → 120 lb on Earth : 20 lb on the Moon ×4

b. Explain Mitsu's reasoning. Then verify the ratio 120 lb on Earth : 20 lb on the Moon is a correct equivalent ratio.

Mitsu

I used the weights for a 30-lb person and a 90-lb person to obtain the weight of a 120-lb person.

Weight on Earth (lb)	60	30	90	120
Weight on the Moon (lb)	10	5	15	20

So that means 120 lb on Earth : 20 lb on the Moon.

c. Explain why Ralph's reasoning is not correct.

Ralph

The difference between 90 and 120 is 30, so I just added 30 to 15 and got 45.

		+30
Weight on Earth (lb)	90	120
Weight on the Moon (lb)	15	45
		+30

I got the ratio of 120 lb on Earth : 45 lb on the Moon.

4. Mitsu said, "I see another equivalent ratio when I look at the way Carla showed her work."

30 lb on Earth : 5 lb on the Moon
120 lb on Earth : 20 lb on the Moon
150 lb on Earth : 25 lb on the Moon

Is Mitsu correct? Explain her reasoning.

5. Use the table to show a different calculation for the ratio of 150 lb on Earth : 25 lb on the Moon. Explain your reasoning.

Weight on Earth (lb)	60	30	90	120	150
Weight on the Moon (lb)	10	5	15	20	25

ACTIVITY
4.2 Using Equivalent Ratio Tables

The 6th-grade pizza party is planned for tomorrow. Tracy is in charge of ordering the pizza for 450 students. The pizza parlor said two pizzas will serve 9 students. Tracy made a ratio table to help her determine how many pizzas to order for 450 students.

Pizzas	2	10	
Students	9	45	450

1. Explain Tracy's strategy and determine the number of pizzas needed.

2. **Complete the table to show the number of pizzas to order given the number of students. Explain your calculations.**

Pizzas	2	10						
Students	9	45	450	135	270	225	900	1350

3. **Use your table of values to answer each question. Explain your calculations.**

   a. **How many students will 12 pizzas feed?**

   b. **How many students will 20 pizzas feed?**

   c. **How many students will 90 pizzas feed?**

ACTIVITY
4.3

Parts and Wholes in Ratio Tables

Remember, the school colors at Riverview Middle School are a shade of bluish green and white. The art teacher, Mr. Raith, needs to mix different quantities of the green paint for several school projects. It takes 3 parts blue paint to 2 parts yellow paint to create the bluish green color. Carla needs 5 total pints of the bluish green paint, so she used 3 pints of blue paint and 2 pints of yellow paint.

Mr. Raith thought that the art students needed a table to help determine the correct amount of each color of paint for different projects—both large and small.

1. Complete the table with the correct amounts. Explain your reasoning.

Amount of Bluish Green Paint Needed	5 pints	15 pints			
Yellow Paint	2 pints		8 pints		
Blue Paint	3 pints		12 pints	18 pints	1.5 pints

2. Examine Sally's answer. Explain what is wrong with her thinking.

Sally

If I want 15 pints of bluish green paint, then I will need to add 10 to the original 5 total parts of bluish green to get 15. So, I should add 10 to each of the other numbers too to get 12 pints of yellow and 13 pints of blue.

Charlie said, "The table is helpful, but it cannot list every amount we might need for every painting project. I think if we multiply $\frac{2}{5}$ times the total amount of bluish green paint we need, we can determine the amount of yellow paint needed. If we multiply $\frac{3}{5}$ times the total amount of bluish green paint we need, we can determine the amount of blue paint needed."

3. What do you think about Charlie's method? Is he correct or incorrect? Explain your reasoning.

Charlene said, "I am thinking about this in a different way. The amount of blue paint is always $1\frac{1}{2}$ times as much as the amount of yellow paint."

4. Is she correct in her thinking? Explain your reasoning.

Clifford said, "My thinking is related to Charlene's. The yellow paint is $\frac{2}{3}$ of the blue paint."

5. Is Clifford correct? Explain your reasoning.

6. How does Clifford's thinking relate to Charlene's thinking?

NOTES

TALK the TALK

Lollipop Recipe

Consider the recipe for making one batch of lollipops.

- 2 cups granulated sugar
- $\frac{2}{3}$ cup light corn syrup
- $\frac{3}{4}$ cup water
- $\frac{1}{4}$ teaspoon flavoring oil

1. The table represents the ratio of ingredients used to make lollipops. Complete the ratio table. Explain your calculations.

Number of Batches	1	2	5	10
Sugar (c)				
Corn syrup (c)				
Water (c)				
Flavoring Oil (tsp)				

2. For each number of batches, describe how you can use addition to determine the amount of each ingredient needed.

a. 3 batches **b. 7 batches**

3. For each number of batches, describe how you can use subtraction to determine the amount of each ingredient needed.

a. 3 batches **b. 7 batches**

Assignment

Write

Describe how addition can be used with ratio tables to create equivalent ratios. Use examples in your explanation.

Remember

You can use a table to represent, organize, and determine equivalent ratios. You can use addition and multiplication to create equivalent ratios.

Practice

Each table represents the ratio of yellow daffodils to white daffodils for different garden displays. Complete each ratio table. Explain your calculations.

1.

Yellow daffodils	9	36	45	
White daffodils	15			90

2.

Yellow daffodils	7		28	
White daffodils	6	12		42

3.

Yellow daffodils	32			16
White daffodils		48	6	12

4.

Yellow daffodils	5	1		9
White daffodils		3	30	

5.

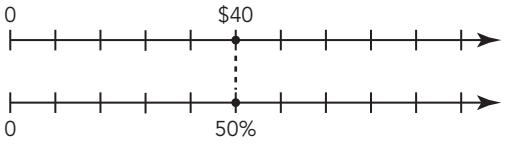
Yellow daffodils		105	84	21
White daffodils	20	60		

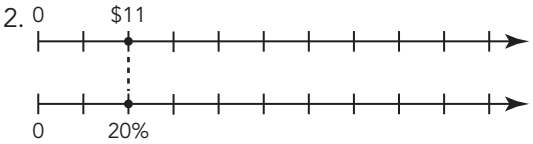
6.

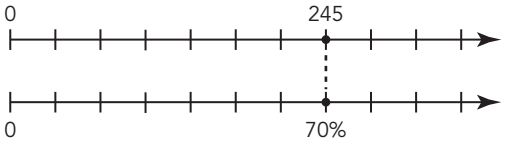
Yellow daffodils	55	22	77	
White daffodils	25	10		5

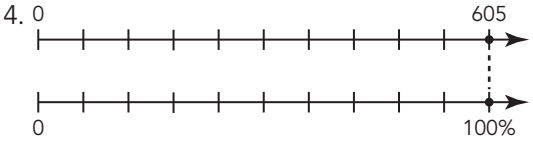
Stretch

Complete each double number line.

1. 

2. 

3. 

4. 

Review

1. In tennis, an ace is a legal serve that cannot be returned and is not even touched by the opponent's racket. Cecelia has an excellent serve. Last week, Cecelia hit 7 aces in 2 matches.
   a. If she plays 6 matches in the regional tournament, how many aces should she expect? Show your work.
   b. If she plays 10 matches in the regional tournament, how many aces should she expect? Show your work.

2. The winning time for the middle school 4-person 100-meter relay was 62.59 seconds. Suppose that each runner ran exactly the same amount of time. What would the time be for each runner?

3. Spring Hill Park is on a rectangular piece of land that measures 0.75 mile by 1.25 miles. Draw and label a rectangle to represent the park. Then determine the area of the park.

4. Determine each product.
   a. 25×0.31
   b. 7.05×3.72