



## Lesson 9: Tables of Equivalent Ratios

### Student Outcomes

- Students understand that a ratio is often used to describe the relationship between the amount of one quantity and the amount of another quantity as in the cases of mixtures or constant rates.
- Students understand that a *ratio table* is a table of equivalent ratios. Students use ratio tables to solve problems.

### Lesson Notes

The approach of this lesson, and those that follow, is for the teacher to model the use of tables in problem solving. There is no need to engage in an explanation of why or how tables are useful; simply modeling their use in this lesson, examining their structure in the next lesson, and repeatedly using them for problem solving in the remaining lessons of the topic should sufficiently promote tables as a tool for problem solving with collections of equivalent ratios.

### Classwork

#### Example 1 (10 minutes)

##### Example 1

To make Paper Mache, the art teacher mixes water and flour. For every two cups of water, she needs to mix in three cups of flour to make the paste.

Find equivalent ratios for the ratio relationship 2 cups of water to 3 cups of flour. Represent the equivalent ratios in the table below:

Cups of Water	Cups of Flour	
2	3	2:3
4	6	2:3
6	9	2:3
8	12	2:3
10	15	2:3



- What does this ratio mean? For every 2 cups of water, there are 3 cups of flour.
  - *Every time we have a set of two cups of water, we need to have a set of three cups of flour.*
- Why is it worded, “for every 2 cups of water, there are 3 cups of flour”?
  - *This suggests that we might be doing that action repeatedly, adding 2 cups of water and 3 cups of flour.*
- Why would I do it more than once?
  - *There are times that batches need to be larger than using 2 cups of water and 3 cups of flour.*
- (Create a table on the board and label the columns.) Can we list all of the possible recipes for this mixture in order in a table? Let’s start with the ratio that uses the smallest whole numbers. Is there an equivalent ratio that uses smaller whole numbers than the ratio 2 to 3?
  - *No.*
- Then let’s make 2 cups of water and 3 cups of flour our first entry.
- What would the next possibility be if we were using only whole numbers? I don’t want to skip over any of my options here.
  - *For every 4 cups of water, there are 6 cups of flour.*

Continue to guide the students to create the table shown.

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- What is the value of each ratio in the table?
  - $\frac{2}{3}$
- Is that what we expected? Should the value of all of these ratios be equal to each other?
  - *Yes.*
- What we have created here is a ratio table, a table in which all of the values of the ratios are equivalent to one another.
- What kinds of questions could we answer with the data in our table? Can anyone think of a question we might have had at the start of this problem that this table could help us answer?
  - *Answers will vary but students should include ratios and associated ratios in their answer.*

**Example 2 (5 minutes)**

**Example 2**

Javier has a new job designing websites. He is paid at a rate of \$700 for every 3 pages of web content that he builds. Create a ratio table to show the total amount of money Javier has earned in ratio to the number of pages he has built.

Total Pages Built	3	6	9	12	15	18	21	24
Total Money Earned	700	1,400	2,100	2,800	3,500	4,200	4,900	5,600

Javier is saving up to purchase a used car that costs \$4,200. How many web pages will Javier need to build before he can pay for the car?

*Javier will need to build 18 web pages in order to pay for the car.*



- Is there an equivalent ratio to 700: 3 that uses smaller whole numbers?
  - *No.*
- So we'll start our table with the entry 3 pages built and \$700 earned.
- Go ahead and fill in the table without skipping over any possible ratios. Use only whole numbers in the table.

Allow 5 to 10 minutes for each of the next two exercises. If students can only finish one of them, that is alright. Alternatively, if students finish both exercises quickly, you can extend the lesson by either: (a) allowing students to present their table on the board and asking students if they notice any patterns within the table or (b) presenting a partially completed table on the board and asking students to create their own real-world situation and word problem that could go with it.

### Exercise 1 (10 minutes)

#### Exercise 1

Spraying plants with “cornmeal juice” is a natural way to prevent fungal growth on the plants. It is made by soaking cornmeal in water, using two cups of cornmeal for every nine gallons of water. Complete the ratio table to answer the questions that follow.

Cups of Cornmeal	Gallons of Water
2	9
4	18
6	27
8	36
10	45

- a. How many cups of cornmeal should be added to 45 gallons of water?  
*10 cups of cornmeal should be added to 45 gallons of water.*
- b. Paul has only 8 cups of cornmeal. How many gallons of water should he add if he wants to make as much cornmeal juice as he can?  
*Paul should add 36 gallons of water.*
- c. What can you say about the values of the ratios in the table?  
*The values of the ratios are equivalent.*

## Exercise 2 (10 minutes)

## Exercise 2

James is setting up a fish tank. He is buying a breed of goldfish that typically grows to be 12 inches long. It is recommended that there be 1 gallon of water for every inch of fish length in the tank. What is the recommended ratio of gallons of water per fully-grown goldfish in the tank?

Complete the ratio table to help answer the following questions:

Number of Fish	Gallons of Water
1	12
2	24
3	36
4	48
5	60

- What size tank (in gallons) is needed for James to have 5 full-grown goldfish?  
*James needs a tank that holds 60 gallons of water in order to have 5 full-grown goldfish.*
- How many fully-grown goldfish can go in a 40-gallon tank?  
*3 fully-grown goldfish can go in a 40-gallon tank.*
- What can you say about the values of the ratios in the table?  
*The values of the ratios are equivalent.*

## Closing (5 minutes)

- When creating a ratio table, what does each pair of values represent?
  - *Each pair of values represents a ratio that is equivalent to all the other ratios in the table and that describes the ratio relationship of two quantities.*
- Can anyone think of a situation where you have seen a ratio table other than here in class?
  - *The back of a pancake mix box.*
- Can you think of an example of a table of numbers you've seen that was not a ratio table? If you can't think of one that you've seen, see if you can make one up to match a real-world situation.

## Lesson Summary

A ratio table is a table of pairs of numbers that form equivalent ratios.

## Exit Ticket (5 minutes)



Name \_\_\_\_\_

Date \_\_\_\_\_

## Lesson 9: Tables of Equivalent Ratios

### Exit Ticket

A father and his young toddler are walking along the sidewalk. For every 3 steps the father takes, the son takes 5 steps just to keep up. What is the ratio of the number of steps the father takes to the number of steps the son takes? Add labels to the columns of the table and place the ratio into the first row of data. Add equivalent ratios to build a ratio table.



What can you say about the values of the ratios in the table?



Exit Ticket Sample Solutions

A father and his young toddler are walking along the sidewalk. For every 3 steps the father takes, the son takes 5 steps just to keep up. What is the ratio of the number of steps the father takes to the number of steps the son takes? Add labels to the columns of the table and place the ratio into the first row of data. Add equivalent ratios to build a ratio table.

<i>Number of Steps the Father Takes</i>	<i>Number of Steps the Son Takes</i>
3	5
6	10
9	15
12	20
15	25
18	30

What can you say about the values of the ratios in the table?

*The values of the ratios in the table should all be equal since the ratios in the table are equivalent.*

Problem Set Sample Solutions

Assume each of the following represents a table of equivalent ratios. Fill in the missing values. Then choose one of the tables and create a real-world context for the ratios shown in the table.

1.

4	11
8	22
12	33
16	44
20	55
24	66

2.

5	7
10	14
15	21
20	28
25	35
30	42

3.

3	17
6	34
9	51
12	68
15	85
18	102

*Context provided will vary.*