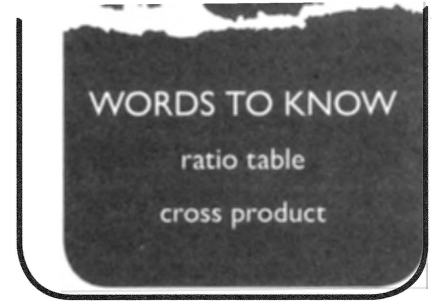


Lesson 3

MAKE AND USE TABLES OF EQUIVALENT RATIOS

NY-6.RP.3, NY-6.RP.3a, NY-6.RP.3b



INTRODUCTION

Real-World Connection

Celena is making pineapple star fruit punch for a class party. To make the punch, she needs to add 3 cups of water to every cup of juice concentrate. If she wants to make 28 cups of punch, how many cups of concentrate will she need? Let's practice the skills in the **Guided Instruction** and **Independent Practice** and, at the end of the lesson, see how many cups of concentrate Celena uses!

What I Am Going to Learn

- How to make a ratio table
- How to solve problems involving rates using ratio tables

What I May Already Know

- I know how to show that fractions are equivalent.
- I know how to compare fractions.
- I know how to show number patterns in a table and how to graph corresponding terms.
- I know how to write a ratio as the relationship between two quantities.



Vocabulary in Action

Ratio tables can be used to solve ratio problems.

- Ratio tables show equivalent ratios.
- Simplified ratios are useful when finding missing values in a ratio table. This is especially helpful when you are asked to find an equivalent ratio that is not a multiple of the given ratio.

A **cross product** is the product of the numerator of one fraction and the denominator of the other. The relationship below has two cross products, $a \times d$ and $c \times b$.

$$\frac{a}{b} \times \frac{c}{d}$$

- Two ratios are equivalent ratios if the two cross products are equal.

A graph can also be used to solve ratio problems.

- The values in a ratio table can be written as ordered pairs and plotted on the coordinate plane.
- Connecting the plotted points will form a line and can show ratios that are not in the table, but are on the line.

EXAMPLE

At a pet adoption center, the ratio of puppies to kittens is 2:3. If there are 10 puppies, how many kittens are there?

A ratio table will show equivalent ratios.

PUPPIES AND KITTENS

Puppies	2	4	6	8	10
Kittens	3	6	9	12	15

As the number of puppies increases by 2, the number of kittens increases by 3.

The ratio table shows that if there are 10 puppies, there will be 15 kittens:

$$\frac{2}{3} = \frac{10}{15}$$

Use a simplified ratio to find an equivalent ratio.

EXAMPLE

Jason runs 10 kilometers in 45 minutes. How long will it take him to run 12 kilometers?

A ratio table can help find the answer.

12 is not a multiple of 10, but $\frac{10}{45}$ simplifies to $\frac{2}{9}$. Begin the table from the simplified ratio $\frac{2}{9}$.

JASON'S RUNNING TIMES

Kilometers	2	4	6	8	10	12
Minutes	9	18	27	36	45	54

So, it would take Jason 54 minutes to run 12 kilometers.

► THINK ABOUT IT

If the ratio is 2:3, could there be 7 puppies? Could there be 11 kittens? Why?



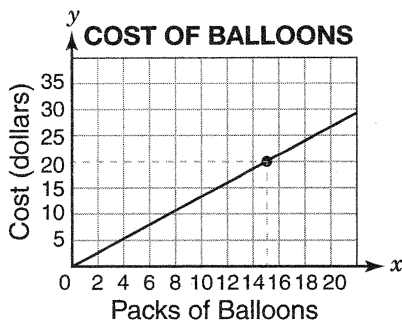
The values in a ratio table can also be plotted on a graph as ordered pairs.

EXAMPLE

Sean is buying decorations for a school dance. The cost of balloons is shown in the ratio table and the graph. What is the cost of 15 packs of balloons?

COST OF BALLOONS

Packs of Balloons	Cost (dollars)
0	0
6	8
12	16
18	24



The graph shows that 15 packs cost \$20.

The table does not directly show that 15 packs costs \$20. However, it does show that 6 packs cost \$8, so 3 packs cost \$4. 15 is 5 times as much as 3, and \$20 is 5 times as much as \$4.

SKETCH IT

On the graph, plot a point for the unit rate of dollars per pack of balloons.

Cross products can be used to find missing ratio numbers.

EXAMPLE

Laqueta is going to decide how many rolls of streamers to put up based on the number of people who RSVP to her party. She is keeping track of the RSVPs and streamers to put up in a ratio table. She just received four last-minute RSVPs and added them to her table. How many rolls of streamers will she put up?

Using cross products will help find the missing number in the ratio table.

RSVPS AND STREAMERS

Guest RSVPs	8	16	24	32	36
Rolls of Streamers	2	4	6	8	?

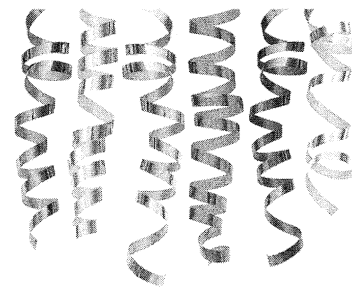
$$\frac{8}{2} = \frac{36}{x}$$

$$8x = 36 \times 2$$

$$8x = 72$$

$$x = 9$$

Laqueta will put up 9 rolls of streamers for her 36 guests.



GUIDED INSTRUCTION

TIPS AND HINTS

Think of this ratio table like a multiplication chart. The top row is multiples of 3, and the bottom row is multiples of 2.

- Sasha is planting a vegetable garden following a suggested ratio of tomato plants to zucchini plants. Use the information in the table to find the number of tomato plants needed if she wants 8 zucchini plants.

TOMATO AND ZUCCHINI PLANTS

Tomato plants	3	6	9	?
Zucchini plants	2	4	6	8

Method One Use the simplified ratio to find an equivalent ratio.

The simplified ratio is 3:2.

Multiply by 4 to have 8 zucchini plants, so multiply the number of tomato plants by 4.

$$2 \text{ zucchini plants} \times 4 = 8 \text{ zucchini plants}$$

$$3 \text{ tomato plants} \times 4 = 12 \text{ tomato plants}$$

Method Two Use another equivalent ratio in the table.

Or, since 8 is 4 doubled, double 6 tomato plants.

$$4 \text{ zucchini plants} \times 2 = 8 \text{ zucchini plants}$$

$$6 \text{ tomato plants} \times 2 = 12 \text{ tomato plants}$$

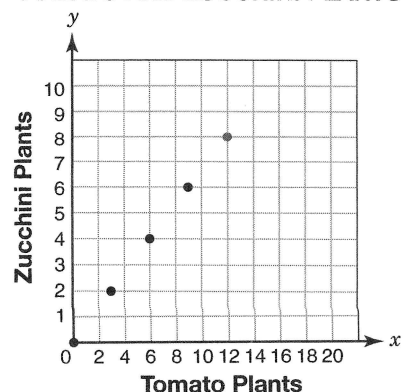
Method Three Add within the table to get 8 zucchini plants and the corresponding number of tomato plants.

For each increase of 2 zucchini plants, the number of tomato plants increases by 3.

$$9 \text{ tomato plants} + 3 \text{ tomato plants} = 12 \text{ tomato plants.}$$

- Use the values in the tomato and zucchini plant table to make a graph.

TOMATO AND ZUCCHINI PLANTS



TURN AND TALK

Could the points be connected in the graph to form a line? What would be confusing about that line?

Step One Use the values in the table to write ordered pairs in the form (tomato, zucchini).

$$(3, 2), (6, 4), (9, 6), (\quad, 8)$$

Step Two Plot the ordered pairs on a coordinate graph including (0, 0).

The x-axis will be the number of tomato plants, and the y-axis will be the number of zucchini plants.

3. The table below shows ratios relating the amount of money a ninth-grader charges for tutoring to the number of hours he tutors. Use the table to determine how much this tutor charges for 5 hours of tutoring.

$\frac{\text{Total Cost}}{\text{Number of Hours}}$	$\frac{30}{2}$	$\frac{45}{3}$	$\frac{60}{4}$	$\frac{\square}{5}$
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To find an equivalent ratio, follow some simple steps.

Step One Examine the ratios in the table. Determine whether the ratios are equivalent using cross products.

$$\begin{array}{ccc} \frac{30}{2} = \frac{45}{3} & \frac{30}{2} = \frac{60}{4} & \frac{45}{3} = \frac{60}{4} \\ 30 \times 3 = 45 \times 2 & 30 \times 4 = 60 \times 2 & 45 \times 4 = 60 \times 3 \\ 90 = 90 & 120 = 120 & 180 = 180 \end{array}$$

Yes, the ratios are all equivalent.

Step Two Use any of the ratios to find the missing number. $\frac{30}{2} = \frac{?}{5}$

Write the cross products. $30 \times 5 = 2 \times ?$

Find the missing number using division. $150 \div 2 = 75$

The missing equivalent ratio is $\frac{75}{5}$.

Step Three Use the ratio to answer the question.

The tutor will charge \$75 for 5 hours of tutoring.

4. George and Aiden are preparing for physical fitness testing by timing their laps around the track.

Aiden can run 5 laps in 10 minutes.

George can run 2 laps in 6 minutes.

Does Aiden run faster than, slower than, or the same speed as George?

Write your answer in the box.

Aiden runs George.

SHARE IT

In which subject would you be best able to tutor someone? Are other people in your family also strong in this subject area?



TIPS AND HINTS

The speeds can be easily compared if the number of laps is the same or if the number of minutes is the same.

Learning Together

Ratios and scaling can be used to make estimations about larger quantities. For example, determine the ratio of boys to girls in your class or the ratio of adults to students. Then use that ratio to estimate the number of boys and girls in the school based on the school's population. Determine if the ratio in your classroom is the same as the ratio in the school. Discuss why the ratios are the same or different.



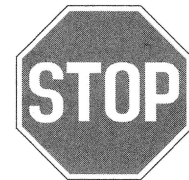
How Am I Doing?

What questions do you have?

How do you complete a ratio table, given one ratio?

What is an example where you might see a ratio table involving cost per number of items?

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



I am stuck.



I almost have it.



I understand the skill.

INDEPENDENT PRACTICE 1

- 1 The table below shows a pattern of dimes and nickels.

COIN RATIOS

Dimes	1	4	6	14
Nickels	2	8	12	?

Which ratio fits the pattern in the table?

- A 14:10
- B 14:20
- C 14:22
- D 14:28

- 2 The table below shows a list of equivalent ratios with only one ratio showing.

A	B	$\frac{10}{35}$	C	D
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Which ratio would **not** belong in the table of equivalent ratios?

- A $\frac{2}{7}$
- B $\frac{8}{28}$
- C $\frac{16}{56}$
- D $\frac{20}{75}$

SKETCH IT

You could solve this problem by drawing a line on a coordinate plane that passes through both (1, 2) and (6, 12).

TIPS AND HINTS

To what does $\frac{10}{35}$ simplify?

3

The table below shows equivalent ratios of inches and yards.

LENGTH CONVERSIONS IN $\frac{\text{INCHES}}{\text{YARDS}}$

$\frac{72}{2}$	$\frac{180}{5}$	$\frac{432}{12}$	$\frac{?}{15}$
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According to the table of equivalent ratios, how many inches are in 15 yards?

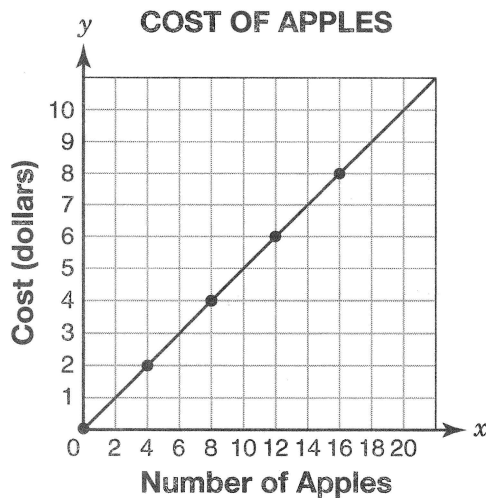
- A 468
- B 504
- C 540
- D 576

THINK ABOUT IT

Does it make a difference that the number of inches in a yard are fixed?

4

The graph below shows the cost of apples.



How much would 10 apples cost?

Answer \$ _____

Explain your answer.

THINK ABOUT IT

What multiplication fact can be used to verify other points on the line?

INDEPENDENT PRACTICE 2

1 The table below compares inches and feet.

INCHES TO FEET CONVERSIONS

Inches	12	24	36	48	?	144
Feet	1	2	3	4	8	12

Which number correctly completes the table?

- A 60
- B 72
- C 84
- D 96

2 The table below shows ratios of cookies to chocolate chips.

RATIO OF COOKIES TO CHOCOLATE CHIPS

Cookies	1	2	3	4
Chocolate Chips	6	12	18	24

Which ratio would be included in the table?

- A 7 cookies, 42 chocolate chips
- B 8 cookies, 49 chocolate chips
- C 12 cookies, 60 chocolate chips
- D 15 cookies, 80 chocolate chips

3 Mama Yoli's punch uses 3 cups of guava juice and 2 cups of pineapple juice. If Mia wants to make 20 cups of punch, how many cups of guava juice does she need to use?

- A 8
- B 10
- C 12
- D 30

4

The table below shows ratios between ounces and grams.

OUNCES TO GRAMS CONVERSIONS

Ounces	1	2	3	5	6
Grams	28	56	84	?	168

Find the number of grams in 5 ounces.

- A 112 C 128
B 120 D 140

5

Look at the patterns in the tables below.

PATTERN A

Term	1	4	7	10
Value	3	6	9	12

PATTERN B

Term	2	3	4	5
Value	4	6	8	10

Which statement is true?

- A Both patterns are additive.
B Both patterns are multiplicative.
C Pattern A is additive and Pattern B is multiplicative.
D Pattern A is multiplicative and Pattern B is additive.

6

Zach was told to make a table of ratios that are equivalent to 4:7. The table Zach made is shown below.

4:7 RATIOS

4	8	12	16
7	15	21	28

Which mistake did Zach make?

- A 12:21 is not equivalent to 4:7. C 16:28 should be 14:28.
B 8:15 should be 6:15. D 8:15 should be 8:14.

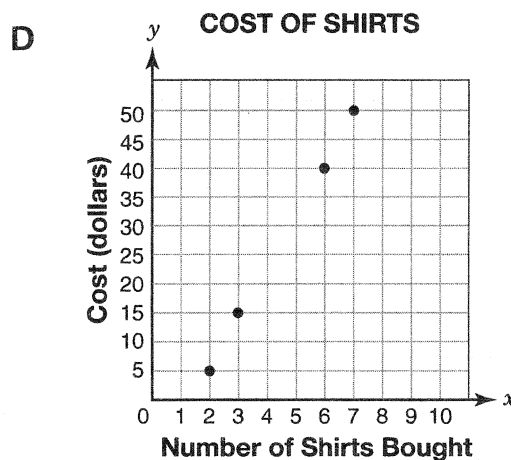
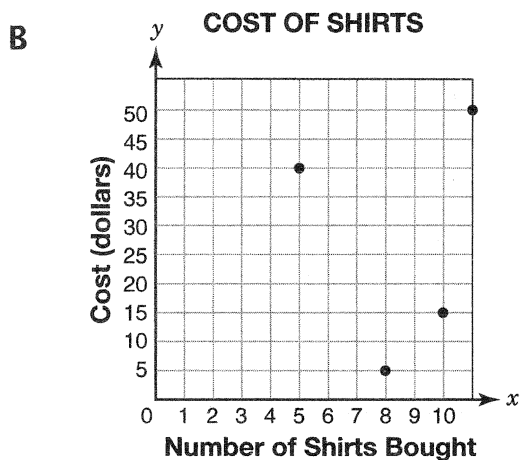
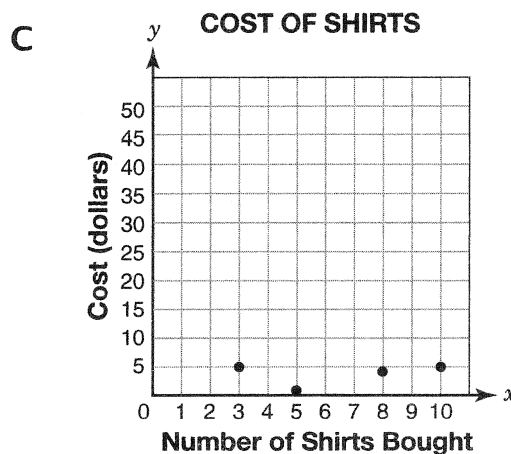
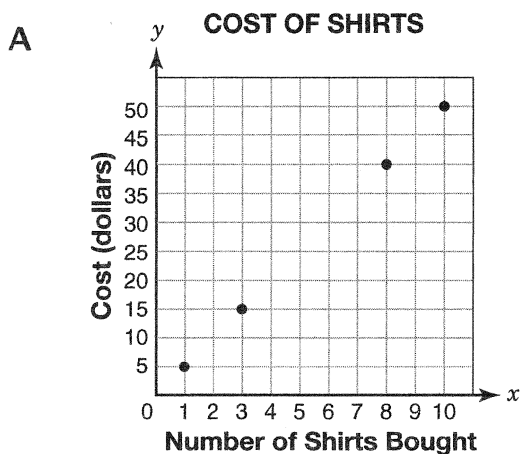
7

Gabriel went to his favorite store and bought 8 shirts for \$40. How much would different numbers of shirts cost? Complete the table.

COST OF SHIRTS

Number of Shirts Bought	Cost (dollars)
1	
3	
8	40
	50

Which graph correctly shows the cost of shirts from the ratio table?



8

Two clubs are having car washes to raise money. Each club made a table of its earnings as shown below.

MATH CLUB

Cars Washed	Earnings (dollars)
8	40
12	60
20	100
25	125

ASTRONOMY CLUB

Cars Washed	Earnings (dollars)
5	25
10	50
15	75
30	150

Which club's car wash made more per car?

Explain your answer.

9

Veronica found a recipe for macaroni and cheese that uses 1 cup of cheddar cheese and 2 cups of Monterey Jack cheese. She reasoned that if she used 2 cups of cheddar, she then would use 3 cups of Monterey Jack cheese and have a total of 5 cups of cheese.

Explain why her answer is incorrect.

How many cups of Monterey Jack cheese should she use?

Answer _____ cups

EXIT TICKET

NY-6.RP.3, NY-6.RP.3a, NY-6.RP.3b

Now that you have mastered using ratio tables, let's solve the problem in the Real-World Connection.

Celena is making pineapple star fruit punch for a class party. To make the punch, she needs to add 3 cups of water to every cup of juice concentrate. If she wants to make 28 cups of punch, how many cups of concentrate will she need?

