LESSON 3

Using Tables of Equivalent Ratios

A table can be used to show the relationship between two quantities. You can use **equivalent ratios** to find a missing value in a table.

EXAMPLE A The table shows the relationship between the number of green beads and the number of blue beads Mindy uses when she makes bracelets.

Green Beads	2	4	6	8	10
Blue Beads	5	10	15	20	?

How many blue beads does Mindy use when she uses 10 green beads?

1 Write the first two ratios as fractions.

First ratio: $\frac{\text{green beads}}{\text{blue beads}} = \frac{2}{5}$ Second ratio: $\frac{\text{green beads}}{\text{blue beads}} = \frac{4}{10}$

2 Look for a pattern to see how the first ratio can be changed to the second, third, and fourth ratios.

$\frac{2}{5} = \frac{2 \times \mathbf{2}}{5 \times \mathbf{2}} = \frac{4}{10}$ $\frac{2}{5} = \frac{2 \times \mathbf{3}}{5 \times \mathbf{3}} = \frac{6}{15}$ $\frac{2}{5} = \frac{2 \times \mathbf{4}}{5 \times \mathbf{4}} = \frac{8}{20}$

The ratios are equivalent.

3 Extend the pattern to find the fifth ratio.

Multiply each term in the first ratio by 5.

$\frac{2}{5} = \frac{2 \times \mathbf{5}}{5 \times \mathbf{5}} = \frac{10}{25}$

$\frac{\text{green beads}}{\text{blue beads}} = \frac{10}{25}$

▶ Mindy uses 25 blue beads when she uses 10 green beads.

DISCUSS

Explain how to find the number of green beads Mindy uses when she uses 35 blue beads.

EXAMPLE B The table shows the relationship between the number of dog collars Travis can make and the number of hours he takes to make the collars.

Number of Hours	3	9	15	24
Number of Dog Collars	8	?	?	?

Use ratios to complete the table.

1 Decide what ratio the table shows.

The table shows the ratio of hours to dog collars, or $\frac{\text{hours}}{\text{dog collars}}$.

2 Write equivalent ratios for the first ratio and the other ratios in the table.

Compare the numerators of the equivalent ratios to decide how the terms are changing in each ratio.

$\frac{3}{8} = \frac{9}{?}$ Think: $3 \times \mathbf{3} = 9$, $8 \times \mathbf{3} = 24$ So $\frac{3}{8} = \frac{9}{24}$

$\frac{3}{8} = \frac{15}{?}$ Think: $3 \times \mathbf{5} = 15$, $8 \times \mathbf{5} = 40$ So $\frac{3}{8} = \frac{15}{40}$

$\frac{3}{8} = \frac{24}{?}$ Think: $3 \times \mathbf{8} = 24$, $8 \times \mathbf{8} = 64$ So $\frac{3}{8} = \frac{24}{64}$

3 Use the equivalent ratios to complete the table.

Number of Hours	3	9	15	24
Number of Dog Collars	8	24	40	64

CHECK

How many dog collars can Travis make in 21 hours?

EXAMPLE C The table shows the relationship between the total number of games and the total number of weeks the games were played.

Number of Games	2	4	6	8	10
Number of Weeks	?	?	?	4	?

Complete the table. Then list the ratios as **ordered pairs**.

1 Decide what ratio the table shows and which ratio is known.

The table shows the ratio of games to weeks, or $\frac{\text{games}}{\text{weeks}}$.

From the table, 8 games were played in week 4. The ratio is $\frac{8}{4}$.

2 Use the known ratio to find the first ratio in the table.

As one term in a ratio changes due to multiplication or division, the other unit changes in the same way.

$\frac{8}{4} = \frac{2}{?}$ Think: $8 \div \mathbf{4} = 2$, so divide the denominator by 4.

$\frac{8}{4} = \frac{8 \div 4}{4 \div \mathbf{4}} = \frac{2}{1}$

3 Use the first ratio to find the remaining ratios.

$\frac{\mathbf{2}}{1} = \frac{\mathbf{4}}{?}$ Think: $2 \times \mathbf{2} = 4$, so multiply the denominator by 2. $\frac{2}{1} = \frac{2 \times 2}{1 \times 2} = \frac{4}{2}$

$\frac{\mathbf{2}}{1} = \frac{\mathbf{6}}{?}$ Think: $2 \times \mathbf{3} = 6$, so multiply the denominator by 3. $\frac{2}{1} = \frac{2 \times 3}{1 \times 3} = \frac{6}{3}$

$\frac{\mathbf{2}}{1} = \frac{\mathbf{10}}{?}$ Think: $2 \times \mathbf{5} = 10$, so multiply the denominator by 5. $\frac{2}{1} = \frac{2 \times 5}{1 \times 5} = \frac{10}{5}$

4 Use the equivalent ratios to complete the table.

Number of Games	2	4	6	8	10
Number of Weeks	1	2	3	4	5

5 List the ratios as ordered pairs.

An ordered pair is shown as (x, y).

The first coordinate, or the ***x*-coordinate**, is the number of games.

The second coordinate, or the ***y*-coordinate**, is the number of weeks.

The ordered pairs are (2, 1), (4, 2), (6, 3), (8, 4), and (10, 5).

TRY

Write the ordered pair for the number of weeks needed to play 16 games.

EXAMPLE D Use the ordered pairs from Example C. Plot the ordered pairs on a **coordinate plane**.

1 Decide what each axis represents on the coordinate plane.

The horizontal axis is called the ***x*-axis**. It shows the location of the *x*-coordinate. In these ordered pairs, the *x*-coordinate represents the number of games.

The vertical axis is called the ***y*-axis**. It shows the location of the *y*-coordinate. In these ordered pairs, the *y*-coordinate is the number of weeks.

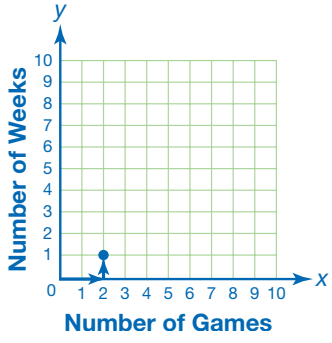
2 List the ordered pairs.

(2, 1), (4, 2), (6, 3), (8, 4), (10, 5)

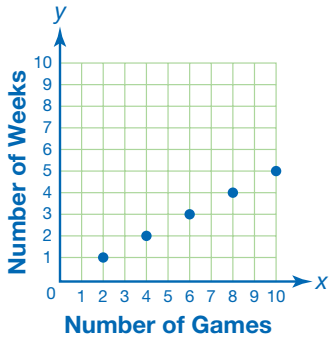
3 Label the axes. Plot the first ordered pair.

The first ordered pair is (2, 1).

Start at the **origin**. Move 2 units to the right. Then move up 1 unit. Plot the point.



4 Plot the remaining ordered pairs.



DISCUSS

Explain how you plotted the remaining ordered pairs.

Practice

For questions 1–3, use equivalent ratios to complete each table.

1.

Number of Hours	3	6	9	12	15
Number of Miles	20	40	60	?	?

2.

Number of Teachers	4	12	16	24	32
Number of Students	12	?	?	?	?

HINT

As one unit in a ratio changes, the other unit changes in the same way.

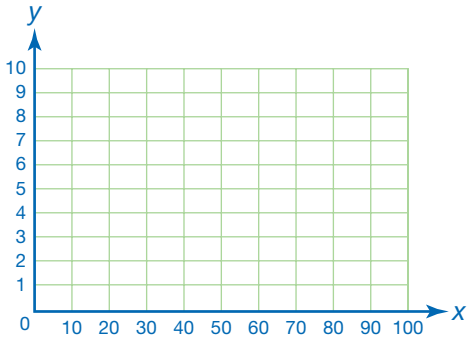
3.

Number of Words	25	75	125	150	200
Number of Minutes	?	?	?	6	?

For questions 4 and 5, use equivalent ratios to complete each table. List the ratios in each table as ordered pairs. Then plot the ordered pairs on the coordinate plane.

4.

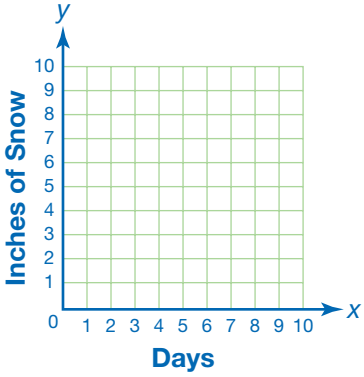
x	10	20	40	50	80
y	1				



REMEMBER To plot an ordered pair (x, y), start at the origin. Move horizontally x units and then vertically y units.

5.

Number of Days	1	2	3	4	5
Inches of Snow			6		



For questions 6 and 7, use the information given to complete the tables.

6. A recipe uses 2 cups of cooked rice and 3 cups of milk. Create a table of equivalent ratios that shows the relationship between the number of cups of rice and the number of cups of milk used for the recipe.

Cups of Rice					
Cups of Milk					

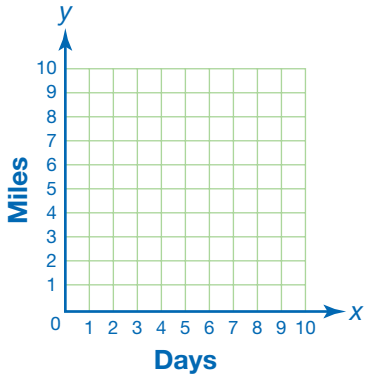
7. For every 15 sit-ups Ryan does, he does 10 push-ups. Create a table of equivalent ratios that shows the relationship between the number of sit-ups and the number of push-ups Ryan does.

Number of Sit-ups					
Number of Push-ups					

Complete the table and graph.

8. Every 3 days, students in a fitness class run 2 miles. Use equivalent ratios to complete the table. Plot the corresponding ordered pairs on the coordinate plane.

Number of Days	Number of Miles
3	
6	
9	



Solve.

9. REASON Which of the following ratios is **not** equivalent to the ratio $\frac{5}{6}$? Explain.

$\frac{10}{12}, \frac{13}{14}, \frac{15}{18}, \frac{25}{30}$

10. STRUCTURE Explain how you completed the table of equivalent ratios in question 7.