Lesson 16: From Ratios to Rates

Student Outcomes

- Students recognize that they can associate a ratio of two quantities, such as the ratio of miles per hour is $5:2$, to another quantity called the rate.
- Given a ratio, students precisely identify the associated rate. They identify the unit rate and the rate unit.

Classwork

Ratios can be transformed to rates and unit rates.

Example 1 (5 minutes): Introduction to Rates and Unit Rates

Students complete the problem individually. Encourage students to use prior knowledge of equivalent ratios. Discuss answers and methods after a few minutes of student work time.

Example 1: Introduction to Rates and Unit Rates

Diet cola was on sale last week; it cost $\$10$ for every 4 packs of diet cola.

a. How much do 2 packs of diet cola cost?

Packs of Diet Cola	4	2
Total Cost	10	5

2 packs of diet cola cost $\$5.00$.

b. How much does 1 pack of diet cola cost?

Packs of Diet Cola	2	1
Total Cost	5	2.50

1 pack of diet cola costs $\$2.50$.

After answers have been discussed, use this example to identify the new terms.

Rate: $\$10$ for every 4 packs of diet cola is a *rate* because it is a ratio of two quantities.

Unit Rate: The *unit rate* is 2.5 because it is the value of the ratio.

Rate Unit: The *rate unit* is dollars/packs of diet cola because it costs 2.5 dollars for every 1 pack of diet cola.

Now that the new terms have been introduced, use these vocabulary words throughout the lesson.

Exploratory Challenge (25 minutes)

Students may work in pairs or small groups to be able to discuss different methods of solving examples. Encourage them to show or explain their thinking as much as possible. Take note of different ways groups are solving problems. After providing time for groups to solve the problems, have different groups present their findings and explain the methods they used to solve each problem.

Exploratory Challenge

1. **Teagan went to Gamer Realm to buy new video games. Gamer Realm was having a sale: $65 for 4 video games. He bought 3 games for himself and one game for his friend, Diego, but Teagan does not know how much Diego owes him for the one game. What is the unit price of the video games? What is the rate unit?**

   The unit price is $16.25; the rate unit is dollars/video game.

2. **Four football fans took turns driving the distance from New York to Oklahoma to see a big game. Each driver set the cruise control during his or her portion of the trip, enabling him or her to travel at a constant speed. The group changed drivers each time they stopped for gas and recorded their driving times and distances in the table below.**

Fan	Distance (miles)	Time (hours)
Andre	208	4
Matteo	456	8
Janaye	300	6
Greyson	265	5

Use the given data to answer the following questions.

a. **What two quantities are being compared?**

The two quantities being compared are distance and time, which are measured in miles and hours.

b. **What is the ratio of the two quantities for Andre's portion of the trip? What is the associated rate?**

Andre's ratio: 208:4 *Andre's rate:* 52 *miles per hour*

c. **Answer the same two questions in part (b) for the other three drivers.**

Matteo's ratio: 456:8 *Matteo's rate:* 57 *miles per hour*

Janaye's ratio: 300:6 *Janaye's rate:* 50 *miles per hour*

Greyson's ratio: 265:5 *Greyson's rate:* 53 *miles per hour*

d. **For each driver in parts (b) and (c), circle the unit rate and put a box around the rate unit.**

3. **A publishing company is looking for new employees to type novels that will soon be published. The publishing company wants to find someone who can type at least 45 words per minute. Dominique discovered she can type at a constant rate of 704 words in 16 minutes. Does Dominique type at a fast enough rate to qualify for the job? Explain why or why not.**

Minutes	1	2	4	8	16
Words	44	88	176	352	704

Dominique does not type at a fast enough rate because she only types 44 words per minute.

Scaffolding:

If one of these drivers had been chosen to drive the entire distance,

a. Which driver would have gotten them to the game in the shortest time? Approximately how long would this trip have taken?

b. Which driver would have gotten them to the game in the greatest amount of time? Approximately how long would this trip have taken?

Scaffolding:

Question 3 could be extended to ask students to figure out how many words she needed to type in the 20 minutes to be able to qualify.

Closing (10 minutes)

Describe additional questions:

- What are some examples of rates?
- What are some examples of unit rates?

Lesson Summary

A ratio of two quantities, such as 5 miles per 2 hours, can be written as another quantity called a *rate.*

The numerical part of the rate is called the *unit rate* and is simply the value of the ratio, in this case 2.5. This means that in 1 hour, the car travels 2.5 miles. The unit for the rate (or *rate unit*) is miles/hour, which is read "miles per hour".

Exit Ticket (5 minutes)

Name _____ Date_____

Lesson 16: From Ratios to Rates

Exit Ticket

Angela enjoys swimming and often swims at a steady pace to burn calories. At this pace, Angela can swim 1,700 meters in 40 minutes.

a. What is Angela's unit rate?

b. What is the rate unit?

Exit Ticket Sample Solutions

Angela enjoys swimming and often swims at a steady pace to burn calories. At this pace, Angela can swim $1,700$ meters in 40 minutes.

a. **What is Angela's unit rate?**

42.5

b. **What is the rate unit?**

Meters per minute

Problem Set Sample Solutions

The Scott family is trying to save as much money as possible. One way to cut back on the money they spend is by finding deals while grocery shopping; however, the Scott family needs help determining which stores have the better deals.

1. **At Grocery Mart, strawberries cost $\$2.99$ for 2 lb., and at Baldwin Hills Market strawberries are $\$3.99$ for 3 lb.**

   a. **What is the unit price of strawberries at each grocery store? If necessary, round to the nearest penny.**

   Grocery Mart: $\$1.50$ per pound (1.495 rounded to nearest penny)

   Baldwin Hills Market: $\$1.33$ per pound

   b. **If the Scott family wanted to save money, where should they go to buy strawberries? Why?**

   Possible Answer: The Scott family should got to Baldwin Hills Market because the strawberries cost less money there than at Grocery Mart.

2. **Potatoes are on sale at both Grocery Mart and Baldwin Hills Market. At Grocery Mart, a 5 lb. bag of potatoes cost $\$2.85$, and at Baldwin Hills Market a 7 lb. bag of potatoes costs $\$4.20$. Which store offers the best deal on potatoes? How do you know? How much better is the deal?**

   Grocery Mart: $\$0.57$ per pound

   Baldwin Hills Market: $\$0.60$ per pound

   Grocery Mart offers the best deal on potatoes because potatoes cost $\$0.03$ less per pound at Grocery Mart when compared to Baldwin Hills Market.