GETTING READY FOR GRADE 7

GR3.2 Constant Rates of Change

Engage

ESSENTIAL QUESTION

How can you tell if a relationship is a proportional relationship?
In a proportional relationship, the rate of change is constant between two quantities.

Motivate the Lesson

Ask: At the grocery store, is the larger box of cereal always the better buy? Does the price per ounce go up, go down, or stay the same as the size of the package changes? How can you tell? Begin the Explore Activity to find out.

Explore

EXPLORE ACTIVITY Connect Vocabulary ELL

Make sure that students understand the meaning of the word *constant*. Tell them that it means "the same" or "unchanging," and ask students for possible examples. Ask students to explain the meaning of the abbreviations in the table: h and mi.

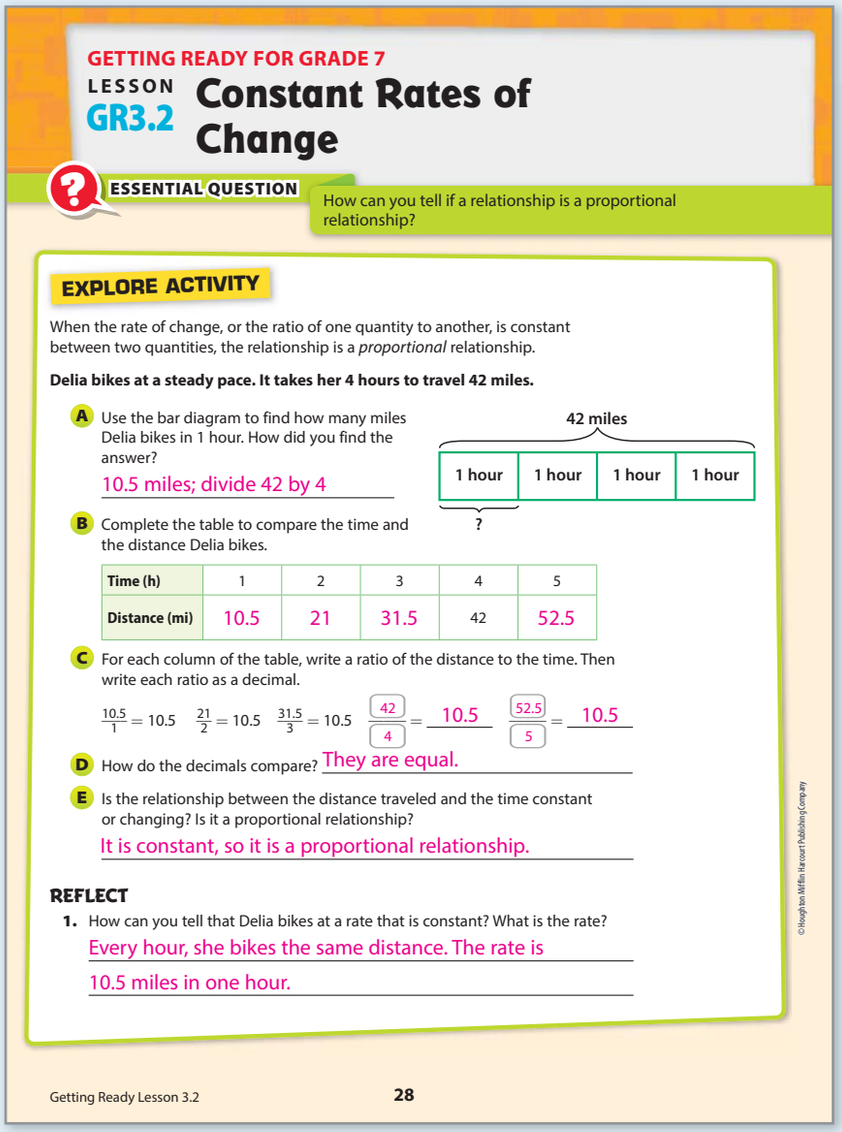
Questioning Strategies

- How did you find the values in the table? Justify your answer. I took the ratio that was given for 4 hours and multiplied the hour by the unit rate.
- How far could Delia ride her bike if she rode for 6 hours at the same steady pace? 6 hours × 10.5 miles per hour = 63 miles

Explain

YOUR TURN Avoid Common Errors

Exercise 2 Some students may not read the question correctly or have trouble relating it to the table. Read the table to make sure these students understand the table. 1 ride cost 6 tickets, and so on.



GETTING READY FOR GRADE 7

LESSON GR3.2 **Constant Rates of Change**

ESSENTIAL QUESTION: How can you tell if a relationship is a proportional relationship?

EXPLORE ACTIVITY

When the rate of change, or the ratio of one quantity to another, is constant between two quantities, the relationship is a *proportional* relationship.

Delia bikes at a steady pace. It takes her 4 hours to travel 42 miles.

A Use the bar diagram to find how many miles Delia bikes in 1 hour. How did you find the answer?

10.5 miles; divide 42 by 4

42 miles

1 hour	1 hour	1 hour	1 hour

?

B Complete the table to compare the time and the distance Delia bikes.

Time (h)	1	2	3	4	5
Distance (mi)	10.5	21	31.5	42	52.5

C For each column of the table, write a ratio of the distance to the time. Then write each ratio as a decimal.

$\frac{10.5}{1} = 10.5$ $\frac{21}{2} = 10.5$ $\frac{31.5}{3} = 10.5$ $\frac{42}{4} = 10.5$ $\frac{52.5}{5} = 10.5$

D How do the decimals compare? They are equal.

E Is the relationship between the distance traveled and the time constant or changing? Is it a proportional relationship?

It is constant, so it is a proportional relationship.

REFLECT

1. How can you tell that Delia bikes at a rate that is constant? What is the rate?

Every hour, she bikes the same distance. The rate is 10.5 miles in one hour.

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ADDITIONAL PRACTICE

Is the relationship shown in each table a proportional relationship? Explain

1.

Sheep	3	4	5	6
Number of hooves	12	16	20	24

Yes, the rate is constant at 4 hooves per sheep.

2.

Hours worked	6	8	16	20
Dollars earned	72	96	192	240

Yes, the rate is constant at $12 earned per hour.

3.

Height (inches)	18	28	38	48
Time (months)	6	9	12	15

No, the rate is not constant

4.

Time (minutes)	3	5	8	11
Distance (mi)	9	15	24	33

Yes, rate is constant at 3 miles per minute

YOUR TURN

2. Based on the table, is the relationship between the number of tickets purchased and the number of rides a proportional relationship? Explain.

Rides	1	2	3	4
Tickets Purchased	6	12	18	24

Yes, because the rate is constant at 6 tickets per ride.

Guided Practice

1. Roger earns $15 for each lawn he mows.

Number of Lawns	1	2	3	4	5
Amount Earned ($)	15	30	45	60	75

For each column of the table, find the rate.

$15 , $15 , $15 , $15 , $15

Is the relationship between the amount Roger earns and the number of lawns he mows a proportional relationship? Explain.

Yes; Sample answer: The rate is constant; $15 per lawn.

ESSENTIAL QUESTION CHECK-IN

2. How can a table help you determine if a relationship is a proportional relationship?

If the ratios are all equal, then the relationship is proportional.

Independent Practice

3. The table shows the amount that Rajeev earns.

Hours Worked	1	2	3	4	5
Amount Earned ($)	21.50	43	64.5	86	107.50

a. Is the relationship shown in the table proportional? yes

b. Write an equation to represent the relationship, where x is the number of hours worked and y is the amount earned. $y = 21.5x$

c. How much will Rajeev earn if he works for 8 hours? $172

Elaborate

Talk About It Summarize the Lesson

Ask: How can you tell when the relationship between two quantities is a proportional relationship? The relationship is proportional when the ratio of one quantity to the other is constant and does not change.

GUIDED PRACTICE Avoid Common Errors

Exercise 1 Some students may only check the first two rate of change for the first two ratios. Remind students that it is not proportional unless all the pairs have equal rates.

Evaluate

LESSON QUIZ

1. A. Use the relationship in the first column to complete this table so that it shows a proportional relationship.

Bracelets	1	2	3	4	5
Beads	18	36	54	72	90

B. Write an equation to represent the relationship in the table where x is the number of bracelets and y is the number of beads. $y = 18x$

2. Is the relationship shown in this table a proportional one? Explain.

Ounces	10	16	20	45	60
Price	$1.80	$2.60	$3.60	$8.50	$9.00

No, the rates of change are not constant.

H.O.T. FOCUS ON HIGHER ORDER THINKING

1. Multi-step The table shows how much Helen can earn, working 6 hours a day, for 1 day up to 5 days, if she is paid $7 an hour. **DOK 3; MP.3**

Number of days	1	2	3	4	5
Earnings ($)	42	84	126	168	210

a. Complete the table.

b. Explain how you found the amounts that go in each cell of the table. Multiply days by $42.

c. Is this a proportional relationship? How do you know? Yes, there is a constant rate of change.

d. Write an equation to represent the relationship where x is the days worked and y is the dollars earned. $y = 42x$

2. Draw Conclusions Henry looks at a table that shows a proportional relationship. He notices that, in one column, the number of people is equal to the number of sandwiches eaten. What conclusion can he draw about the other cells in this table? Every cell must also show equal numbers for number of people and number of sandwiches eaten. **DOK 3; MP.7**