

Introduction to Proportional and Nonproportional Relationships

Lesson 4 - pages 33 - 36

What You'll Learn

Scan the lesson. Write the definitions of proportional and nonproportional.

- proportional When 2 quantities have the same unit rate or constant ratio.
- nonporportional when there isn't a constant ratio between 2 quantities.



Real-World Link

Pizza Party Ms. Cochran is planning a year-end pizza party for her students. Ace Pizza offers free delivery and charges \$8 per medium pizza.

1. Complete the table to determine the cost for different numbers of pizzas ordered.

Cost (\$)	8	16	24	32	40
Pizza	1	2	3	4	5



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2. For each number of pizzas, fill in the boxes to write the relationship of the cost and number of pizzas as a ratio in simplest form.

$$\frac{16}{2} = \frac{8}{1}$$

$$\frac{24}{3} = \frac{8}{1}$$

$$\frac{32}{4} = \frac{8}{1}$$

$$\frac{40}{5} = \frac{8}{1}$$

3. What do you notice about the simplified ratios?

They all have the same unit
rate $\$8/1$ pizza

What is the constant of proportionality?

$$k = 8$$

Identify Proportional Relationships

Two quantities are **proportional** if they have a constant ratio or unit rate. For relationships in which this ratio is not constant, the two quantities are **nonproportional**.

In the pizza example on the previous page, the cost of an order is *proportional* to the number of pizzas ordered.

$$\frac{\text{cost of order}}{\text{pizzas ordered}} = \frac{8}{1} = \frac{16}{2} = \frac{24}{3} = \frac{32}{4} = \frac{40}{5} \text{ or } \$8 \text{ per pizza}$$

All of the ratios above are **equivalent ratios** because they all have the same value.

Got It? Do this problem to find out.

- b. At the beginning of the year, Isabel had \$120 in the bank. Each week, she deposits another \$20. Is her account balance proportional to the number of weeks of deposits? Use the table below. Explain your reasoning.

Time (wk)	0	1	2	3
Balance (\$)	120	140	160	180

$\frac{140}{1} = 140$ $\frac{160}{2} = 80$ $\frac{180}{3} = 60$
different unit rates, so
it isn't proportional.

the starting amount of \$120 makes it non-proportional

Guided Practice

For Exercises 1 and 2, use a table to solve. Then explain your reasoning.

- The Vista Marina rents boats for \$25 per hour. In addition to the rental fee, there is a \$12 charge for fuel. Is the number of hours you can rent the boat proportional to the total cost? Explain. (Examples 1-3)

Rental Time (h)	1	2	3
Cost (\$)	12	37	62

not proportional

$$\frac{37}{1} = 37 \quad \frac{62}{2} = 31 \quad \frac{87}{3} = 29$$

different unit rates

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2. Which situation represents a proportional relationship between the hours worked and amount earned for Matt and Jane? Explain. (Example 4)

Matt's Earnings (\$)	12	20	31
Time (h)	1	2	3

$12 \neq 10 \neq 10.33$

non-proportional

proportional

Jane's Earnings (\$)	12	24	36
Time (h)	1	2	3

$12 = 12 = 12$

$k = 12$ for Jane

What is the constant of proportionality?

3.  **Building on the Essential Question** Explain what makes two quantities proportional.