



*I can find the unit rate using a table and a graph (7.RP.2b)

*I can represent proportional relationships by equations (7.RP.2c)

Today I will need:

- Pencil
- Class Notebook
- Text Book
- Vocabulary Sheet

2.3 Finding Costs

Unit Rate and Constant of Proportionality

In *Comparing Bits and Pieces*, you found unit rates. Recall that a **unit rate** is a rate in which the second quantity is 1 unit. The rates *45 miles per gallon* and *\$3.50 per hour* are unit rates because “per gallon” means “for one gallon” and “per hour” means “for one hour.”

You may have used the following unit rates in previous Problems:

- amount of pizza per person
- number of people per pizza
- price per pizza

The unit rate for the price of one pizza at Howdy’s is \$13. The equation $C = 13n$ relates cost of pizza and number of pizzas.

unit rate

A rate where the second number (or denominator) is 1.

ex:

some unit rates

32 miles per gallon $\frac{3 \text{ flavors of ice cream}}{1 \text{ banana split}}$

The unit rate for the price of one pizza at Howdy’s is \$13. The equation $C = 13n$ relates cost of pizza and number of pizzas.

This equation represents a *proportional relationship* because you multiply one variable by a constant number to get the value of the other variable. The constant multiplier is called the **constant of proportionality**.

$$C = 13n$$

↑
constant of proportionality

When a delivery charge of \$5 is added to the cost, the relationship is no longer proportional: $C = 13n + 5$ is not a proportional relationship.

constant of proportionality

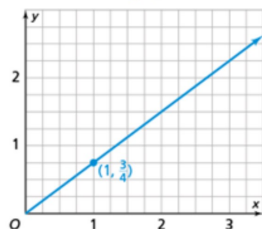
A constant ratio of two numbers, usually written as $y = kx$, where k is the constant of proportionality.

ex:

a constant of proportionality of $\frac{3}{4}$

as an equation: $y = \frac{3}{4}x$

as a graph:

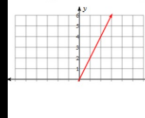


? How can you recognize a proportional relationship from a table or graph?

A Proportional Relationship

the graph:

- straight line
- goes through (0, 0)



the table:

- has equivalent ratios between values

Number of Pizzas	1	2	3	4	5	10	15
Price for Pick Up	\$13	\$26	\$39	\$52	\$65	\$130	\$195

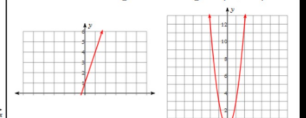
$$\frac{1}{13} = \frac{2}{26}$$

NOT

A Proportional Relationship

the graph:

- not a straight line
- doesn't go through (0, 0)



the table:

- doesn't have equivalent ratios between values

Number of Pizzas	1	2	3	4	5	10	15
Price if Howdy's Delivers	\$18	\$31	\$44	\$57	\$70	\$135	\$200

$$\frac{1}{18} \neq \frac{2}{31}$$

As a team, answer the questions on page 48.
Record the answers in your graph paper.

A FreshFoods has oranges on sale at 10 for \$2. For each part, find the unit rate. Be sure to label your answers with the proper units.

1. What is the cost per orange?

2. How many oranges can you buy for \$1?

3. Copy and complete the table below.

Number of Oranges, n	10		1	20	11	
Cost, C	\$2	\$1				\$2.60

Class Work Answers:

- A. 1. \$0.20 per 1 orange.
2. 5 oranges per \$1.
3. completed table:

Number of Oranges, n	10	5	1	20	11	13
Cost, C	\$2	\$1	\$0.20	\$4	\$2.20	\$2.60

Number of Oranges, n	10	5	1	20	11	13
Cost, C	\$2	\$1	\$0.20	\$4	\$2.20	\$2.60

4. How does finding a unit rate help you answer questions such as the ones below?

- How many oranges can you buy for \$5?
- How much do 25 oranges cost?

Class Work Answers:

- A. 4. If you know the unit rate of 5 oranges per \$1, then you know that \$5 would buy five times as many oranges, which is 25 oranges.

If you know the unit rate of \$0.20 per 1 orange, then you know 25 oranges would cost 25 times as much money, which is \$5.

5. The equation $n = 5C$ relates cost C to number of oranges n .

a. What does this equation tell you about the relationship between the number of oranges and the cost of the oranges?

b. What is another equation relating these same two variables? What information does this other equation give you?

$$n = 5C \quad C = 0.20n$$

c. Identify two unit rates from these equations. Explain how you found the unit rates. What information do the unit rates give you?

d. How does the constant of proportionality relate to the unit rate?

Class Work Answers:

A. 5.

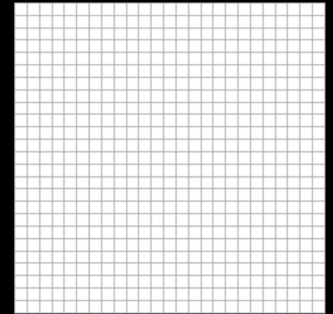
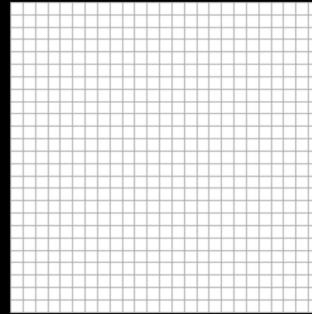
- The equation tells you the number of oranges is five times the cost.
- This equation tells you the cost is one fifth of (or 0.20 times) the number of oranges:

$$C = \frac{1}{5}n \quad C = 0.20n$$

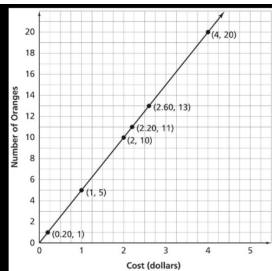
- The unit rates were the numbers multiplied by the variable:
0.20 tells us how much money it costs to buy 1 orange.
5 tells us how many oranges we can buy for \$1.
- The constant of proportionality is equal to the unit rate.

Number of Oranges, n	10	5	1	20	11	13
Cost, C	\$2	\$1	\$0.20	\$4	\$2.20	\$2.60

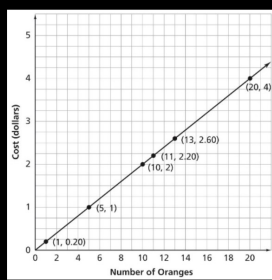
6. a. Graph the equations from Question 5 on two coordinate planes. Show values of n from 1 to 20.



b. How can you use the graphs to find the unit rates?



c. How can you use the graphs to find the constants of proportionality?

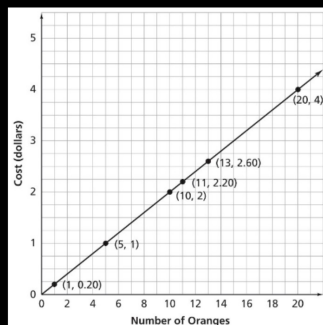
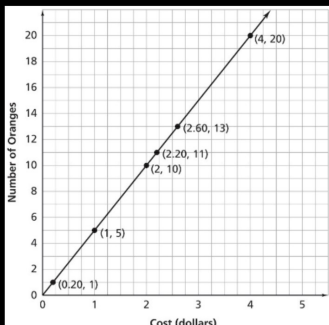


Homework:

pg. 55 #12

Class Work Answers:

A. 6a.



b. and c. You can find the *unit rate* and the *constant of proportionality* by looking at the point (1, y). The value of the y-coordinate is the unit rate.