

1-29-18

Aim: SWBAT begin to determine if a relationship is proportional based on information from a chart or graph.

HW: Packet Pages 15 - 16

Do Now: Turn to Packet Page 13

Aim: SWBAT determine if a relationship is proportional.

What is a Proportional Relationship?

Suppose you and some friends plan to go to a movie where tickets cost \$8 each.

You will pay \$8 for 1 ticket, \$16 for 2 tickets, \$24 for 3 tickets, \$32 for 4 tickets, and so on. The ratios of the total cost of the tickets to the number of tickets are all equivalent.

A group of ratios that are equivalent are in a **proportional relationship**. When ratios are equivalent **they all have the same unit rate**. In a proportional relationship, the unit rate is called the **constant of proportionality**.

You can use a table to tell if a relationship is proportional.

Example 1) The table below shows the total cost of movie tickets based on the number of tickets you buy.

dependent	Total Cost of Tickets (\$)	8	16	24	32
independent	Number of Tickets	1	2	3	4

$$\text{unit rate} = \frac{\text{dependent}}{\text{independent}}$$

All the ratios of the total cost of tickets to the number of tickets are equivalent. The ratios all simplify to $\frac{8}{1}$ or 8, so the ratios are in a proportional relationship.

$$\frac{8}{1} = 8 \quad \frac{16}{2} = 8 \quad \frac{24}{3} = 8 \quad \frac{32}{4} = 8$$

The unit rate is 8 *dollars per ticket*, so the constant of proportionality is 8. This equation $c = 8t$, where c is the total cost and t is the number of tickets, represents this relationship. The total cost is always 8 times the number of tickets.

Let's look at another table . . .

Example 2) The table below shows the cost to play in the town soccer tournament.

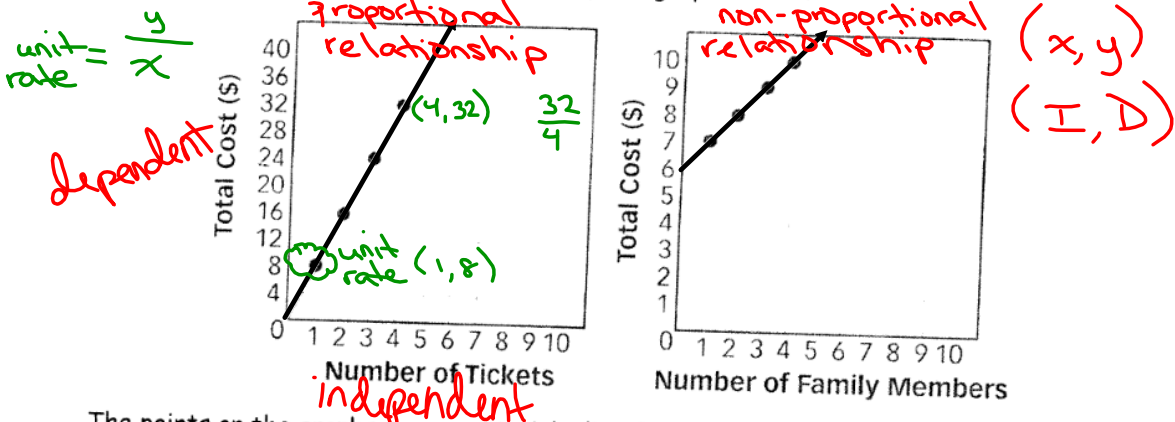
dependent	Total Cost (\$)	7	8	9	10
independent	Number of Family Members	1	2	3	4

We can find and simplify the ratios of the total cost to the number of family members.

$$\frac{7}{1} = 7 \quad \frac{8}{2} = 4 \quad \frac{9}{3} = 3 \quad \frac{10}{4} = 2\frac{1}{2}$$

The ratios are NOT equivalent, so the quantities are NOT in a proportional relationship. You can also use a graph to tell if a relationship is proportional.

The data for the cost of movie tickets (Example 1) and the cost to participate in the soccer tournament (Example 2) can be modeled by the graphs below.



The points on the graphs are on a straight line for both sets of data, but only the data for the cost of the movie tickets goes through the origin. This means that only the total cost of the movie tickets compared to the number of tickets is a proportional relationship.

Proportional Relationship	Non- Proportional Relationship
<ul style="list-style-type: none"> The graph can be represented by a straight line. The line goes through the origin (0,0) 	<ul style="list-style-type: none"> The graph may or may not be represented by a straight line. IF the graph is a line, it does not go through the origin. (0,0)

Practice Problems. Decide each situation is Proportional Reasoning or Non-Proportional Reasoning.

- | | | |
|--|--------------|------------------|
| 1) If one girl can walk to school in 10 minutes, two girls can walk to school in 20 minutes. | Proportional | Non-Proportional |
| 2) If one box of cereal costs \$2.80, two boxes of cereal cost \$5.60. | Proportional | Non-Proportional |
| 3) If one boy makes one model car in 2 hours, then he can make three of the same model in 6 hours. | Proportional | Non-Proportional |
| 4) If Huck can paint the fence in 2 days, then Huck, Tom and a third boy can paint the same fence in 6 days. | Proportional | Non-Proportional |
| 5) If one girl has 2 cats then 4 girls have 8 cats. | Proportional | Non-Proportional |

$$\frac{1}{2} \times 2 = \frac{2}{4}$$

$$\frac{1}{2} = \frac{2}{4}$$

$$\frac{1}{2} \times 3 = \frac{3}{6}$$

$$\frac{1}{2} = \frac{3}{6}$$

Homework - Proportional Vs. Non-Proportional Reasoning

For #'s 1 - 4, Use the table below to analyze the cost of downloading applications to a phone.

$unit\ rate = \frac{y}{x}$

<i>independent</i> Number of Downloads	2	4	5	6	10
<i>dependent</i> Total Cost (\$)	6	12	15	18	30

1) What is the ratio of the total cost to the number of downloads for each of the following:

a) 2 Apps? _____ b) 4 Apps? _____ c) 5 Apps? _____

d) 6 Apps? _____ e) 10 Apps? _____

2) What is the Unit Rate (remember to include 2 labels): _____

3) Is the data in the table in a proportional relationship? If so, what is the constant of proportionality?

4) How much money do you think it would cost to download 12 applications? _____

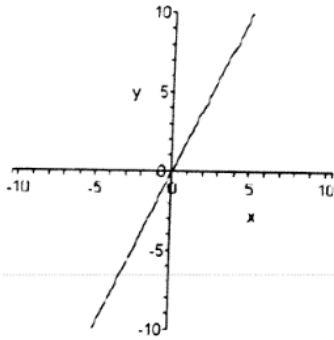
5) The table shows the number of hours needed for different numbers of people to clean up after a school dance.

Hours Needed to Clean Up	12	9	8	6
Number of People Cleaning	2	3	4	6

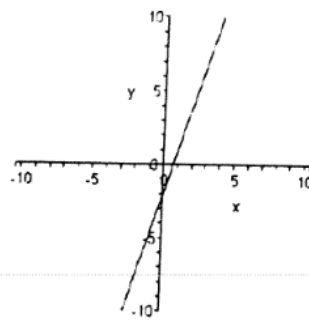
Are the quantities in the table in a proportional relationship? Explain your reasoning.

Which of the following graphs represent a proportional relationship?
Explain your reasoning.

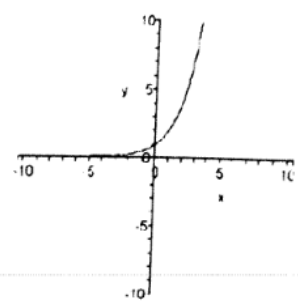
A



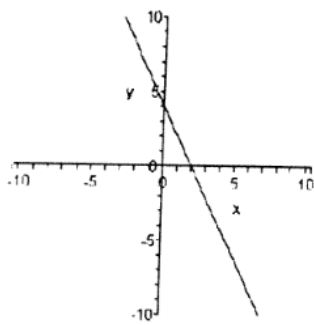
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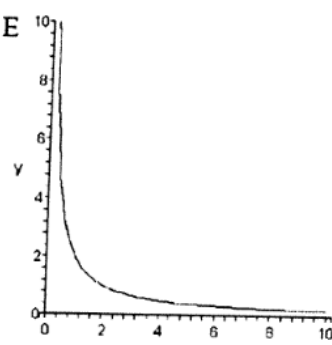
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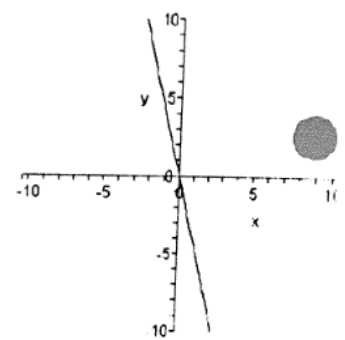
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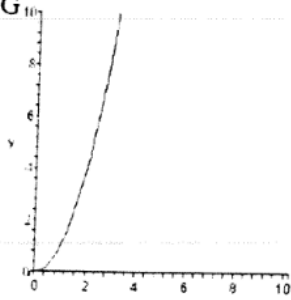
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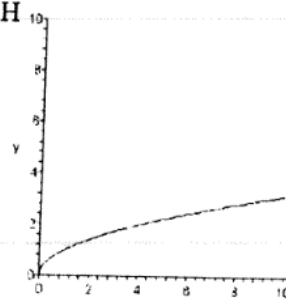
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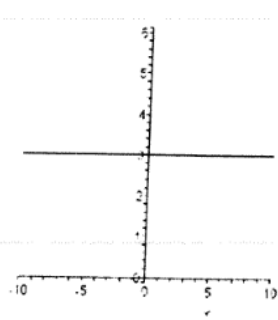
G



H



I



Graphs generated with Maple 9.5.