Name ____________________ Period Key

Proportional Relationships

Two quantities are proportional to each other when there is a constant (number) such that each measure in the first quantity (x) multiplied by this constant gives the corresponding measure in the second quantity (y).

Identify the measures in the first number with X and the measures in the second number with Y. The second quantity, y, is proportional to the first quantity, x, if $y = kx$ for some positive number K.

Example 1

A new self-serve frozen yogurt store opened this summer that sells its yogurt at a price based upon the total weight of the yogurt and its toppings in a dish. Each member of your family weighed their dish and this is what you found:

Weight (ounces)	12.5	10	5	8
Cost ($)	5	4	2	3.20

Cost is proportion to Weight.

1) Does everyone pay the same cost per ounce? Yes How do you know?

it costs 40¢ per ounce. Each cost value by its corresponding weight it will give the same unit rate of 40¢

2) You have a relative that takes an extra-long time to create a dish of yogurt. When it is placed on the scale, it weighs 15 ounces. If everyone pays the same rate in this store, how much will this dish cost? \$6.00 15 ounces x unit rate

Conclusion: $K = \frac{Y}{X}$ $.40 = \frac{5}{12.5} = \frac{4}{10} = \frac{2}{5} = \frac{3.20}{8}$

3) What happens if you do not serve yourself yogurt or toppings?

$0

Does the relationship above still hold true? Even for 0, you can still multiply by this constant value to get the cost.

Lesson Summary

How can you use a table to determine whether the relationship between two quantities is proportional? The check for a constant multiple between measures of x and measures of y when given a table.

For each given measure of quantity A and Quantity B, find the value of $\frac{B}{A}$. If the value of $\frac{B}{A}$ is the same for each pair of numbers in the table, then the quantities are proportional to each other.

In each table determine if **y** is proportional to **x**.

1)

x	y
3	12
5	20
2	8
8	32

Yes

$4x = y$

0	4
2	8
3	12
4	16
5	20
6	24
7	28
8	32

2)

x	y
3	15
4	17
5	19
6	21

0	9
1	11
2	13

+1 +2

No

Cross multiply any 2 pairs, if they are equal the tables are proportional

3)

x	y
6	4
9	6
12	8
3	2

Yes

0	0
3	2
6	4
9	6
12	8

Identifying Proportional & Non-Proportional Relationships in Tables

Examine the situations and decide whether two quantities are proportional to each other by checking for a constant multiple between measures of **x** and measures of **y**.

Example 1

Example 1: Which Team Will Win the Race?

You have decided to run in a long distance race. There are two teams that you can join. Team A runs at a constant rate of 2.5 miles per hour. Team B runs 4 miles the first hour and then 2 miles per hour after that.

Task: Create a table for each team showing the distances that would be run for times of 1, 2, 3, 4, 5, and 6 hours. Using your tables, answer the questions that follow:

Team A	
Time (hrs)	Distance (miles)
1	2.5
2	5
3	7.5
4	10
5	12.5
6	15

2.5
2.5

6

Team B	
Time (hrs)	Distance (miles)
1	4
2	6
3	8
4	10
5	12
6	14

3.5 miles
$= 2(3.5) + 2 = 9$
$A = 2.5(3.5) = 8.75$

1) For which team is distance proportional to time? Explain.

Team A since all the ratios comparing distance to time are equivalent. The ratio is $\boxed{2.5}$

2) Explain how you know if either team is not proportional to time.

Team B does not equivalent ratios. The ratios are 4, 3, 8/3, 2.5, 12/5, 14/6
Every measure of time cannot be multiplied by a constant to give each corresponding measure of distance

B
$y = 2x + 2$
$70 + 2 = 72$ miles
A $y = 2.5x = 87.5$ miles

3) If the race were 35 miles long, which team would win? Explain.

Team B @ 3.5 Team A @ 35

Team A would win because more distance is covered in less time (@ 35 miles) Team B (if 3.5 miles)

Time is equal
$y = 2x + 2 = 11$
$y = 2.5x = 11.25$

4) If the race were 4.5 miles long, which team would win? Explain.

Team A would win because more distance was covered in less time.

5) For what length race would it be better to be on Team B than Team A?

If the race were less than 10 miles, Team B is faster because more distance would be covered in less time.

6) Will there always be a winning team? Explain.

No, there would be a tie (both teams win) at 4 hours.

Identifying Proportional & Non-Proportional Relationships in Graphs

Two quantities are proportional to each other by graphing on a coordinate plane and observing whether the graph is a straight line through the origin.

Opening Exercise

Isaiah sold candy bars to help raise money for his scouting troop. The table shows the amount of candy he sold to the money he received.

Is the amount of candy bars sold proportional to the money Isaiah received? How do you know?

The two quantities are not proportional to each other because a constant describing the proportion does not exist.

x Candy Bars Sold	y Money Received ($)
2	3
4	5
8	9
12	12

2, 4, 4

2, 4, 3

$\frac{\Delta Y}{\Delta X}$

slope = [illegible]

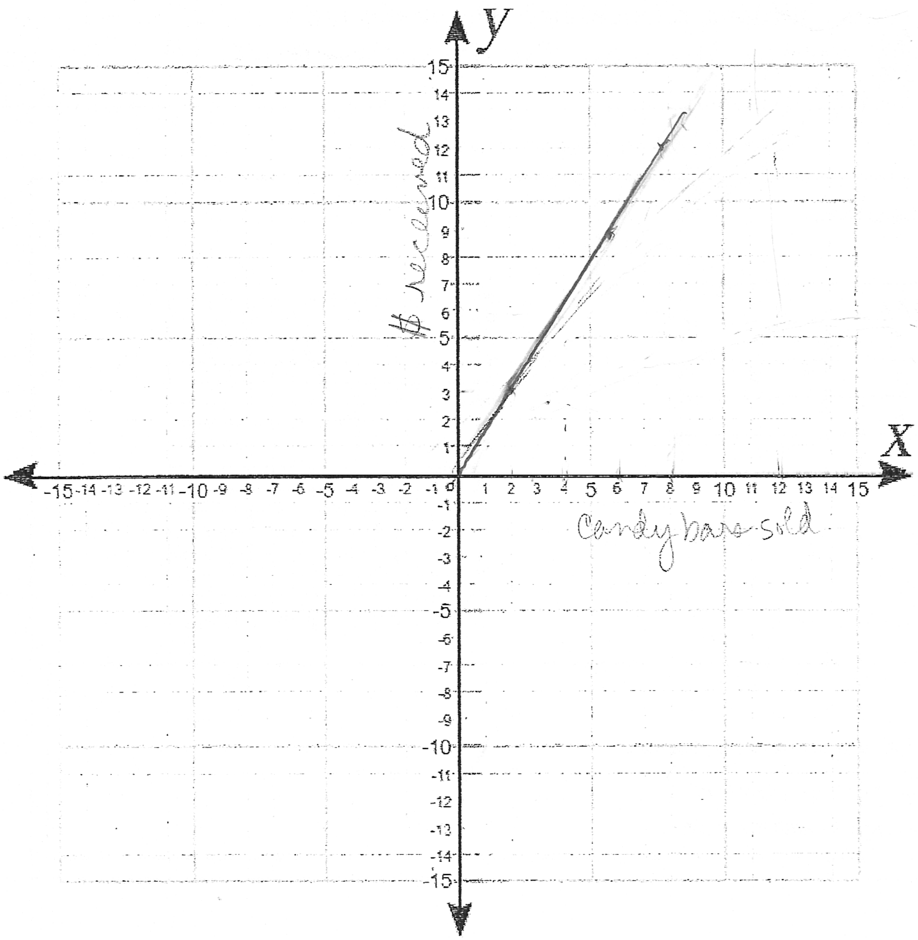
(if no [illegible]

no

1) Create a ratio table that contains two sets of quantities that are proportional to each other using the first ratio on the original table.

x	y
2	3
4	6
8	12
12	18

Express the ratios from this table as ordered pairs. (2,3) (4,6) (8,12) (12,18)



1) Where is the origin? 0, 0

2) What should we label the x axis and the y axis? X= candy bars sold
y= money received

3) Could the axis be switched (the other way around)?
No, the amt. of $ received should depend on the candy bars being sold, so the amount of money should be y, the dependent variable

4) Plot the ratio pairs on the graph.

5) What observation can you make about the arrangement of points?
The points all fall on a straight line.

6) Would all proportional relationships pass through the origin? Yes

7) What can you infer about graphs of two quantities that are proportional to each other? The graph will be a straight line and go through the origin.

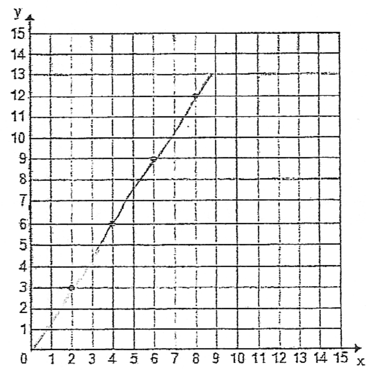
Example 1 Is this a proportional relationship? Why or why not?

Yes, it passes through the origin and its in a straight line.

The table is proportional $\frac{\Delta Y}{\Delta X}$

Example 1: From a Table to Graph

x	y
2	3
4	6
6	9
8	12



Important Note:

Characteristics of graphs of proportional relationships:

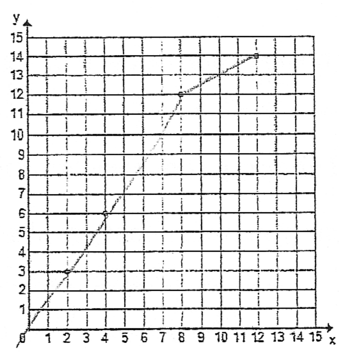
1. *Points lie in a straight line.*
2. *Line goes through the origin.*

Example 2 Is this a proportional relationship? Why or why not?

no, not all the quantities are proportional to each other.

Example 2

x	y
2	3
4	6
8	12
12	14



What can you predict about the graph of this ratio table? The points will not lie on a straight line and will ~~not~~ go through the origin.

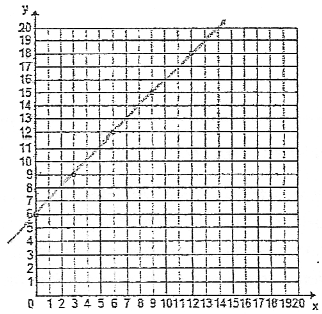
Example 3 Is this a proportional relationship? Why or Why not?

no, although it is a straight line, it does not pass through the origin.

can you write the equation?

Example 3

x	y
0	6
3	9
6	12
9	15
12	18



$y = 3x + 6$

Similarities with Example 1:

The points of both graphs fall in a line.

Differences from Example 1:

The points of Graph 1 fall in a line that pass through the origin. The points of Graph 3 fall in a line that do not pass through the origin.

What can you predict about the graph of this ratio table? The points will not pass through the origin.

How are the graphs of the data in Example 1 and 3 similar? How are they different?

Example 1 & 3 - the points of both graphs fall in a line.

Differences: The points of Graph 1 fall in a line that pass through the origin. The points of Graph 3 fall in a line that do not pass through the origin.

Lesson Summary:

When two proportional quantities are graphed on a coordinate plane, the points lie on a straight line that passes through the origin.