Page 1

Accelerated Math
from Math 7 textbook Section 1.9
Direct Variation

When two variable quantities have a constant ratio, their relationship is called a direct variation, which also means that they are

proportional

This constant ratio is also called the constant of proportionality. **k**

In a direct variation, the constant rate of change, or slope, or unit rate, or constant of proportionality can be assigned a special variable, k.
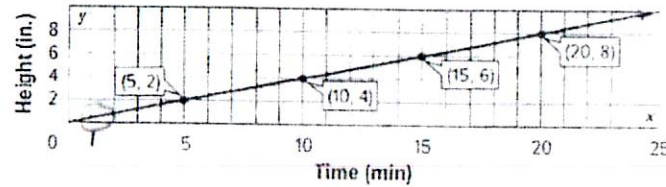
$$\frac{y}{x} = k \text{ or } y = kx$$

$k = 2$

$y = 2x$

(1, 2)

$y = 2x$

Page 2
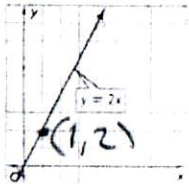
The height of the water as a pool is being filled is shown in the graph. Determine the rate in inches per minute.

(5, 2) (10, 4) (15, 6) (20, 8)

Time (min) / Height (in.)

The graph is linear (forms a straight line) and passes through the origin. It is therefore proportional. You can use any point on the graph to divide to find the unit rate, also called the constant of proportionality

or use slope points

y height $\frac{2}{5}$ = $\frac{0.4}{1}$ $\frac{4}{10}$ = $\frac{4}{1}$ $\frac{6}{15}$ = $\frac{2}{5}$ $\frac{\square}{\square}$ = $\frac{\square}{\square}$

x time

The pool fills at a rate of _0.4_ in/min.

or $\frac{2}{5}$ in/min.

Page 3

Two minutes after a diver enters the water, he has descended 52 feet. After 5 minutes, he has descended 130 feet. At what rate is the scuba diver descending? Write an equation to represent this proportional relationship.

Label first!

y ft. $\frac{52}{2}$ $\frac{130}{5}$

x min.

26   26

$y = kx$

$y = 26x$

unit rate 26 ft/min

Page 4

The equation $y = 10x$ represents the amount of money y Julio earns for x hours of work. Identify the constant of proportionality. Explain what it represent in this situation.

$y = kx$

$y = \boxed{10}x$

$k = 10$

$\frac{y}{x}$ $\frac{\#}{hours}$

$10/hour

The distance y traveled in miles by the Chang family in x hours is represented by the equation $y = 55x$. Identify the constant of proportionality. Then explain what it represents.
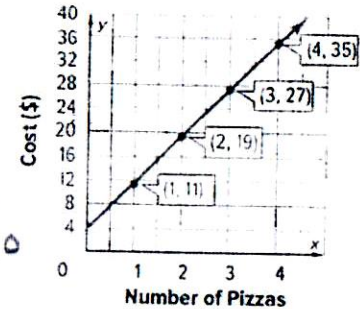
$$y = 55x$$

$$k = 55$$

55 miles per hour

Page 5

Not all situations with a constant rate of change are proportional relationships. Likewise, not all linear functions are direct variations.

Pizzas cost $8 each plus a $3 delivery charge. Show the cost of 1, 2, 3, and 4 pizzas. Is there a direct variation?
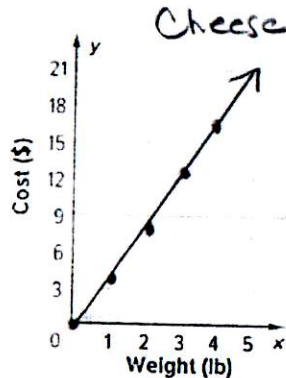
Number of Pizzas	1	2	3	4
Cost ($)	$11	$19	$27	$35

No Graph does not go through origin so it is not proportional

Page 6   Which means not a direct variation

Graph points: (1, 11), (2, 19), (3, 27), (4, 35)

Two pounds of cheese cost $8.40. Show the cost of 1, 2, 3, and 4 pounds of cheese by making a chart and a graph. Is there a direct variation?

Weight (lb)	Cost ($)
1	4.20
2	8.40
3	12.60
4	16.80

Cheese

Yes the graph is a straight line through origin. This means it is a proportional relationship or a direct variation

Page 7

Determine whether the linear relationship is a direct variation. If so, state the constant of proportionality.

Time, x	1	2	3	4
Wages ($), y	12	24	36	48

Compare the ratios to check for a common ratio.

$$\frac{12}{1} \qquad \frac{24}{2} \text{ or } \frac{12}{1} \qquad \frac{36}{3} \text{ or } \frac{12}{1} \qquad \frac{48}{4} \text{ or } \frac{12}{1}$$

Since the ratios are the same, the relationship is a direct variation. The constant of proportionality is $\frac{12}{1}$.

Write the equation of the line. $y = 12x$

Page 8