Name ______________________ Period ________ Date ______________________

DIRECT VARIATION: A Fancy Way for Proportional Thinking

And in perfect harmony with SLOPE

In earlier grades, you learned that when ratios were equivalent, they were

proportions   1 bb = $10   — = —

For instance, if Sam spent $40 on 4 basketballs, and Jill spent $60 on 6 basketballs, then their rates were equivalent. Therefore, the pricing was proportional. You can use this information to solve for more problems using this information.

At the same RATE, how much will Henry pay for 11 basketballs? $\frac{y\ \$}{x\ bb}$ $\frac{40}{4} = \frac{?\ \boxed{110}}{11}$ 10

Now that you are in Algebra, the thinking is still the same, but the wording has changed.

Now we say that the:

y   x $\frac{y}{x}$

The DEPENDENT VARIABLE **VARIES DIRECTLY** WITH THE INDEPENDENT VARIABLE (instead of the dependent variable is proportional with the independent variable).

Example: The price of basketballs varies directly with the number of basketballs.

$ y   x

If a situation VARIES DIRECTLY, then the ratio must be $\frac{y}{x}$ or $\frac{dependent}{independent}$.

"Y" VARIES DIRECTLY with "X"

Once you have this ratio, then you have your rate of change or slope

or Constant of variation. $y = mx \boxed{+b}$

Thus, you have your equation to the line! ☺ f(x) = mx

Remember, this graph will graph through the ORIGIN, or (0,0).

So in the basketball situation, the ratio is ______________ = 10.

Therefore the rate of change/slope/constant of variation is 10. Thus, the equation of the line is f(x) = 10x. The constant of variation is _______. Why do you think it is called this?

y = 10x

Example 1:

40 hrs

Mr. Gomez works five 8-hour shifts and earns $480 per week. Which equation represents the direct variation between x, the number of hours worked, and y, his weekly earnings?

A.) y = 60x B.) y = (1/60)x C.) y = (1/12)x D.) y = 12x

$\frac{y}{x}\ \frac{480}{40} = 12$

Example 2:

If y varies directly with x and y is 32 when x is 12, which of the following represents this situation?

A.) y= (8/3)x B.) y = 20x C.) y = (3/8)x D.) y = 44x

$\frac{y}{x}\ \frac{32}{12} = \frac{8}{3}$

Example 3:

Which of the following represents the relationship when y varies directly with x when y=3 and x=2 ?

A. y = (3/2)x B.) y = (2/3) x C.) y = 5x D.) y = 4x

$\frac{y}{x}\ \frac{3}{2}$

Example 4: If y is directly proportional to x and y=12 when x = 16, what is the value of x when y = 5?

$\frac{y}{x}$ $\frac{12}{16} = \frac{5}{?}$ $\boxed{6.\overline{6}}$

Example 5: Two quantities, x and y, are in a relationship in which y varies directly with x. The graph of this function contains the point (-16, 28). Which of the following represents this relationship?

A.) ~~y = (4/7)x~~ B.) y=(- 7/4) x C.) y = (- 4/7) x D.) ~~y = (7/4)x~~

$\frac{28}{-16} = \frac{-7}{4}$

Example 6: The value of y varies directly with x. Which function represents the relationship between x and y if y = (20/3) and x = 30 ?

A.) y = 200x B.) y = (2/9)x C.) y = (110/3)x D.) y = (9/2)x

$\frac{y}{x}\ \frac{\frac{20}{3}\left(\frac{1}{30}\right)}{30\left(\frac{1}{30}\right)} = \frac{20}{90} = \frac{2}{9}$

Calculator will solve this :)

Example 7: The height of red solo cups in a tower varies directly with the number of cups. If (5, 60) is a point on the line, then what is the y-value for (8, y) ?

$\frac{y}{x} = \frac{60}{5} = \frac{y}{8}$ $\boxed{y=96}$

Example 8: The height of red solo cups in a tower varies directly with the number of cups. If (4, 48) is a point of the line, then what is the constant of variation? (Hint: Just find the equation. The constant of variation is the same as the slope.)

$\frac{48}{4} = \boxed{12}$

Example 9: Which of the following is an example of direct variation? How do you know?

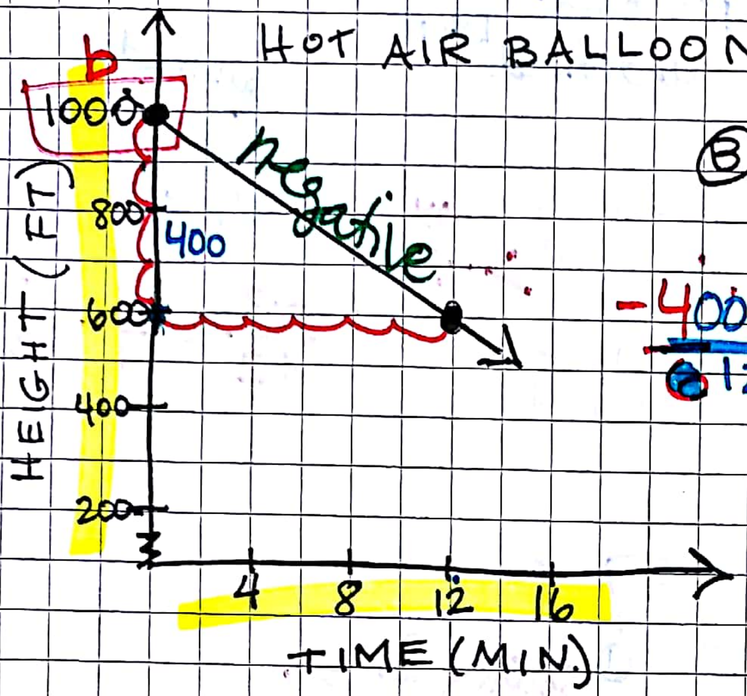
A.) f(x) = 4.5x B.) f(x) = 6.5x + 4 C.) f(x) = (2/3)x – 0.4 D.) f(x) = 8.1x + 2.8

no fee fee fee fee

Name ________________ Review

Ⓐ

1. What is the rate of change? Round to tenths place. ________



Ⓑ What is equation? ________

$\frac{-400}{12}$ $\frac{-100}{3}$ $\frac{y}{x}$ $\frac{ft}{min}$

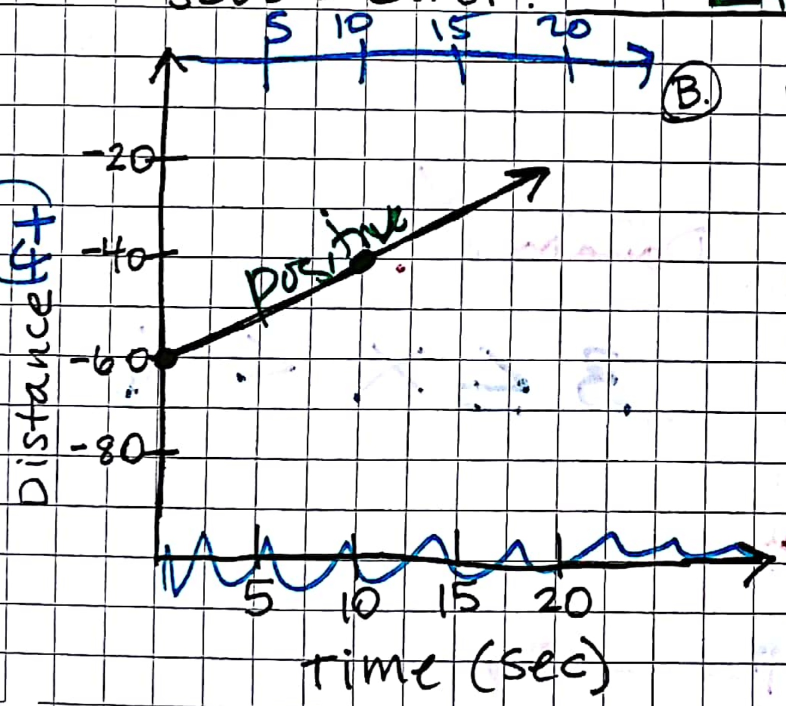
$33.\overline{3}$ unit rate

$y = 1000 - \frac{100}{3}x$

$y = 1000 - 33.\overline{3}x$

$y = \frac{-100}{3}x + 1000$

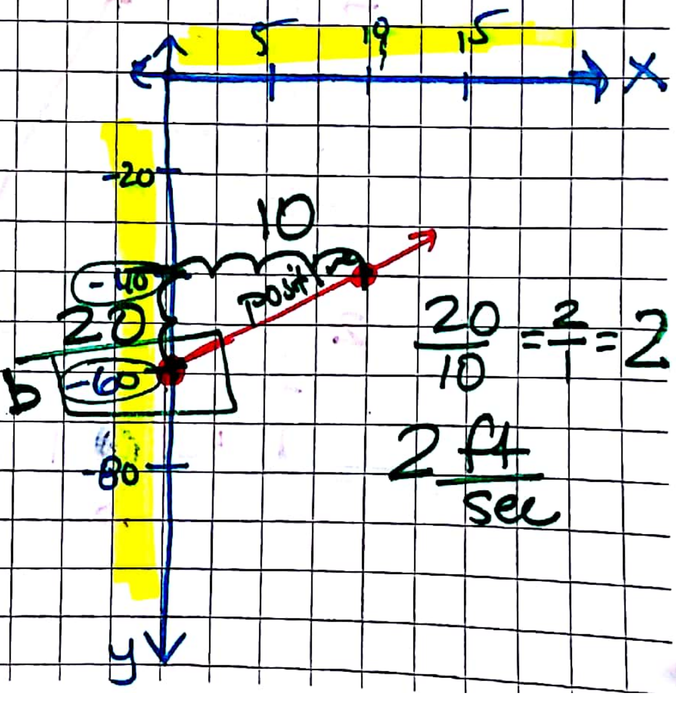
2. Ⓐ What is the rate of change of scuba diver? 2 ft/sec



Ⓑ. What is the equation? ________

$y = mx + b$

$y = 2x - 60$



$\frac{20}{10} = \frac{2}{1} = 2$

$2 \frac{ft}{sec}$

③ What is the slope of the line that passes through $(\underset{x}{5}, \underset{y}{-7})$ and $(\underset{x}{5}, \underset{y}{11.4})$

$\dfrac{y_2 - y_1}{x_2 - x_1}$ $\dfrac{\Delta y}{\Delta x}$

$\dfrac{-7 - 11.4}{5 - 5} = \dfrac{\quad}{0}$ No slope undefined DNE

④ Find the slope

subtract $\dfrac{\Delta y}{\Delta x}$

X	Y
-4	10
-2	8
0	6
2	4

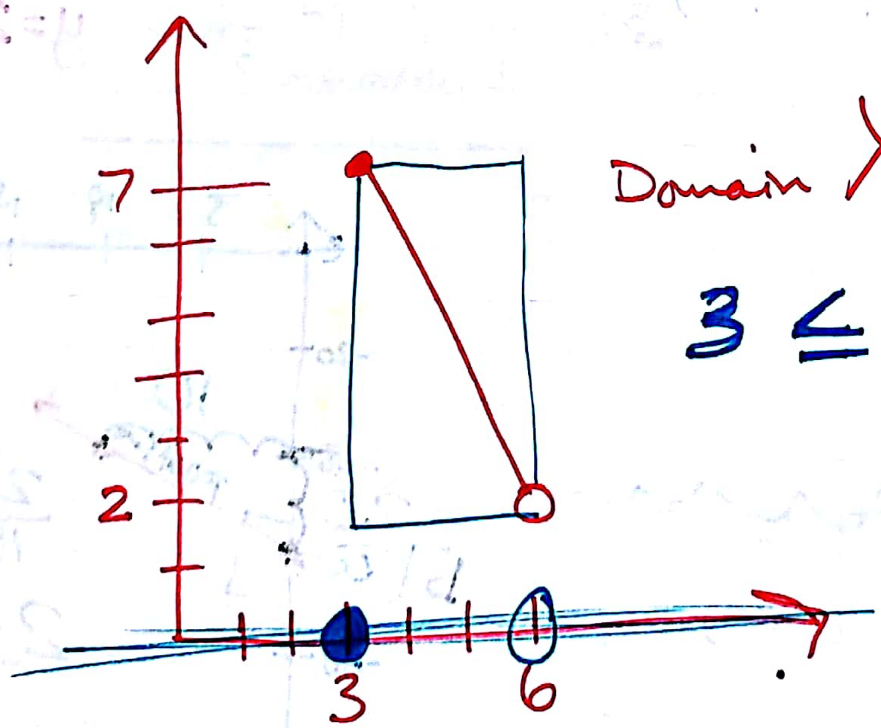
Δx +2 Δy -2

$\dfrac{-2}{+2} = \dfrac{-1}{1} = \boxed{-1}$

⑤ What is the slope of the line represented by ① solving for y

$2x - 8\boxed{y} = 30$ ② $y = \underset{\text{slope}}{\underset{\downarrow}{m}}x + b$

⑥



Domain X

$3 \leq x < 6$

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