

5.6 Worksheet - Connecting Variation, Slope, and First Differences

MPM1D

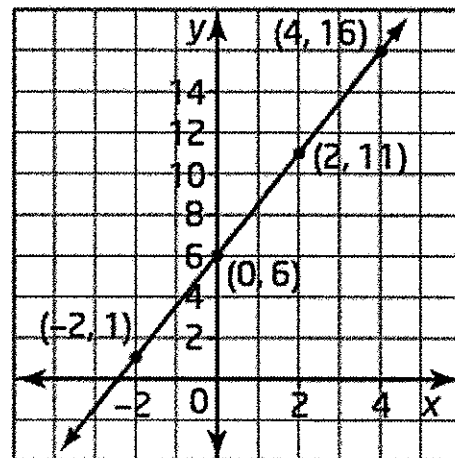
Jensen

1. a) Find the slope of the following graph using the formula $m = \frac{y_2 - y_1}{x_2 - x_1}$, where one point on the line has coordinates (x_1, y_1) and another point on the line has coordinates (x_2, y_2)

Point 1: $(0, 6)$
 x_1, y_1

Point 2: $(2, 11)$
 x_2, y_2

$$\begin{aligned} m &= \frac{y_2 - y_1}{x_2 - x_1} \\ &= \frac{11 - 6}{2 - 0} \\ &= \frac{5}{2} \end{aligned}$$



- b) What is the y-intercept? (the initial value)

$$b = 6$$

- c) Write an equation for the relation

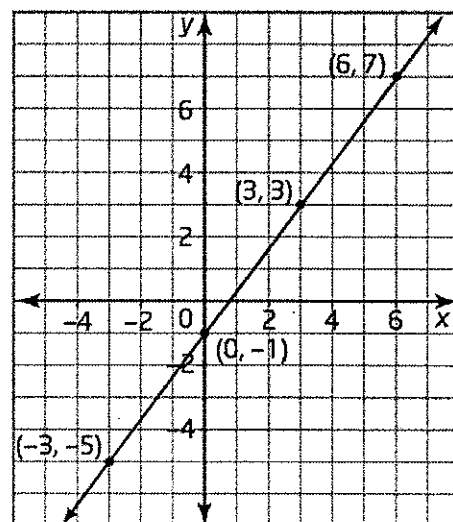
$$y = \frac{5}{2}x + 6$$

2. a) Find the slope of the following graph using the formula $m = \frac{y_2 - y_1}{x_2 - x_1}$, where one point on the line has coordinates (x_1, y_1) and another point on the line has coordinates (x_2, y_2)

Point 1: $(3, 3)$
 x_1, y_1

Point 2: $(6, 7)$
 x_2, y_2

$$\begin{aligned} m &= \frac{y_2 - y_1}{x_2 - x_1} \\ &= \frac{7 - 3}{6 - 3} \\ &= \frac{4}{3} \end{aligned}$$



- b) What is the y-intercept? (the initial value)

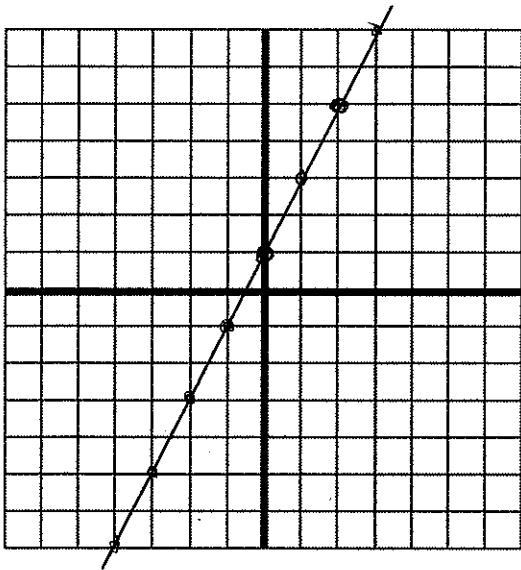
$$b = -1$$

- c) Write an equation for the relation

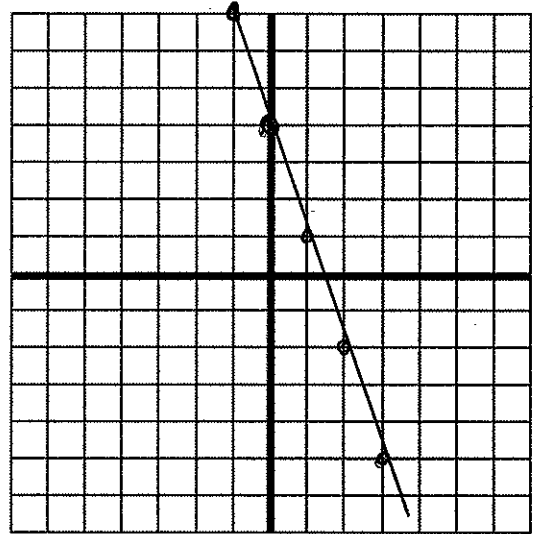
$$y = \frac{4}{3}x - 1$$

3. Graph each of the following lines on the grids provided.

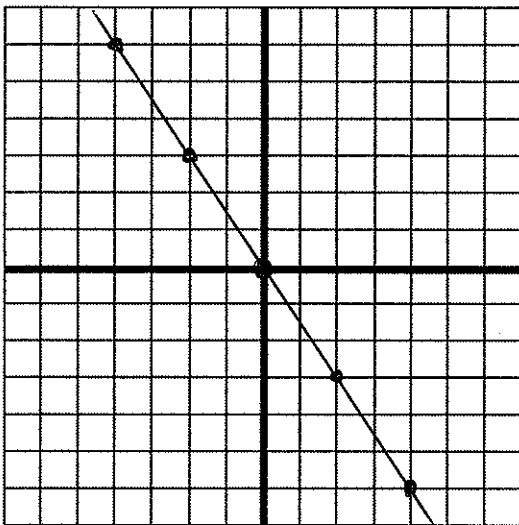
a) $y = 2x + 1$



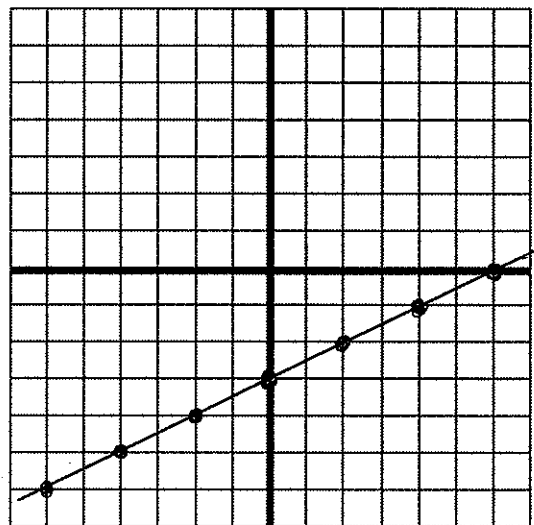
b) $y = -3x + 4$



c) $y = -\frac{3}{2}x$



d) $y = \frac{1}{2}x - 3$



4. Using the table of values:

a) Calculate the slope (constant of variation, m)

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{5 - 2}{1 - 0} = 3$$

b) What is the initial value? (y -intercept, b)

$$b = 2$$

x	y
0	2
1	5
2	8
3	11
4	14

c) Is this an example of direct or partial variation?

partial

d) Write the equation of the relation in the form $y = mx + b$.

$$y = 3x + 2$$

5. Using the table of values:

a) Calculate the slope (constant of variation, m)

$$\begin{aligned} m &= \frac{y_2 - y_1}{x_2 - x_1} \\ &= \frac{6 - 1}{-4 - (-6)} \\ &= \frac{5}{2} \end{aligned}$$

b) What is the initial value? (y-intercept, b)

$$b = 16$$

x	y
-6	1
-4	6
-2	11
0	16
2	21

, Is this an example of direct or partial variation?

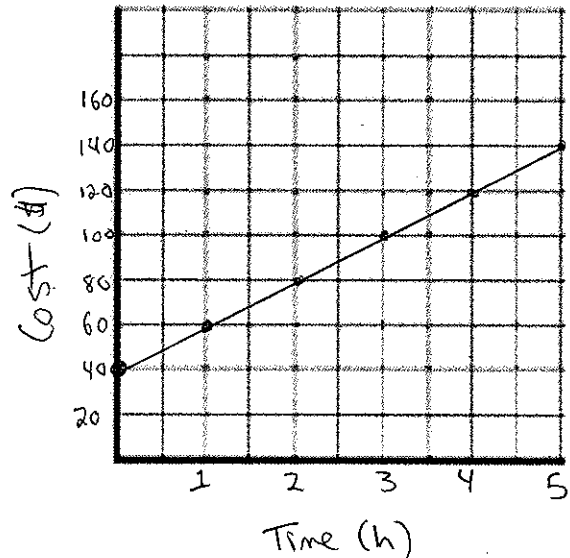
Partial

d) Write the equation of the relation in the form $y = mx + b$.

$$y = \frac{5}{2}x + 16$$

6. A house painter charges a flat fee of \$40 plus \$20 per hour to paint the interior of a house. Represent the relation using a table of values, a graph, and an equation.

Time (hours)	Cost (\$)
0	40
1	60
2	80
3	100
4	120
5	140



7. The cost of a taxi ride is \$5.00 plus \$0.75 for every 0.5 km.

a) Identify the slope (m) and the y-intercept (b) of the line. What do they represent?

$$m = \frac{\Delta y}{\Delta x} = \frac{0.75}{0.5} = 1.50$$

b) Is this a direct or a partial variation? Explain.

Partial. The

c) Write an equation relating the cost and the distance travelled.

$$y = 1.5x + 5$$

8. y varies directly with x. When x=4, y=9.

a) Find the slope (m) and y-intercept (b)

$$m = \frac{9-0}{4-0} = \frac{9}{4} \quad b = 0$$

b) Write an equation for this relationship

$$y = \frac{9}{4}x \quad \text{or} \quad y = 2.25x$$

9. y varies partially with x. When x=0, y=5, and when x=6, y=8

a) Find the slope (m) and y-intercept (b)

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{8-5}{6-0} = \frac{3}{6} = \frac{1}{2} \quad b = 5$$

b) Write an equation for this relationship

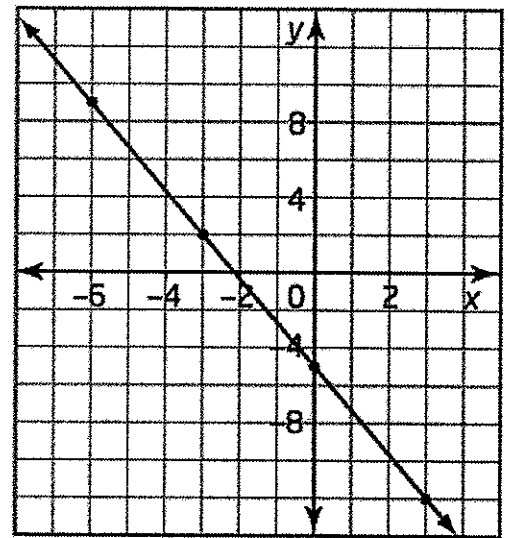
$$y = \frac{1}{2}x + 5$$

10. Based on the graph

a) What is the slope (m)?

$$m = \frac{\text{rise}}{\text{run}}$$

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



b) What is the y-intercept (b)?

$$b = -5$$

c) Write an equation for the line in the form $y = mx + b$

$$y = -\frac{7}{4}x - 5$$

11. A company tests the heavy-duty elastic bands it makes by measuring how much they stretch when supporting various masses. This table shows the results of tests on one of the elastic bands.

Mass (kg)	Length (cm)
0	6.2
2	9.6
4	13
6	16.4
8	19.8

a) What is the initial value (b)? What does it represent?

$$b = 6.2$$

It represents the length of the band when it is not being stretched.

b) Calculate the constant of variation (slope)

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$= \frac{9.6 - 6.2}{2 - 0}$$

$$= \frac{3.4}{2}$$

$$= 1.7$$

c) Write an equation for the relationship

$$y = 1.7x + 6.2$$

d) Use your equation to predict how long the elastic band will be when it is supporting a 10 kg mass.

$$y = 1.7(10) + 6.2$$

$$y = 17 + 6.2$$

$$= 23.2$$

23.2 cm

Answers:

1. a) $m = \frac{5}{2}$ b) $b=6$ c) $y = \frac{5}{2}x + 6$

2. a) $m = \frac{4}{3}$ b) $b=-1$ c) $y = \frac{4}{3}x - 1$

3.

4. a) $m = 3$ b) $b=2$ c) partial d) $y = 3x + 2$

5. a) $m = \frac{5}{2}$ b) $b = 16$ c) partial d) $y = \frac{5}{2}x + 16$

6.

7. a) $m = 1.5$ b) $b = 5$ c) partial d) $y = 1.5x + 5$

8. a) $m = 2.25$ b) $b = 0$ c) $y = 2.25x$

9. a) $m = \frac{1}{2}$ b) $b = 5$ c) $y = \frac{1}{2}x + 5$

10. a) $m = \frac{-7}{3}$ b) $b = -5$ c) $y = \frac{-7}{3}x - 5$

11. a) $b = 6.2$ b) $m = 1.7$ c) $y = 1.7x + 6.2$ d) 23.2 cm