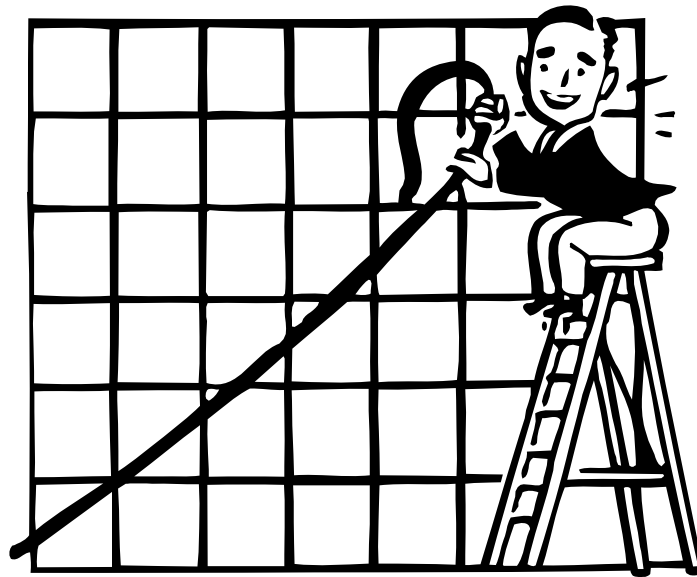# Direct and Partial Variation

Lesson 12

Lesson Twelve Concepts

Overall Expectations

➢ Apply data-management techniques to investigate relationships between two variables;
➢ Determine the characteristics of linear relations;
➢ Demonstrate an understanding of the constant rate of change and its connection to linear relations;
➢ Connect various representations of a linear relation, and solve problems using the representations.

Specific Expectations

➢ Construct tables of values and graphs, using a variety of tools;
➢ Construct tables of values, scatter plots, and lines or curves of best fit as appropriate using a variety of tools;
➢ Identify through investigation, some properties of linear relations;
➢ Determine other representations of a linear relation arising from a realistic situation, given one representation;
➢ Determine values of a linear relation by using a table of values, by using the equation of the relation, and by interpolating or extrapolating from the graph of the relation;
➢ Express a linear relation as an equation in two variables, using the rate of change and the initial value;
➢ Describe the effects on a linear graph and make the corresponding changes to the linear equation when the conditions of the situation they represent are varied;
➢ Determine graphically the point of intersection of two linear relations, and interpret the intersection point in the context of an application.

Direct and Partial Variation

Direct Variation

Direct Variation is a relation that is of the form y = mx.

The graph of y = mx is a straight line with the slope of m.

The line y = mx always passes through the order pair (0, 0). (0, 0) is called the origin.

The relation y = mx represents direct variation because there is a direct relationship.

Example

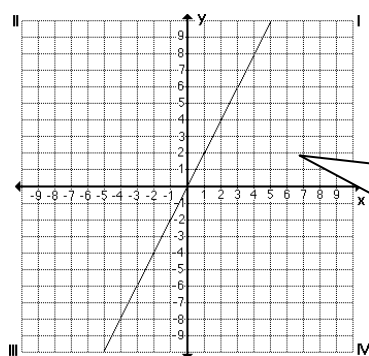Graph each equation which models direct variation.

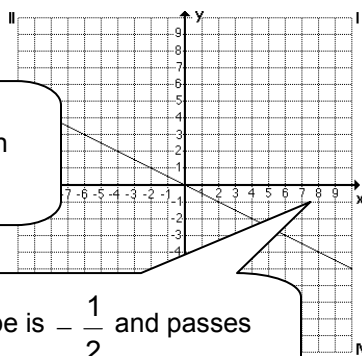a) $y = 2x$ b) $y = -\dfrac{1}{2}x$

Solution

a) $y = 2x$ b) $y = -\dfrac{1}{2}x$

Slope is 2 and passes through the origin.

Slope is $-\dfrac{1}{2}$ and passes through the origin.

Support Questions

1. State the value of m in each equation of the form y = mx.

    a) $y = -4x$ b) $y = x$ c) $y = -\dfrac{1}{3}x$ d) $y = \dfrac{2}{5}x$

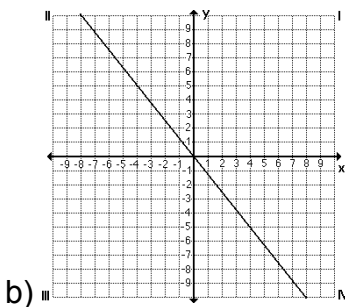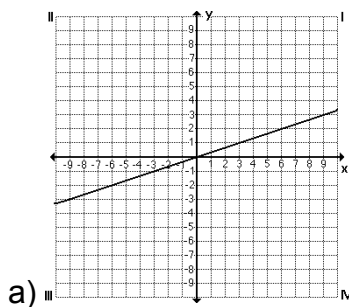2. Write an equation of the line through the origin with each slope.

    a) $m = -5$ b) $m = -\dfrac{3}{7}$ c) $m = \dfrac{1}{4}$ d) $m = 1$

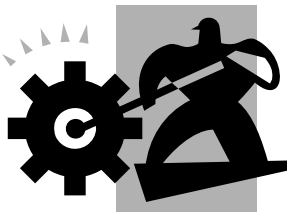3. Find the slope of each line, and then write its equation.

a)

b)

4. Graph each line.

a) $y = -\dfrac{1}{5}x$ b) $y = \dfrac{2}{3}x$

5. Johnny earns $6 for every hour worked. Write an equation for this statement, then create a table of values and graph.

Partial Variation

Partial Variation is a relation that is of the form y = mx+b.

The graph of y = mx+b is a straight line with the slope of m and a y-intercept of b.

The line y = mx+b does not pass through the origin.

The relation y = mx +b represents partial variation because the value of y varies partially with the value of x.
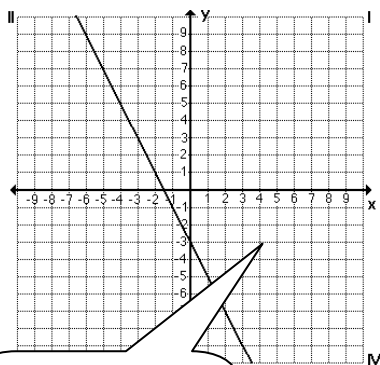
Example

Graph each equation which models partial variation.

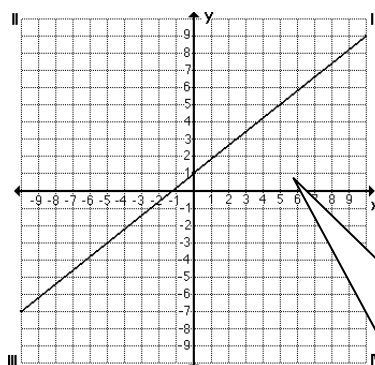a) $y = -2x - 3$ b) $y = \dfrac{4}{5}x + 1$

Solution

a) $y = -2x - 3$

b) $y = \dfrac{4}{5}x + 1$

Slope is -2 and intersects the y-axis at –3.

Slope is $\dfrac{4}{5}$ and intersects the y-axis at +1.
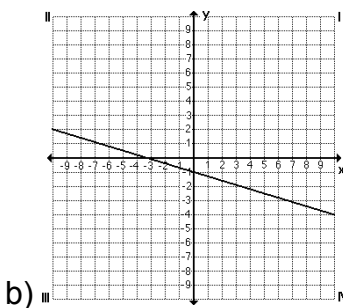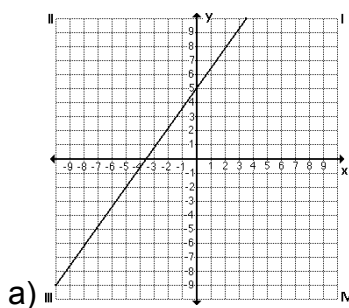
Support Questions

6. Write an equation of the line with each slope and y-intercept.

   a) $m = -5$, b =1

   b) $m = -\dfrac{3}{7}$, b = -4

   c) $m = \dfrac{1}{4}$, b = +6

7. Find the slope and y-intercept of each line, and then write its equation.

   a)

   b)

8. Graph each line.

   a) $y = -2x + 1$ b) $y = \dfrac{2}{3}x - 6$ c) $y = x - 4$

9. Noah earns a $100 a week and $2 for every hour worked. Write an equation for this statement, then create a table of values and graph.

Key Question #12

1. State the value of m in each equation of the form y = mx. (2 marks)

   a) $y = 7x$ b) $y = -x$ c) $y = \dfrac{2}{7}x$ d) $y = -\dfrac{3}{8}x$

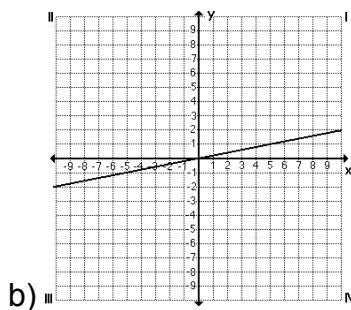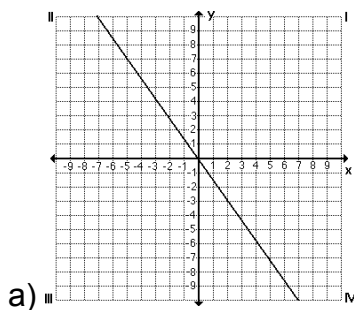2. Write an equation of the line through the origin with each slope. (2 marks)

   a) $m = 7$ b) $m = \dfrac{1}{2}$ c) $m = -3$ d) $m = -\dfrac{3}{8}$

3. Find the slope of each line, and then write its equation. (2 marks)
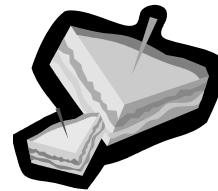
a)   b)

4. Graph each line. (3 marks)

   a) $y = -3x$ b) $y = \dfrac{3}{5}x$ c) $y = -x$

5. Brook spends $4.00 each day for lunch on work days. Write an equation for this statement, then create a table of values and graph. (3 marks)

6. Write an equation of the line with each slope and y-intercept. (3 marks)
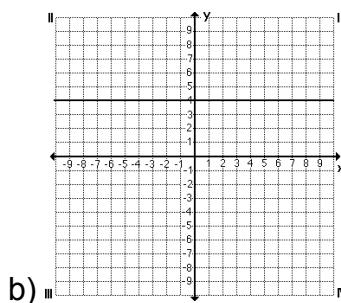
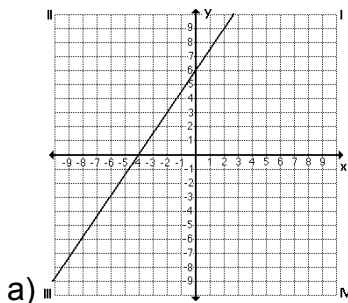   a) $m = 3$, b =0   b) $m = -2$, b = -3   c) $m = \dfrac{3}{4}$, b = +7

Key Question #12

7. Find the slope and y-intercept of each line, and then write its equation. (4 marks)

a)

b)

8. Graph each line. (3 marks)

a) $y = 4x - 2$ b) $y = -\dfrac{1}{4}x + 1$ c) $y = -x + 3$

9. The length of time to set up is 200 min. The time to make paint each sign is 25 min. Write an equation for this statement, then create a table of values and graph. (3 marks)

10. Stephen graphed the equation y = 2x –1 on a Cartesian plane. When he checked with a classmate, he realized the graph was different. Is Stephen's graph correct? If so, explain how you know. If not, explain what Stephen did wrong. (4 marks)