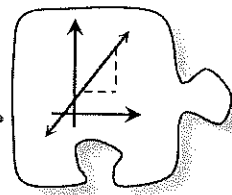# 2.1.4 What information determines a line?

$y = mx + b$ and More on Slope

In previous lessons, you found the slope and y-intercept of linear functions. You connected slope (growth) and y-intercept (starting value) to their representations in patterns, tables, equations, and graphs. Today you will complete your focus on determining slope and learn how to use slope and the y-intercept to write the equation of a line. During this lesson, keep the following questions in mind:

How can we determine the growth? How can we determine the starting value?

Is there enough information to graph the line?

How can we calculate the slope of a line without graphing it?

2-35.   Equations for linear patterns can all be written in the form $y = mx + b$.

a. x and y represent **variables**. When you wrote equations relating the figure number to the number of tiles, what did x represent? What did y represent?

b. m and b are **parameters**—they do not change within a given linear situation.

m is also called a **coefficient** since it multiplies a variable (x), and b is a **constant term** since it does not multiply a variable.

What do m and b represent in a linear situation like the tile patterns?

c.   What effect does m have on a graph of the line? What effect does b have?
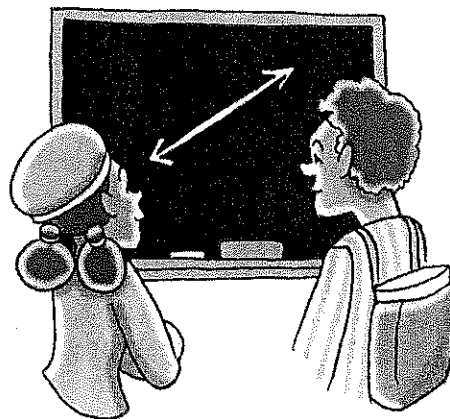
2-36.   THE LINE FACTORY

You are an engineer at the city's premiere
Line Factory. Your job is to process
customers' orders for lines.

Analyze the recent orders below. If the
customer has provided enough information to
produce one (and only one) line, then pass it
on to your production department with an
equation and a graph.
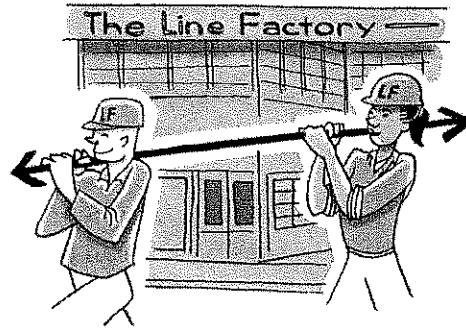
However, if you do not have enough information to draw one specific line, draw at
least two lines that fit the order and send it back to the customer.

The Line Factory uses the Lesson 2.1.4 Resource Page to design orders.

a.   Line A goes through the point $(2, 5)$.

b.   Line B has a slope of -3 and goes through the origin.

c.   Line C goes through points $(-3, -2)$ and $(3, 10)$.
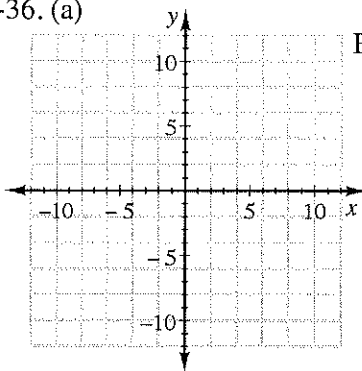
d.   Line D has the following table:

x	2	3	4	5
y	1	3.5	6	8.5

e.   Line E has a slope of 4.

f.   Line F goes through the point $(8, -1)$ and has a slope of $-\frac{3}{4}$.

g.   Customer G sent the following table:

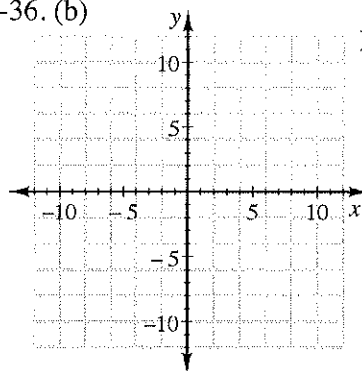| x	0	1	2	3	4
y	1	2	4	8	16

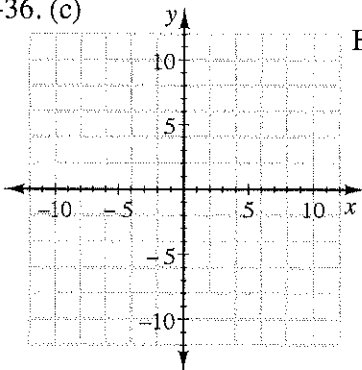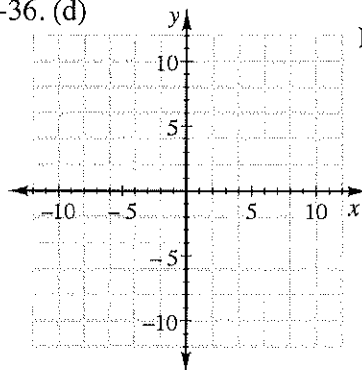Lesson 2.1.4 Resource Page
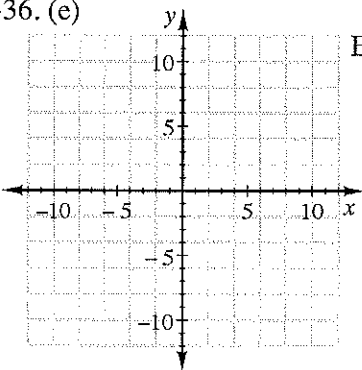
2-36. (a)

Equation:

2-36. (b)

Equation:

2-36. (c)
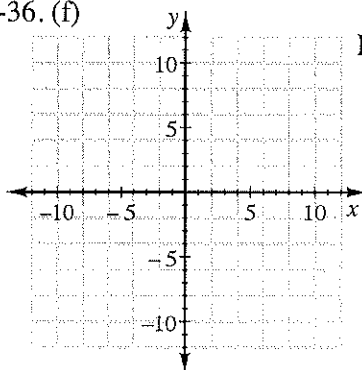
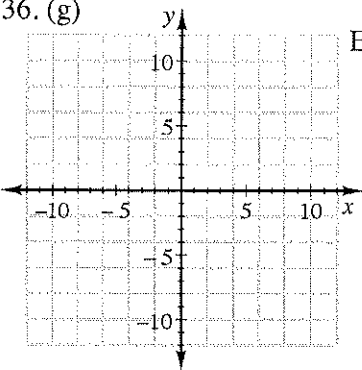Equation:

2-36. (d)

Equation:

2-36. (e)

Equation:

2-36. (f)
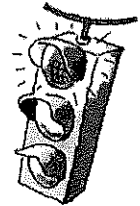
Equation:

2-36. (g)

Equation:

2-37.   CALCULATING THE SLOPE OF A LINE WITHOUT GRAPHING

While determining the slope of a line
that goes through the points $(6, 5)$ and
$(3, 7)$, Gloria figured that $\Delta y = -2$ and
$\Delta x = 3$ without graphing.

a.   Explain how Gloria could figure out
      the horizontal and vertical distances
      of the slope triangle without graphing.
      Draw a sketch of the line and validate
      her method.
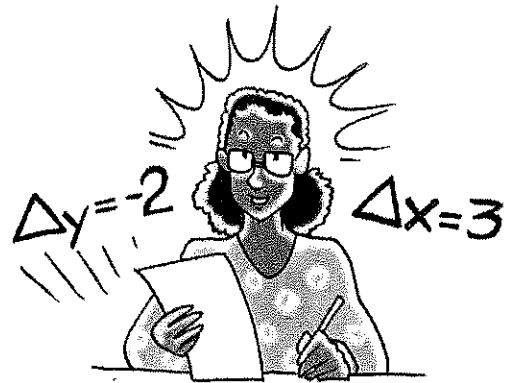
b.   What is the slope of the line?

c.   Use Gloria's method (without graphing) to calculate the slope of the line that
      goes through the points $(4, 15)$ and $(2, 11)$.

d.   Use Gloria's method to calculate the slope of the line that goes through the
      points $(28, 86)$ and $(34, 83)$.

e.   Another student found the slope from part (d) to be 2. What
      error or errors did that student make?

2-38.   STEEPEST SLOPE?

What is the steepest line possible? What is its slope? Be ready to justify your
statements.

2-39.   LEARNING LOG

Consider the equation for a line, $y = mx + b$. What does the m
represent? What does the b represent? Now consider the four
representations of a linear function: situation (for example, a
tile pattern), table, equation, and graph. Where in each of
these representations would you look if you wanted to
determine the slope? The y-intercept? Title this Learning Log entry "$y = mx + b$",
and include today's date.