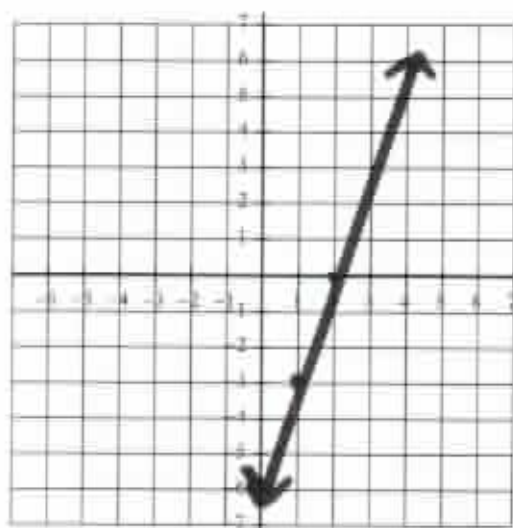


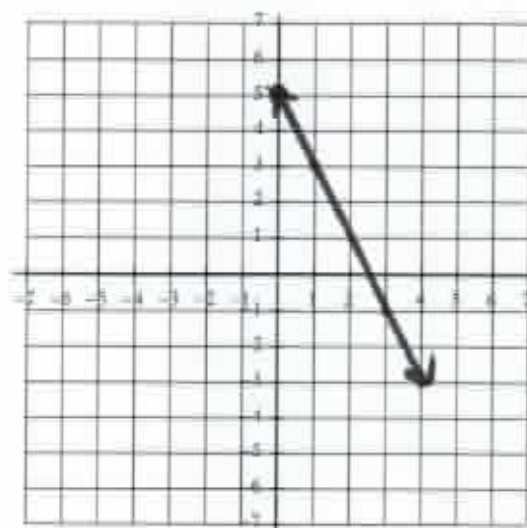
Linear Functions – Mathematical Modeling

Graph $f(x) = 3x - 6$ Slope $m = 3$



y-int
 $y = -6$

Graph $f(x) = 5 - 2x$ Slope $m = -2$



y-int
 $y = 5$

Example: A salesman earns $W(n) = 300 + 75n$, where n is the number of products sold, and $W(n)$ is the total weekly wage in dollars.

a) Identify the slope and y-intercept and explain their meaning in practical terms.

→ The salesman earns \$300 even if he sells zero products. So \$300 is his base salary (y-int)

→ He then earns \$75 extra for every product he sells (slope)

Example: Sam purchased a car that was worth \$15,800 in 2008. Three years later, the car is worth \$6800. Assuming that the car depreciates linearly, write the equation that models this relationship (hint: use $x = 0$ for 2008).

→ Sam bought the car for an initial price of \$15,800 (y-int)

→ The car is losing value at a rate of \$3000 per year (slope)
 $y = 15800 - 3000x$

Linear Functions – Mathematical Modeling

Key

1. Your salary was \$28,500 in 1994 and \$32,900 in 1996. If your salary follows a linear growth pattern, what will your salary be in 2012?

$$y = 2200x + 28500$$

- a. What is the slope of this model? What does it represent?

Your salary is increasing \$2200 per year

2. A small college had 2546 students in 2003 and 2702 in 2005. If the enrollment follows a linear growth pattern, how many students did the college have in 2009?

$$y = 78x + 2546$$

- a. What is the slope of this model? What does it represent?

College enrollment is increasing 78 students per year.

3. A small business purchases a piece of equipment for \$875. After 5 years the equipment will be outdated and have no value. Write a linear equation giving the value V of the equipment during the 5 years it will be used.

$$y = 875 - 175x$$

- a. What is the slope of this model? What does it represent?

Equipment loses its value \$175 per year

4. A small business purchases a piece of equipment for \$25,000. After 10 years the equipment will have to be replaced. Its value at that time is estimated to be \$2000. Write a linear equation giving the value V of the equipment during the 10 years it will be used.

$$y = 25000 - 2300x$$

- a. What is the slope of this model? What does it represent?

Equipment is losing its value \$2300 per year

5. A manufacturer pays its assembly line workers \$11.50 per hour. In addition, workers receive a piecework rate of \$0.75 per unit produced. Write a linear equation for the hourly wages W in terms of the number of units x produced per hour.

$$W = 11.50 + .75x$$

6. A real estate office handles an apartment complex with 50 units. When the rent per unit is \$580 per month, all 50 units are occupied. However, when the rent is \$625 per month, the average number of occupied units drops to 47. Assume the relationship between the monthly rent p and the demand D is linear.

(\$, units)
units depends on price

(Calculator)
LinReg

- a) Write a linear equation giving the demand D in terms of the rent p .

$$D = -1.066x + 88.66$$

- b) Use this equation to predict the number of units occupied if the rent is \$655. 45

- c) If the demand drops to 42 units, what is the corresponding rent? \$700

7. Three consecutive integers have a sum of 87. Find the three integers.

$$x + x + 1 + x + 2 = 87 \quad 3x + 3 = 87 \quad x = 28 \quad \boxed{28, 29, 30}$$

8. A rectangle has a length that is 5 units longer than the width. The perimeter is 58 units. Find the dimensions.

$$2x + 2x + 10 = 58$$

$$x = 12$$

$$\boxed{12 \times 17}$$