

## Lesson 3: Analyzing a Verbal Description

### Classwork

Read the example problems below and discuss a problem-solving strategy with a partner or small group.

#### Example 1

Gregory plans to purchase a video game player. He has \$500 in his savings account and plans to save \$20 per week from his allowance until he has enough money to buy the player. He needs to figure out how long it will take. What type of function should he use to model this problem? Justify your answer mathematically.

#### Example 2

One of the highlights in a car show event is a car driving up a ramp and flying over approximately five cars placed end-to-end. The ramp is 8 ft. at its highest point, and there is an upward speed of 88 ft/sec before it leaves the top of the ramp. What type of function can best model the height,  $h$ , in feet, of the car  $t$  seconds after leaving the end of the ramp? Justify your answer mathematically.

#### Example 3

Margie got \$1,000 from her grandmother to start her college fund. She is opening a new savings account and finds out that her bank offers a 2% annual interest rate, compounded monthly. What type of function would best represent the amount of money in Margie's account? Justify your answer mathematically.

**Exercises**

1. City workers recorded the number of squirrels in a park over a period of time. At the first count, there were 15 pairs of male and female squirrels (30 squirrels total). After 6 months, the city workers recorded a total of 60 squirrels, and after a year, there were 120.
  - a. What type of function can best model the population of squirrels recorded over a period of time, assuming the same growth rate and that no squirrel dies?
  
  
  
  
  
  
  
  
  
  
  - b. Write a function that represents the population of squirrels recorded over  $x$  number of years. Explain how you determined your function.
  
  
  
  
  
  
  
  
  
  
2. A rectangular photograph measuring 8 in. by 10 in. is surrounded by a frame with a uniform width,  $x$ .
  - a. What type of function can best represent the area of the picture and the frame in terms of  $x$  (the unknown frame's width)? Explain mathematically how you know.
  
  
  
  
  
  
  
  
  
  
  - b. Write an equation in standard form representing the area of the picture and the frame. Explain how you arrive at your equation.

3. A ball is tossed up in the air at an initial rate of 50 ft/sec from 5 ft. off the ground.
- What type of function models the height ( $h$ , in feet) of the ball after  $t$  seconds?
  - Explain what is happening to the height of the ball as it travels over a period of time (in  $t$  seconds).
  - What function models the height,  $h$  (in feet), of the ball over a period of time (in  $t$  seconds)?
4. A population of insects is known to triple in size every month. At the beginning of a scientific research project, there were 200 insects.
- What type of function models the population of the insects after  $t$  years?
  - Write a function that models the population growth of the insects after  $t$  years.

**Lesson Summary**

The following methods can be used to recognize a function type from a word problem:

1. If a problem requires repeated addition or subtraction of a constant value, then it is represented by a linear function.
2. If a problem involves free-falling motion of an object or an area, then it is represented by a quadratic function.
3. If a problem is about population growth or compound interest, then it is represented by an exponential function.

**Problem Set**

1. The costs to purchase school spirit posters are as follows: two posters for \$5, four posters for \$9, six posters for \$13, eight posters for \$17, and so on.
  - a. What type of function would best represent the cost of the total number of posters purchased?
  - b. What function represents the cost of the total number of posters purchased? How did you know? Justify your reasoning.
  - c. If you have \$40 to spend, write an inequality to find the maximum number of posters you could buy.
2. NYC Sports Gym had 425 members in 2011. Based on statistics, the total number of memberships increases by 2% annually.
  - a. What type of function models the total number of memberships in this situation?
  - b. If the trend continues, what function represents the total number of memberships in  $n$  years? How did you know? Justify your reasoning.
3. Derek hits a baseball thrown by the pitcher with an initial upward speed of 60 ft/sec from a height of 3 ft.
  - a. What type of function models the height of the baseball versus time since it was hit?
  - b. What is the function that models the height,  $h$  (in feet), the baseball travels over a period of time in  $t$  seconds? How did you know? Justify your reasoning.