In-Class Activity 1.A Talking About Quantities

You are playing with a tennis ball in your backyard. You hit the ball straight up in the air and watch it until it falls to the ground. As you watch the ball rise and then fall, you think about some of the quantities associated with this situation and how these quantities are changing.

Credit: iStockphoto/Lorado

1) List three or four quantities that are related to this scenario. What units might be used to measure each of these quantities?

Objectives for the activity

You will understand that:

☐ The English language may not be the most effective way to describe quantities and how they change

You will be able to:

☐ Use function notation to make precise statements about quantities.

It is possible to use physics and calculus to show that if a tennis ball is thrown straight up with a certain speed, then its height above the ground (measured in meters) after t seconds is given by the following equation:

$$h = -4.9t^2 + 20t$$

2) The following phrases describe quantities associated with this scenario. These phrases are written using words. How can these phrases be written mathematically?

   Phrase A: The height of the ball 1 second after being thrown

   Phrase B: The height of the ball 2 seconds after being thrown

   Phrase C: The height of the ball t seconds after being thrown

   Phrase D: The change in the height of the ball between 1 and 2 seconds

   Phrase E: The change in the height of the ball between 1.5 and 2.5 seconds

   Phrase F: The change in the height of the ball between t_1 and t_2 seconds

Interpreting some of the phrases in mathematics from Question 2 may have been difficult, and the result may not convey all of the information that was intended. In science and mathematics, special notation called **function notation** has been used to help translate words into mathematics. The same relationship between height and time in the equation introduced in the scenario could be stated as follows using function notation:

$$h(t) = -4.9t^2 + 20t$$

3) What similarities and differences do you notice between the two equations?

4) Your instructor will help you understand and interpret this new notation.

   Part A: If one were reading the equation from Question 3 aloud, how would you read "$h(t)$"?

   Part B: Explain in words what "$h(5)$" represents.

   Part C: Explain in words what "$h(t)$" represents.

5) Use function to rewrite all of the phrases in Question 2.