Lesson 1: The Concept of a Function

Classwork

**Example 1**

Suppose a moving object travels feet in seconds. Assume that the object travels at a constant speed; that is, the motion of the object is linear with a constant rate of change. Write a linear equation in two variables to represent the situation, and use it to make predictions about the distance traveled over various intervals of time.

|  |  |
| --- | --- |
| Number of seconds () | Distance traveled in feet () |
|  |  |
|  |  |
|  |  |
|  |  |

Example 2

The object, a stone, is dropped from a height of feet. It takes exactly seconds for the stone to hit the ground. How far does the stone drop in the first seconds? What about the last seconds? Can we assume constant speed in this situation? That is, can this situation be expressed using a linear equation?

|  |  |
| --- | --- |
| Number of seconds () | Distance traveled in feet () |
|  |  |
|  |  |
|  |  |
|  |  |

Exercises 1–6

Use the table to answer Exercises 1–5.

|  |  |
| --- | --- |
| Number of seconds () | Distance traveled in feet () |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |

1. Name two predictions you can make from this table.
2. Name a prediction that would require more information.
3. What is the average speed of the object between and seconds? How does this compare to the average speed calculated over the same interval in Example 1?
4. Take a closer look at the data for the falling stone by answering the questions below.
   1. How many feet did the stone drop between and second?
   2. How many feet did the stone drop between and seconds?
   3. How many feet did the stone drop between and seconds?
   4. How many feet did the stone drop between and seconds?
   5. Compare the distances the stone dropped from one time interval to the next. What do you notice?
5. What is the average speed of the stone in each interval second? For example, the average speed over the interval from seconds to seconds is

Repeat this process for every half-second interval. Then answer the question that follows.

|  |  |
| --- | --- |
| * 1. Interval between and second: | * 1. Interval between and second: |
| * 1. Interval between and seconds: | * 1. Interval between and seconds: |
| * 1. Interval between and seconds: | * 1. Interval between and seconds: |
| * 1. Interval between and seconds: |  |

* 1. Compare the average speed between each time interval. What do you notice?

1. Is there any pattern to the data of the falling stone? Record your thoughts below.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Time of interval in seconds  () |  |  |  |  |
| Distance stone fell in feet  () |  |  |  |  |

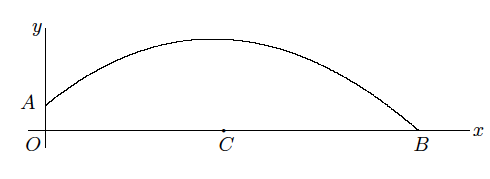
Problem Set

Lesson Summary

Functions are used to make predictions about real-life situations. For example, a function allows you to predict the distance an object has traveled for *any* given time interval.

Constant rate cannot always be assumed. If not stated clearly, you can look at various intervals and inspect the average speed. When the average speed is the same over all time intervals, then you have constant rate. When the average speed is different, you do not have a constant rate.

1. A ball is thrown across the field from point to point It hits the ground at point The path of the ball is shown in the diagram below. The -axis shows the distance the ball travels, and the -axis shows the height of the ball. Use the diagram to complete parts (a)–(g).



* 1. Suppose is approximately feet above ground and that at time the ball is at point Suppose the length of is approximately feet. Include this information on the diagram.
  2. Suppose that after second, the ball is at its highest point of feet (above point and has traveled a distance of feet. Approximate the coordinates of the ball at the following values of ,, , , , , , and
  3. Use your answer from part (b) to write two predictions.
  4. What is the meaning of the point ?
  5. Why do you think the ball is at point when ? In other words, why isn’t the height of the ball ?
  6. Does the graph allow us to make predictions about the height of the ball at all points?

1. In your own words, explain the purpose of a function and why it is needed.