Unit 6 Lesson 6: Building Quadratic Functions to Describe Situations (Part 2)

1 Sky Bound

Student Task Statement

A cannon is 10 feet off the ground. It launches a cannonball straight up with a velocity of 406 feet per second.

Imagine that there is no gravity and that the cannonball continues to travel upward with the same velocity.

1. Complete the table with the heights of the cannonball at different times.

seconds	0	1	2	3	4	5	t
distance above ground (feet)	10						

2. Write an equation to model the distance in feet, d, of the ball t seconds after it was fired from the cannon if there was no gravity.

2 Tracking a Cannonball

Student Task Statement

Earlier, you completed a table that represents the height of a cannonball, in feet, as a function of time, in seconds, if there was no gravity.

1. This table shows the actual heights of the ball at different times.

seconds	0	1	2	3	4	5
distance above ground (feet)	10	400	758	1,084	1,378	1,640

Compare the values in this table with those in the table you completed earlier. Make at least 2 observations.

2. a. Plot the two sets of data you have on the same coordinate plane.
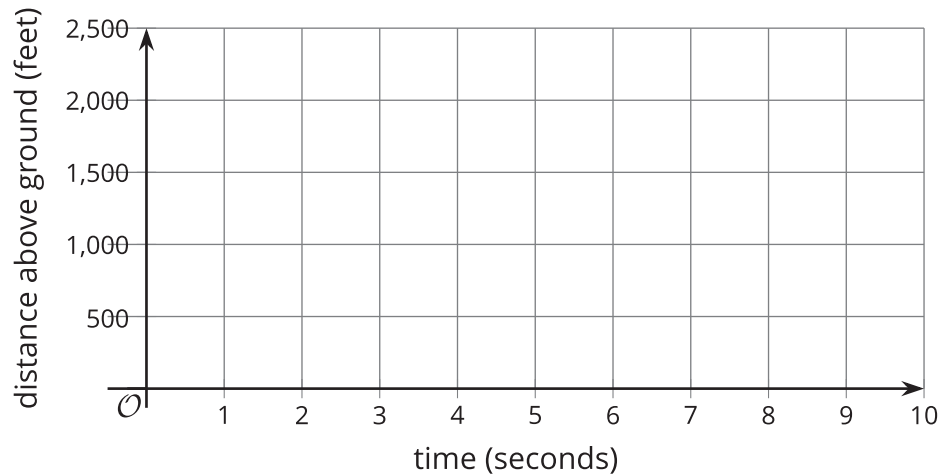
b. How are the two graphs alike? How are they different?

3. Write an equation to model the actual distance d, in feet, of the ball t seconds after it was fired from the cannon. If you get stuck, consider the differences in distances and the effects of gravity from a previous lesson.

3 Graphing Another Cannonball

Student Task Statement

The function defined by $d = 50 + 312t - 16t^2$ gives the height in feet of a cannonball t seconds after the ball leaves the cannon.

1. What do the terms 50, $312t$, and $-16t^2$ tell us about the cannonball?

2. Use graphing technology to graph the function. Adjust the graphing window to the following boundaries: $0 < x < 25$ and $0 < y < 2{,}000$.

3. Observe the graph and:

   a. Describe the shape of the graph. What does it tell us about the movement of the cannonball?

   b. Estimate the maximum height the ball reaches. When does this happen?

   c. Estimate when the ball hits the ground.

4. What domain is appropriate for this function? Explain your reasoning.