

Name \_\_\_\_\_ Date \_\_\_\_\_

## Controlling the Population

### Adding and Subtracting Polynomials

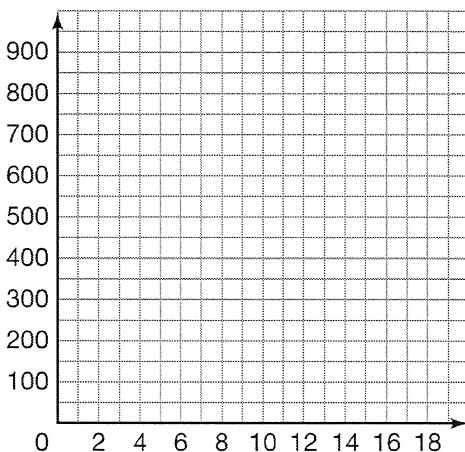
Ramona and James build a model rocket and two rocket launchers. Ramona's rocket launcher can launch the rocket with an initial velocity of 200 feet per second. James's rocket launcher can launch the rocket with an initial velocity of 192 feet per second. They launch the rocket using Ramona's launcher and on its way back down it lands on the roof of a building that is 320 feet tall. The height of the rocket can be represented by the equation  $H_1(x) = -16x^2 + 200x$ , where  $x$  represents the time in seconds and  $H_1(x)$  represents the height.

Ramona and James take the stairs to the roof of the building and re-launch the rocket using James's rocket launcher. The rocket lands back on the ground. The height of the rocket after this launch can be represented by the equation  $H_2(x) = -16x^2 + 192x + 320$ .

In both functions,  $-16$  represents the gravitational pull on the rocket in feet per second squared.

1. Compare and contrast the polynomial functions.

2. Analyze both functions.
  - a. Graph the functions.



- b. Does it make sense in terms of the problem situation to graph the functions outside of Quadrant I? Explain your reasoning.
- c. Explain why the graphs of these functions do not intersect.
3. Ramona believes that she can add the 2 functions to determine the total height of the rocket at any given time.
- a. Write a function  $S(x)$  that represents the sum of  $H_1(x)$  and  $H_2(x)$ . Show your work.
- b. Is Ramona correct? Explain your reasoning.
4. Subtract  $H_1(x)$  from  $H_2(x)$  and write a new function,  $D(x)$ , that represents the difference. Then, explain what this function means in terms of the problem situation.