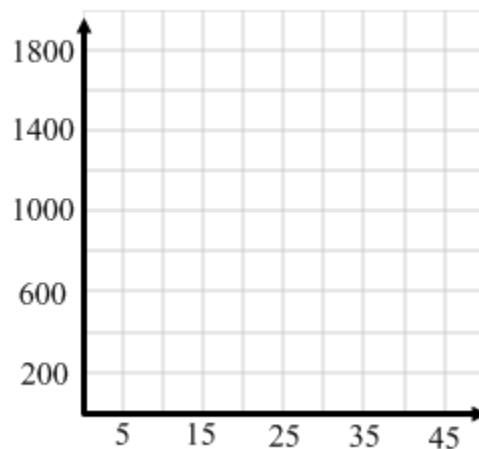


Name: \_\_\_\_\_ Group Name: \_\_\_\_\_

### 1. Rocket Power

The formula  $h = 200t - 5t^2$  approximates the height ( $h$ ) of a rocket, in meters, after  $t$  seconds.

- How long does the rocket remain in the air?
- What is the maximum height of the rocket? How long will it take the rocket to reach its maximum height?
- When during its flight will the rocket reach 1,500 meters?
- Use the information you just obtained to sketch the path of the rocket. (Label the points that you know)



### 2. Football (A mighty kick)

A football is kicked into the air. The formula  $h = 25t - 5t^2$  approximates the height ( $h$ ) in meters of the football above the ground after  $t$  seconds.

- What is the height of the football after 2 seconds?
- When will the football be 20 meters above ground?
- When will the ball hit the ground?

### 3. Circles

The radius of a circle is 15 cm. By how much must the radius be decreased in order to reduce the original area by  $104\pi$  cm<sup>2</sup>?

### 4. Rugs

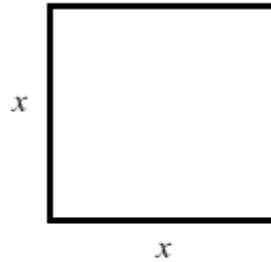
Find the dimensions of a rug that covers 60% of the floor of a room 16 ft by 20 ft and is equidistant from the walls.

**5. Signal Flare** A signal flare is fired into the air from a boat with an initial vertical velocity of 160 feet per second.

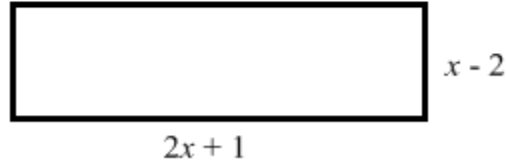
- a. Write an equation to model the height of the flare.
- b. How long will it take the flare to reach its maximum height?
- c. How high will the flare travel?
- d. When will the flare hit the water?

6. **Area** The following polygons have the same area.

a) Write an equation showing that the square and the rectangle have the same area.



b) How many solutions will the equation have?



c) Do all solutions make sense in this situation?

7. **REVENUE** Students are selling packages of flower bulbs to raise money for a class trip. Last year, when students charged \$5 per package, they sold 150 packages. The students want to increase the cost per package. They estimate they will lose 10 sales for each \$1 increase in the cost per package. The sales revenue  $R$ , (in dollars) generated by selling the packages is given by the function

$$R = (5 + n)(150 - 10n)$$

where  $n$  is the number of \$1 increases.

a. Write the function in standard form.

b. Find the maximum value of the function. What does this represent?

c. At what price should the packages be sold to generate the most sales revenue?

d. Does it make sense for the students to increase the price of the packages at all? Why or why not?

**8. SPIDERS** Fishing spiders can propel themselves across water and leap vertically from the surface of the water. During a vertical jump, the height of the body of the spider can be modeled by the function  $y = -4500x^2 + 820x + 43$  where  $x$  is the duration (in seconds) of the jump and  $y$  is the height (in millimeters) of the spider above the surface of the water. After how many seconds does the spider's body reach its maximum height? What is the maximum height?

**9. SOCCER** The height  $y$  (in feet) of a soccer ball after it is kicked can be modeled by the graph of the equation  $y = -0.04x^2 + 1.2x$  where  $x$  is the horizontal distance (in feet) that the ball travels. The ball is not touched and it lands on the ground. Find the distance the ball was kicked. (Check your answer by using a graphing calculator)

**10. DIVING** During a cliff diving competition, a diver begins a dive from 70 feet above the water. The initial vertical velocity of his dive is 8 feet per second.

a) Write an equation that models the height  $h$  (in feet) of the diver as a function of time  $t$  (in seconds).

b) How long does it take the diver to reach the water?

**11. BASKETBALL** A basketball player throws a ball towards a hoop from a height of 6 feet and with an initial vertical velocity of 50 feet per second.

- a) Write a function that models the height  $h$  (in feet) of the ball  $t$  seconds after it is thrown.
  
  
  
  
  
  
  
  
  
  
- b) If the player misses the hoop completely and the ball lands on the ground, how long was the ball in the air?
  
  
  
  
  
  
  
  
  
  
- c) If an opposing player catches the ball at a height of 5 feet, how long was the ball in the air?
  
  
  
  
  
  
  
  
  
  
- d) Can this player score? Explain how you know.

**12. WINDOW** An artist designs a window in a house to be in the shape of a parabola as shown. The top part of the window can be modeled by the function  $y = -1.875x^2 + 7.5x$  and the bottom part of the window can be modeled by the function  $y = 1.5$  where  $x$  represents the width of the window (in feet) and  $y$  represents the height of the window (in feet) above the ground. How tall is the window?

