

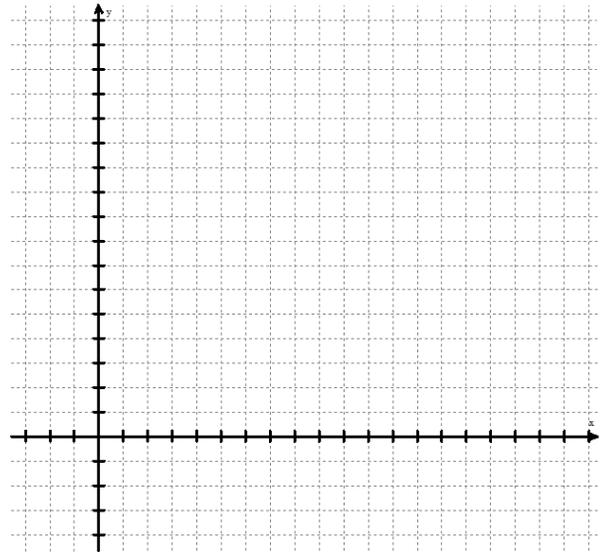
Math 2 Unit 10 Worksheet 3
Modeling with Quadratics

Name: _____
Date: _____ **Per:** _____

1. A golfer hits a ball from the fairway to the green. The flight of the ball is modeled by the equation $g(x) = -16(x - 2)^2 + 64$, where x is the time in seconds since the ball was hit and $g(x)$ is the height of the ball in feet.

[a-e] Preparing to sketch.

- a) Add labels to the axes including: variable, description in words, and units.
- b) Focus on the equation used to model the balls flight. What will the graph look like? Be as specific as possible.



- c) Scale each axis so all the important features of the graph will show. Graph the parabola.

- d) Why does it make sense that this graph is only in the first quadrant?

- e) Use your graph to identify the domain and range that make sense for this problem.

Domain: _____

Range: _____

[f-h] Answer the following questions based on the flight of the ball.

- f) What is the maximum height of the ball?
- g) How do you know?

- h) How high is the ball after 3 seconds?

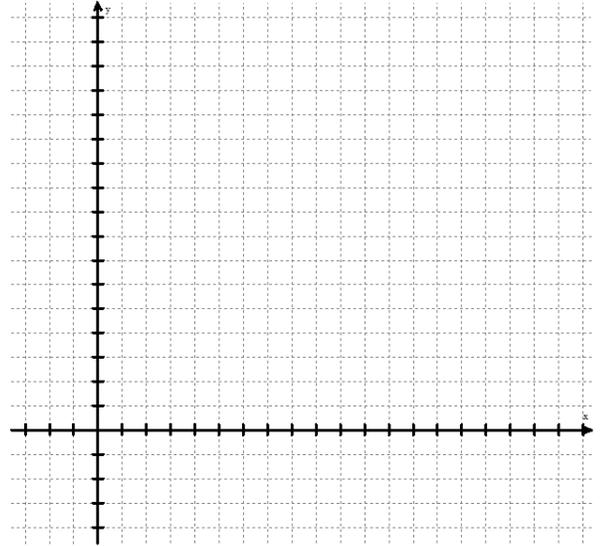
[i-j] Challenge.

- i) How long is the ball in the air?
- j) How do you know?

2. A peach tree produces 275 peaches per tree when 25 trees are planted per acre. For each additional tree planted per acre, the number of peaches a tree produces decreases by 5 peaches. This function is represented by $p(x) = -5(x - 40)^2 + 8000$, where x represents the number of trees per acre and $p(x)$ represents the total number of peaches per acre.

[a-e] Preparing to sketch.

- Add labels to the axes including: variable, description in words, and units.
- Focus on the equation used to model the total number of peaches. What will the graph look like? Be as specific as possible.



- Scale each axis so all the important features of the graph will show. Graph the parabola.

- Why does it make sense that this graph is only in the first quadrant?

- Use your graph to identify the domain and range that make sense for this problem.

Domain: _____

Range: _____

[f-g] Answer the following questions based on the situation and the equation.

- How many peaches do you expect if zero trees are planted?
- What does the function predict when the number of trees per acre (x) is zero? Show algebraic to support your answer.

[h-j] Answer questions about the total number of peaches per acre.

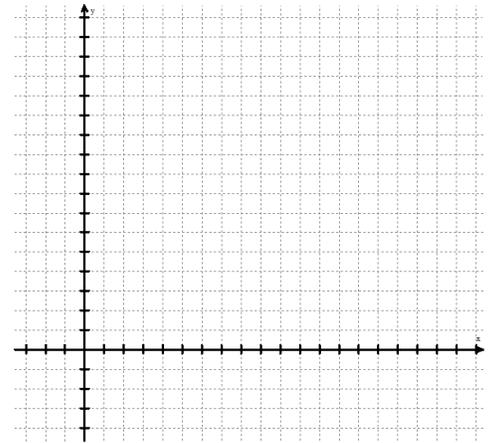
- How many peaches per acre can be expected if 30 trees are planted per acre? Justify your answer algebraically and using a complete sentence.
- How many trees should be planted per acre to maximize the number of peaches?
- What is the expected maximum number of peaches per acre?

3. A stomp rocket is shot vertically upward with an initial speed of 64 ft/sec. Its height, measured in feet, after t seconds is given by: $h(t) = -16(t - 3)^2 + 144$

a) Draw a sketch, including well labeled, appropriately scaled axes.

b) How high does the rocket go?

c) How high is the rocket at 4 seconds? (show work)



4. The Sunshine Manufacturing Company produces 10 solar water heaters per day. If they were to increase their production, income from sales would increase, but so would their expenses. If they were to decrease their production, both their income and their expenses would also decrease. Since they want to maximize their profit, they asked a business analyst to determine a profit function. The analyst estimated that the profit ' y ' from producing ' x ' units per day is given by $y = -(x - 14)^2 + 64$. How many units should they produce to maximize profits? Justify your answer using complete sentences.

5. The yearly profit function $P(x)$ for a company selling x items is given by $P(x) = -3(x - 16)^2 + 400$, where $P(x)$ is in thousands of dollars. What is the maximum profit that this company can expect in one year? Justify your answer using complete sentences.

6. The profit, $P(x)$, made selling phones at price, x , can be modeled by $P(x) = -\frac{1}{5}(x - 400)^2 + 18000$

a) What price will maximize the company's revenue?

b) What is the maximum revenue?

c) What profit could the company expect if they changed the price to \$500 dollars per phone? Why do you think their profit is decreasing at this price?

d) What profit does the function predict if the price is \$800 per phone? Explain what this means in the situation using complete sentences.