Algebra 1 Support      Unit 5: Graphs and Characteristics of Quadratic Functions      Practice
Day 9 – Applications of the Vertex
Practice Assignment

Name: _____
Date: _____ Block: _____

**Review – Find the vertex of the following equation:** $y = 2x^2 - 4x + 5$.

$$X = \frac{-b}{2a} = \frac{4}{2(2)} = \frac{4}{4} = 1$$

Vertex $(1, 3)$

$$y = 2(1)^2 - 4(1) + 5$$
$$y = 3$$

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*Directions:* Answer the following questions that pertain to using applications of the vertex.

1. The valley between two mountains whose peaks touch the x-axis is $y = 40.4x^2 - 404x$, where x and y are measured in feet. How <u>deep</u> is the valley?

minimum

$$X = \frac{-b}{2a} = \frac{404}{2(40.4)} = \frac{404}{80.8} = 5$$

$$y = 40.4(5)^2 - 404(5)$$
$$y = -1010$$

Vertex $(5, -1010)$

The valley is 1,010 feet deep.

2. A model rocket is launched straight upward. The path of the rocket is modeled by $h = -16t^2 + 200t$, where h represents the height of the rocket and t represents the time in seconds.

a. What is its <u>maximum</u> height?

$$t = \frac{-b}{2a} = \frac{-200}{2(-16)} = \frac{-200}{-32} = 6.25 \text{ seconds}$$

$$h = -16(6.25)^2 + 200(6.25)$$
$$= 625 \text{ ft}$$

The maximum height is 625 feet.

b. Is it still in the air after 8 seconds?

$$h = -16(8)^2 + 200(8)$$
$$h = 576 \text{ ft}$$

yes it is still in the air after 8 seconds.

c. Is it still in the air after 14 seconds? Explain why or why not.

$$h = -16(14)^2 + 200(14)$$
$$h = -336$$

no it is not in the air after 14 seconds because the height is negative.

3. A model for a company's revenue is R = -15p² + 300p + 12,000, where p is the price in dollars of the company's product. What price will maximize revenue? What will be the maximum revenue?

$$p = \frac{-b}{2a} = \frac{-300}{2(-15)} = \frac{-300}{-30} = \$10$$

$$R = -15(10)^2 + 300(10) + 12,000$$

$$= \$13,500$$

The price of $10 will maximize the revenue to $13,500.

4. The photo shows the Verranzo-Narrows Bridge in New York, which has the longest span of any suspension bridge in the United States. A suspension of cable of the bridge forms a curve that resembles a parabola. The curve can be modeled with the function y = 0.0001432(x – 2130)², where x and y are measured in feet. The origin of the function's graph is at the base of one of the two towers that support the cable.
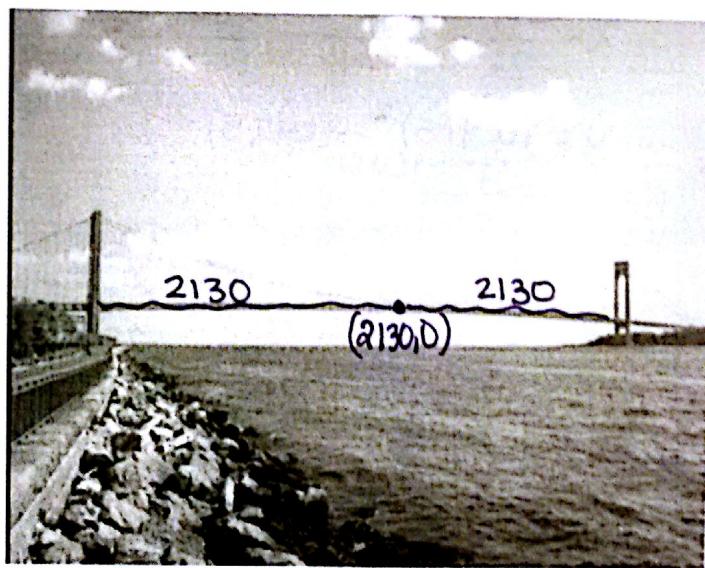
a. What is the vertex of the bridge between two towers?

(2,130, 0)

b. How far apart are the towers?

2130 ft + 2130 ft

4,260 ft

4. A sports store sells about 50 mountain bikes per month at a price of $220 each. For each $20 decrease in price, about 10 more bikes per month are sold. Complete the table below

| Price | Bikes | Revenue |
|-------|-------|---------|
| 220 | 50 | 11,000 |
| 200 | 60 | 12,000 |
| 180 | 70 | 12,600 |
| 160 | 80 | 12,800 |
| 140 | 90 | 12,600 |
| 120 | 100 | 12,000 |
| 100 | 110 | 11,000 |

a. How many prices changes does it take to make a maximum amount of revenue?

3 price changes

b. At what price and how many bikes need to be sold to maximize their revenue?

If they sell bikes for $160, they will sell 80 bikes, which will bring in a max revenue of $12,800.