

Chapter 7: Quadratics

Name: _____

Notes 7.8 Quadratic Modeling

Set up a quadratic equation to model the scenario and use ANY method to solve:

- Vertex Form to find max/min or symmetry
- Factoring to find zeros/solutions
- Quadratic Formula to find zeros/solutions
- Graphing calculator to find max/min, zeros(solutions), or intersections (in decimal form).

Example #1: A store rents an average of 750 video games each month at the current rate of \$4.50. The owners of the store want to raise the rental rate to increase the revenue to \$6000 per month. However, for every \$1 increase, they know that they will rent 30 fewer games each month because some people won't be willing to pay higher prices. What rate should they set for video game rentals?

a) Make a table and try a few examples:

b) Write a quadratic equation to model the problem

c) Graph the quadratic:



d) What is the maximum revenue that the store could make?

Example #2: Determine three consecutive integers, if the square of the largest integer is 33 less than the sum of the squares of the two smaller integers.

Example #3: Synchronized divers perform matching dives from opposite sides of a platform that is 10m high. If two divers reached their maximum height of 0.6m above the platform after 0.35s, how long did it take them to reach the water?

Example #4: At noon, a sailboat leaves a harbor on Vancouver Island and travels due west at 10 km/h. Three hours later, another sailboat leaves the same harbor and travels due south at 15 km/h. At what time, to the nearest minute, will the sailboat be 40 km apart?

Example #5: Ian has been hired to lay a path of uniform width around a rectangular play area that is 18m by 24m, using crushed rock. He has enough crushed rock to cover 145 m^2 . Ian wants to know how wide to make the path so that he uses up all the crushed rock, but also doesn't run out before finishing.

Assignment

1) A student council is holding a raffle to raise money for a charity fund drive. The profit function for the raffle is: $p(c) = -25c^2 + 500c - 350$ where $p(c)$ is the profit and c is the price of each ticket, both in dollars.



a) What ticket price will result in the student council breaking even on the raffle?

b) What ticket price will raise the most money for the school's donation to charity?

2) Akpatok Island in Nunavut is surrounded by steep cliffs along the coast. Suppose that someone accidentally dislodged a stone from a 125m cliff. The height of the stone, $h(t)$, in metres, after t seconds, can be represented by the following function: $h(t) = -4.9t^2 + 4t + 125$. How long would it take the stone to reach the water?



3) The sum of two numbers is 11. Their product is -152. What are the numbers?

4) A doughnut store sells doughnuts with jam centres. The baker wants the area of the jam to be about equal to the area of the cake part of the doughnut, as seen from the top. The outer radius of a whole doughnut is 6 cm. Determine the radius of the jam centre.

5) Duncan dives with a junior swim club. In a dive off a 7.5 m platform, he reaches a maximum height of 7.94 m after 0.30 s. How long does it take him to reach the water?

6) A jet skier leaves a dock at 8 am. And travels due west at 35 km/h. A second jet skier leaves the same dock 10 min later and travels due south at 44 km/h. At what time of day, to the nearest minute, will the two jet skis be 30 km apart?

7) Two consecutive integers are squared. The sum of these squares is 365. What are the integers?

8) A landscaper is designing a rectangular garden, with will be 5.00 m wide by 6.25 m long. She has enough crushed rock to cover an area of $6.0 m^2$ and wants to make a uniform border around the garden. How wide should the border be, if she wants to use all the crushed rock?

a) Draw a picture, and label the variables.

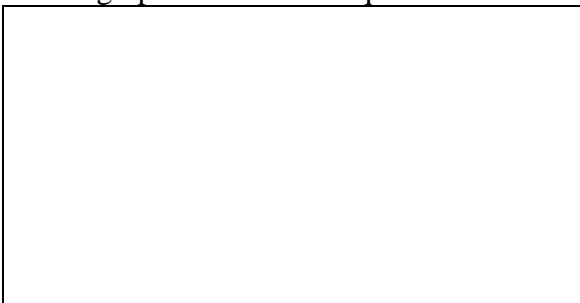
b) Create a quadratic equation to model the situation

c) Use the quadratic formula to solve the quadratic

d) Check your answer by looking at the graph

9) Alexis sells chocolate mousse tortes for \$25. At this price, she can sell 200 tortes every week. She wants to increase her earnings, but, from her research, she knows that she will sell fewer 5 tortes per week for each price increase of \$1. a) Create a quadratic equation to model the situation

Use a graph to answer the questions



b) What higher price would let Alexis earn the same amount of money she earns now?

c) What should Alexis charge for her tortes if she wants for earn the maximum amount of money?

Answer Key

- 1) a) \$0.73 b) \$19.27
- 2) 5.5 s
- 3) -8,19
- 4) 4.24 cm
- 5) 1.57 s
- 6) 8:27 am
- 7) -14 and -13 or 13 and 14
- 8) 0.25 m
- 9) a) $E(x) = -5x^2 + 75x + 5000$ b) \$40 c) \$32.50