Name:_____ Date:_____

Pre Calculus 11 Lesson 7 Solving Max and Minimum Problems:

1. When solving the equation $9 = x^2$, how many solutions will there be? Explain:

2. When Solving the equation $12 = (x-3)^2$, how many solutions will there be? What are they?

3. Suppose we are solving an equation in the form of $ax^2 + bx + c = 0$, what are we looking for on a graph when solving for "x"?

4. In contrast, what are we looking for when solving a different equation like: $ax^2 + bx + c = 10$?

5. Suppose we are solving for the "x-intercepts" and there is only one answer. What does this mean?

6. A rocket is shot into the sky and the height of the rocket is given by the equation: $h(t) = -5t^2 + 12t + 10$ where "t" is the number of seconds after the rocket was launched.
   a. What is the height when the rocket hits the ground?

   b. At what time does the rocket hit the ground?

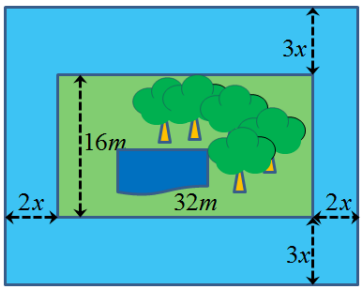
      When does the rocket reach it's maximum height?

   c. What is the maximum height that the rocket reaches?

   d. After how many seconds will the rocket be at a height of 30meters?

7. On desmos, the formula for a perfect basketball shot is given by the formula: $h(x) = -0.05x^2 + 1.2x + 5.6$, where "h" is the height of the ball and "x" is the distance from the shooter. How far is the ball from the shooter when the height of the ball is 11feet high?
https://www.desmos.com/calculator/djikpphgde

8. A rectangular playground (16m by 32m) has a walkway around it as shown below. If adding the walkway doubles the area of the playground, find the value of "x":



9. Jason bought a TV with a 75" diagonal at Costco. He knows that the width to height ratio is 16:9. Around the screen is an uniform border of 2" around. What is the width of the TV?

10. Two numbers have a difference of 10. Write an equation for the product. If their product is a minimum, determine the numbers for the lowest product possible.

11. The sum of two natural numbers is 12. Write an equation for the product. If their product is a maximum. determine the two numbers

12. The sum of an arithmetic series is given by the equation: $S = \frac{n}{2}\left(2 \times a + [n-1]d\right)$, where "n" is the number of terms, "a" is the first term, and "d" is the common difference. If the first term *"a"* is 10, common difference *"d"* is 4, and the sum *"S"* is 1144, find the number of terms *"n"* in the series.

13. A rectangular area is enclosed by a fence and separated into 2 rectangular regions as shown. With 800m of fencing, what is the maximum area that could be enclosed. Find the dimensions of the enclosed area.

14. Suppose the rectangular fence is to be separated into 3 rectangular regions as shown. Again, with 800m of fencing, find the maximum area that could be enclosed. Find the dimensions of the enclosed area.

15. A farmer wants to make a rectangular corral by using his barn wall as one of the sides of the corral. If the farmer has only 60m of fence, what length for the rectangular corral would maximize the area?

16. Challenge: This one is super hard. The parabola $y = f\left(x\right) = x^2 + bx + c$ has vertex "P" and the parabola $y = g\left(x\right) = -x^2 + dx + e$ has vertex "Q", where "P" and "Q" are distinct points. The two parabolas also intersect at "P" and "Q". Prove that $2\left(e - c\right) = bd$.