Math 10 Honours: Section 2.3 Problem Solving Involving Max and Mins

1. Two numbers have a difference of 10. Their product is a minimum. Determine the numbers

2. The sum of two natural numbers is 12. Their product is a maximum. Determine the numbers

3. The sum of two numbers is 60. Their product is a maximum. Determine the numbers.

4. Two numbers have a difference of 30. The sum of their squares is a minimum. Determine the numbers.

5. The sum of two numbers is 32. The sum of their squares is a minimum. Determine the numbers.

6. There is a number such that when you add it to twice its square the sum is minimized. What is this minimum sum?

7. A Broadway musical sells 400 tickets each day at $30 per ticket. For every increase of $3.00, they lose 20 sales. i) What should their ticket price be to yield the maximum revenue?

   ii) What is the maximum revenue? How much more money will they earn compared to their current ticket price?

8. A company that charters a boat for tours around Vancouver Island can sell 200 tickets at $50 each. For every $10 increase in the ticket price, 5 fewer tickets will be sold.
    a. Represent the number of tickets sold as a function of the selling price

    b. Represent the revenue as a function of the selling price

    c. What selling price will provide the maximum revenue? What is the maximum revenue?

    d. What range of price will provide a revenue greater than $20,000?

9. A company sells its bikes at $300 each and can sell 70 in a season. For every $25 increase in the price, the number sold drops by 10.
    a. Represent the sales revenue as a function of the price

    b. What price will yield the maximum revenue?

    c. What range of prices will give a sales revenue that exceed $18,000?

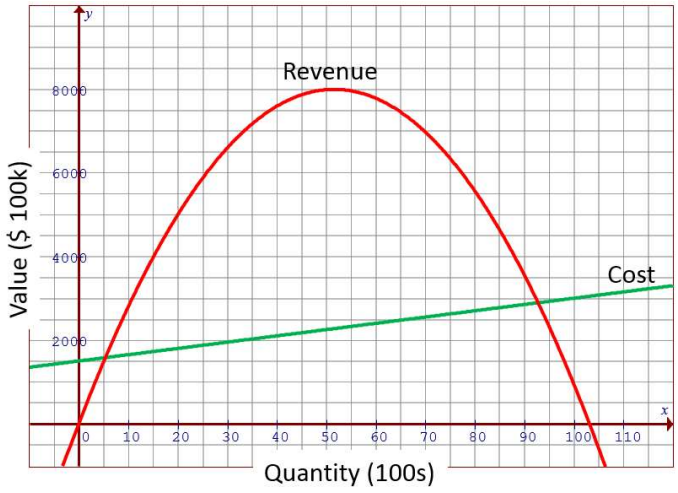
10. A musical show did a statistical research on the impact of its ticket sold by the ticket price. Through their research, they collected the following data. Using this data, determine what ticket price will yield the maximum revenue.

Ticket Price	tickets sold
$5.00	416.67
$6.00	400.00
$8.00	366.67
$10.00	333.33
$12.00	300.00
$17.00	216.67
$19.00	183.33

11. 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?

12. A 50 meter long wire is cut into two separate pieces. One piece is use to make a square and the other into a rectangle, with the length 3 times the width. If the sum of both area is a minimum, find the length of each piece of wire.

13. The following graph shows the revenue and cost for producing and selling a certain number of high end watches in a company. Profit is defined as: $\text{Profit} = \text{Revenue} - \text{Cost}$. Use the graph to answer the following questions: Cost $y = 15x + 1500$, Revenue: $y = -3(x - 51.5)^2 + 8000$



a) What are the solutions to this system? What do the solution represent?

b) What quantity will generate the maximum profit? Solve Algebraically

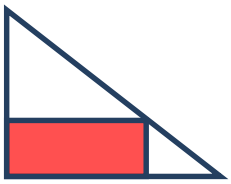
c) What would happen to the company financially if they produced over 100,000 watches?

14. 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.

15. 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.

16. Bob is going to start a small rectangular garden using his house as one side and his garage as another side. He has 60m of fencing and wants to enclose a maximum area of 450 square metres. How long will the longest side of his fence be?

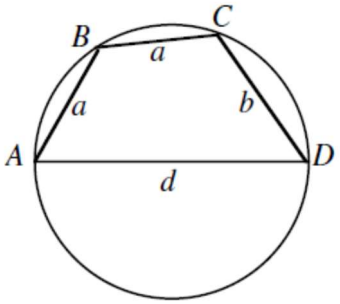
17. A right triangle, with a base of 200m and height of 300m encloses a rectangle as shown. Find the dimensions of the maximum rectangle? Extension: If the height of the triangle is "A" and the base is "B", find the dimensions of the maximum rectangle in terms of "A" and "B".



18. When $f(x) = ax^2 + bx + c$ has a minimum value of "zero", what conditions must be satisfied by $a, b, \text{ and } c$

19. Challenge: [euclid]ABCD is a cyclic quadrilateral with side $AD = d$, where "d" is the diameter of the circle. $AB = a$, $BC = a$, and $CD = b$. If "a", "b", and "d" are integers, where $a \neq b$,
    a) Prove that "d" can not be a prime number

    b) Determine the minimum value of "d"



20. Challenge: In the diagram, the area of ΔABC is 1. Trapezoid DEFG is constructed so that "G" is to the left of "F", DE is parallel to BC, EF is parallel to AB and DG is parallel to AC. Determine the maximum possible area of trapezoid DEFG. [Euclid]