## Steps for Solving Max/Min Problems:

1. **Identify the quantity to be maximized or minimized in a "Let..." statement which also introduces the other variable(s) used in the solution.**
2. **Write an equation for the quantity to be maximized or minimized.**
3. **The right side of the equation must contain only one variable. Use other information in the problem to reduce the number of variables if necessary.**
4. **Complete the square.**
5. **Create a max/min statement.**
6. **Answer the original question.**

1. Two numbers have a difference of 8. Determine the numbers if their product is a minimum.

2. The sum of two numbers is 60. Determine the numbers if their product is a maximum.

3. Two numbers have a difference of 20. Determine the numbers if the sum of their squares is a minimum.

4. The sum of a number and three times another number is 18. Determine the numbers if their product is a maximum.

5. Two numbers have a difference of 16. Determine the numbers if the result of adding their sum and their product is a minimum.

6. A rectangular lot is bordered on one side by a stream and on the other three sides by 600 metres of fencing. Determine the dimensions of the lot if its area is a maximum.

7. A lifeguard marks off a rectangular swimming area at a beach with 200 m of rope. What is the greatest area of water she can enclose if the rope only makes 3 sides of the rectangle? (No rope is needed along the shore side of the swimming area.)

8. A rectangular area is enclosed by a fence and divided into two parts by another section of fence which runs parallel to the short sides. If the 600 m of fence used encloses a maximum area, what are the dimensions of the enclosure?
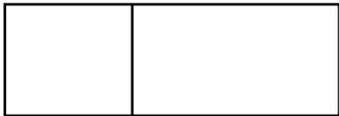
9. What is the maximum area of a triangle having 15 cm as the sum of its base and height?

10. Determine the number which exceeds its square by the greatest possible amount.

11. A straight section of railroad track crosses two highways 400 m and 600 m from an intersection.
    a) Let the x and y-axis represent the two roads. Write the equation of the rail track.
    b) If the dimensions of the field are a and b, what are the coordinates of the corner of the corner of the field which touches the railroad track?
    c) Determine the area of the largest rectangular lot that can be laid out in the triangle formed by the railroad and highways so that the sides of the lot are parallel to the roads.
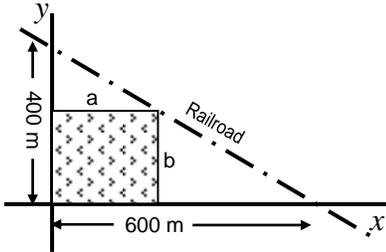
12. Determine the maximum possible area for a rectangle with perimeter 17.

13. A 30 cm piece of wire is cut in two. One piece is bent into the shape of a square, the other piece into the shape of a rectangle with a length-to-width ratio of 2:1. What are the lengths of the two pieces if the sum of the areas of the square and the rectangle is a minimum?

14. Determine the minimum distance from the origin (0,0) to the line $3x + 2y - 12 = 0$.

15. A right triangle has hypotenuse length 10. Show that the area of the triangle will be a maximum when the other two sides are equal in length to each other.

Answers:

1. $-4, 4$	2. $30, 30$	3. $-10, 10$	4. $3, 9$
5. $-9, 7$	6. $150\text{m}, 300\text{m}$	7. $5000\ \text{m}^2$	8. $100\text{m}, 150\text{m}$
9. $28\frac{1}{8}\ \text{cm}^2$	10. $\frac{1}{2}$	11a) $y = -\frac{2}{3}x + 400$	11c) $60000\ \text{m}^2$
12. $18\frac{1}{16}\ \text{m}^2$	13. $14\frac{2}{17}\ \text{cm}, 15\frac{15}{17}\ \text{cm}$	14. $\frac{12}{\sqrt{13}} = \frac{12\sqrt{13}}{13}$	15. A=25; $x = y = 5\sqrt{2}$