College Algebra **Applications of Functions**

Examples:

1. One leg of a right triangle is 6 cm longer than the other leg. Express the hyotenuse of the triangle in terms of the short leg.

2. Express the circumference C of a circle as a function of the area A of the circle.

3. The surface area of a cylinder is 100 square centimeters. Express the height H of the cylinder as a function of the radius R.

Note: Answer the next two examples on another sheet of paper.

4. Twenty-five feet of fence is to be put around a garden. The plans have one edge of the garden to be along the side of a house, with the fence enclosing the other three sides of a rectangle.

    a. Draw and label a figure that illustrates the problem. Assume that the width of the garden is the side perpendicular to the house, and the length of the garden is the side parallel to the house.

    b. If the width of the garden is 4 feet, what is the length of the garden? What is the area of the garden?

    c. If the width of the garden is 9 feet, what is the length of the garden? What is the area of the garden?

    d. If the width of the garden is x feet, write an algebraic representation for the length of the garden in terms of the width x. Write a function A(x) which represents the area of the garden as a function of the width x.

    e. Graph y = A(x) and find the dimensions (width and length) of the garden that will maximize the area of the garden. What is the maximum area?

    f. What should be the dimensions of the garden if it is decided that the area enclosed should be 60 square feet?

5. Given the parabola $y=9-x^2$.

    a. Find the distance between the point (0,3) and the point on the parabola when x=1.

    b. Find the distance between the point (0,3) and the point on the parabola when x=3.

    c. Write an algebraic representation D(x) for the distance between (0,3) and any point (x,y) on the parabola.

    d. Using the function D(x), graphically find the point(s) (x,y) on the parabola that would minimize the distance between (0,3) and the point(s).

Problems:

6. A rectangle has an area of 56 square feet. Determine the perimeter P as a function of the length L.

7. The volume of a cylindricl can is 100 cm^3. Express the radius R of the can as a function of the height H.

Note: Answer the following problems on another sheet of paper.

8. A rectangle has a perimeter of 200 in.

    a. If the width is 10 in, what would the length of the rectangle be? What would the area of the rectangle be?

    b. If the width is 30 in, what would the length of the rectangle be? What would the area of the rectangle be?

    c. If the width of the rectangle is x in, write an algebraic representation A(x) for the area of the rectangle.

    d. Using the function A(x), graphically find the dimensions of the rectangle that would maximize the area of the rectangle.

9. A farmer with 5,000 feet of fencing wants to enclose a rectangular field and then divide it into two plots by adding a fence in the middle parallel to one of the sides.

    a. Sketch a picture of the problem.

    b. What is the area of the field if the width (one of the sides parallel to the added fence) is 500 ft?

    c. What is the area of the field if the width is 1200 ft?

    d. If the width of the pasture is x ft, find an algebraic representation A(x) for the area of the field.

    e. Using the function A(x), graphically find the dimensions of the field that would maximize its area.

10. A rectangular storage container with an open top is to have a volume of 32 ft^3. The length of the base is twice the width. Material for the base costs $6 per square foot and material for the sides cost $4 per square foot.

    a. Sketch a picture of the problem.

    b. If the width of the base is 2 feet, what is the length of the base? What is the height of the container? What is the area of the base? What is the cost of the material to make the base? What is the area of one side of the conrtainer? What is the area of all 4 sides of the container? What is the cost of the material for the 4 sides? What is the cost of the material for the entire container?

    c. If the width of the base is x feet, write an algebraic representation for:

        i. the height of the container.

        ii. the area of the base.

        iii. the cost of the material to make the base.

        iv. the area of one side of the container.

        v. the area of 4 sides of the container.

        vi. the cost of the material for the 4 sides.

        vii. the function C(x), that determines the total cost of the material for the entire container.

    d. Using the function C(x), graphically find the dimensions of the container, and the cost of the materials for the cheapest such container.

11. Given the parabola $y=16-x^2$. A rectangle has its base on the x-axis and its other two vertices above the x-axis and lying on the parabola .

    a. Sketch a picture of the problem.

    b. Find the area of the rectangle if a vertex of the rectangle is on the parabola where x=3.

    c. Write an algebraic representation A(x) for the area of the rectangle if the vertex of the rectangle is at any point (x,y) in the first quadrant on the parabola.

    d. Using the function A(x), graphically find the vertex of the rectangle that would maximize the area of the rectangle.