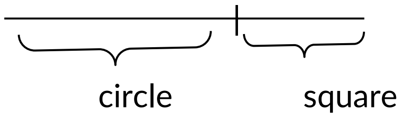
Name: ____________________________________

Optimization Problems

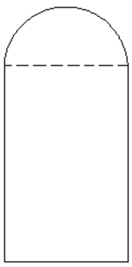
Exercise 1: A 216 m^2 rectangular pea patch is to be enclosed by a fence and divided into two equal parts by another fence parallel to one of the sides. What dimensions for the outer rectangle will require the smallest total length of fence? How much fence is needed?

Exercise 2: A piece of cardboard measures 12 cm by 12 cm. Equal squares are removed from each of the four corners so that the tabs can be folded to form an open rectangular box. Find the maximum volume and the value of x that maximizes the volume.

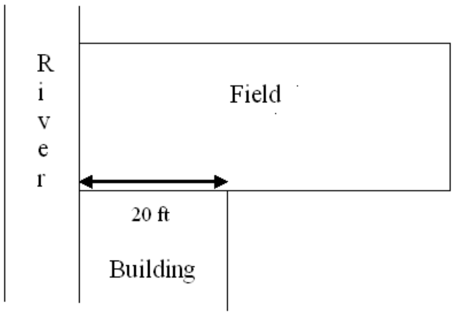
Exercise 3: A wire of length 12 inches can be bent into a circle, a square, or cut to make both a circle and a square. How much wire should be used for the circle if the total area enclosed by the figure(s) is to be a minimum? A maximum?



Exercise 4: A window consisting of a rectangle topped by a semicircle is to have an outer perimeter P. Find the radius of the semicircle if the area of the window is to be a maximum.



Exercise 5: A rectangular field as shown is to be bounded by a fence. Find the dimensions of the field with maximum area that can be enclosed with 1000 feet of fencing. you can assume that fencing is not needed along the river and building.



Exercise 6: A company manufactures cylindrical barrels to store nuclear waste. The top and bottom of the barrels are to be made with material that costs \$10 per square foot and the rest is made with material that costs \$8 per square foot. If each barrel is to hold 5 cubic feet, find the dimensions of the barrel that will minimize the total cost.

Exercise 7: The operating cost of a truck is $12+\frac{x}{6}$ cents per mile when the truck travels x miles per hour. If the driver earns \$6 per hour, what is the most economical speed to operate the truck on a 400 mile turnpike? Due to construction, the truck can only travel between 35 and 60 miles per hour.

Exercise 8: The speed of traffic through the Lincoln Tunnel depends on the density of the traffic. Let *S* be the speed in miles per hour and *D* be the density in vehicles per mile. The relationship between *S* and *D* is approximately $S=42-\frac{D}{3}$ for $D\leq 100$. Find the density that will maximize the hourly flow.