Name: _____   Date: _____

Section 6.5 Solve Problems With Given Constraints

1. Teegan is building a storage bin with a lid in the shape of a square-based prism to hold her gardening tools. She has 12 m^2 of plywood to make the bin.
   a) Find the dimensions of the bin with the greatest possible volume, to the nearest tenth of a metre.
   b) Find the volume of this bin, to the nearest tenth of a cubic metre.

2. Jade wants to make a cylindrical storage can using 600 cm^2 of aluminium.
   a) Find the dimensions of the cylinder with the greatest volume, to the nearest hundredth of a centimetre.
   b) Find the volume of this cylinder, to the nearest tenth of a cubic centimetre.

3. Marco makes a rectangular pizza that is 20 in. by 30 in. and a round pizza with radius 14 in.
   a) Find the area of each pizza.
   b) Find the length and width of the smallest rectangular box needed for each pizza.
   c) If each pizza box is 3 in. deep, find the total surface area of each box.

4. A flexible floating pipe capable of containing oil to a depth of 50 cm is to be placed around a leaking oil tanker containing 200 000 m^3 of oil. The pipe forms a circle around the tanker.
   a) What length of pipe is needed if the leak is stopped when 25% of the oil escaped?
   b) What length of pipe is needed if the leak is stopped when 50% of the oil escaped?
   c) Why is your answer to part b) not double your answer to part a)?

5. A small storage bin using the least amount of material is to be built. The volume of the bin must be 27 000 cm^3.
   a) What are the dimensions that will give a minimum surface area?
   b) If the material being used to construct the box costs $47.75/$m^2$, how much will it cost to construct the bin?

6. The house Diane recently purchased needs new screens on three windows. The dimensions of the three windows are 3.5 ft by 4.0 ft, 2.5 ft by 3.0 ft, and 2.5 ft by 2.0 ft.
   a) The screen material is available at the local building supply store in 50-ft rolls that are 3 ft, 4 ft, or 5 ft wide. Which width should Diane purchase? Explain.
   b) Screen framing material is available in 4 ft, 6 ft, and 8 ft lengths. What frame lengths should she purchase to minimize waste? Explain.

7. Mohamed has a piece of glass that measures 20 cm by 30 cm. He is cutting the glass into six pieces to make a small jewellery box in the shape of a square-based prism. Each side of the box is to be made of one piece of glass.
   a) Draw a scale diagram to show how Mohamed should cut the glass.
   b) Calculate the volume of the box.