# 3.3 Optimization

The following problems are taken from the Nelson text on page 145:

3. A farmer has 600 m of fence and wants to enclose a rectangular field beside a river. Determine the dimensions of the fenced field in which the maximum area is enclosed. (Fencing is required on only three sides: those that aren't next to the river.)

4. A rectangular piece of cardboard, 100 cm by 40 cm, is going to be used to make a rectangular box with an open top by cutting congruent squares from the corners. Calculate the dimensions (to one decimal place) for a box with the largest volume.

5. A rectangle has a perimeter of 440 cm. What dimensions will maximize the area of the rectangle?

6. What are the dimensions of a rectangle with an area of 64 m^2 and the smallest possible perimeter?

7. A rancher has 1000 m of fencing to enclose two rectangular corrals. The corrals have the same dimensions and one side in common. What dimensions will maximize the enclosed area?


11. A cylindrical-shaped tin can must have a capacity of 1000 cm^3.
    a. Determine the dimensions that require the minimum amount of tin for the can. (Assume no waste material.) According to the marketing department, the smallest can that the market will accept has a diameter of 6 cm and a height of 4 cm.

8. A net enclosure for practising golf shots is open at one end, as shown. Find the dimensions that will minimize the amount of netting needed and give a volume of 144 m². (Netting is required only on the sides, the top, and the far end.)
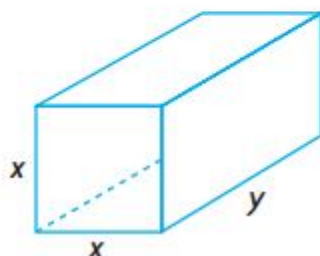
13. a. An isosceles trapezoidal drainage gutter is to be made so that the angles at *A* and *B* in the cross-section *ABCD* are each 120°. If the 5 m long sheet of metal that has to be bent to form the open-topped gutter and the width of the sheet of metal is 60 cm, then determine the dimensions so that the cross-sectional area will be a maximum.
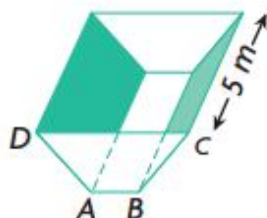
   b. Calculate the maximum volume of water that can be held by this gutter.

Answers to Selected Problems:

4. height 8.8 cm, length 8.24 cm, and width 22.4 cm

6. 8 m by 8 m

7. 125 m by 166.67 m

11. **a.** $r = 5.42, h = 10.84$

8. 4 m by 6 m by 6 m