

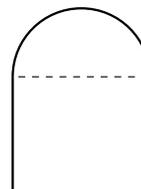
1. A rectangular yard is to be constructed along the side of a house by erecting a fence that is 20 meters long (not high) on three sides, using the house as the fourth wall of the yard. Find the dimensions of the yard that produce the yard of the greatest area.

2. A rectangular poster is to contain  $108 \text{ cm}^2$  of rectangular printed matter, with margins of 6 cm each at the top and bottom and 2 cm on the sides. What is the least cost to make the poster, if it costs 5 cents/cm<sup>2</sup> to make the part consisting of printed matter and 1 cent/cm<sup>2</sup> to make the margins?

3. What are the dimensions of the lightest cylindrical aluminum can with the capacity  $355 \text{ cm}^3$ ? (*Hint*: the lighter the can, the less is its surface area.)

At home, you can compare your result with the dimensions of a regular 12 fl.oz ( $\approx 355 \text{ cm}^3$ ) soda—or, if you are over 21, beer—can.

4. A Norman window consists of a rectangle with a semi-circle mounted on top (see the figure). What are the dimensions of the Norman window with the largest area and a fixed perimeter of  $P$  meters?



5. A bus company will charter a bus that holds 50 people to groups of 35 or more. If a group contains exactly 35 people, each person pays \$60. In larger groups, everyone's fare is reduced by \$1 for each person in excess of 35.

(a) What is the revenue, if the bus is chartered to 35 people? 36 people? 37 people?

(b) Find a formula for the revenue in terms of the number of people chartering the bus.

(c) Determine the size of the group(s) for which the bus company's revenue will be the greatest.

(Note: you need to check that your answer makes physical sense and that it is correct as the physical constraints allow.)

6. The number of boxes of the breakfast cereal Nutty Fruity sold in a month is  $5000e^{-0.5p}$  boxes, where  $p$  is the price per box. Determine the price that will result in the greatest consumer expenditure. (Note: first, you need to find a formula for consumer expenditure, i.e. the amount of money consumers will spend on Nutty Fruity in a month.)