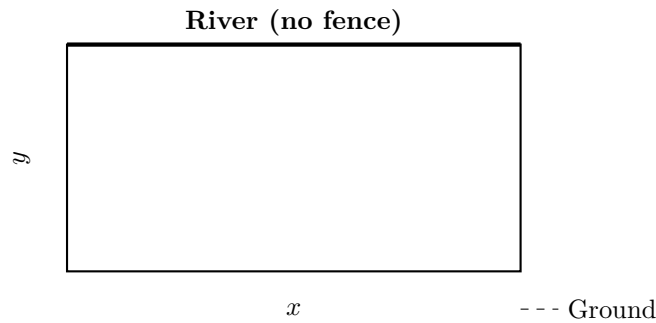


Question 2**Problem:**

A rectangular field is to be enclosed on three sides with fencing (the fourth side lies along a river and requires no fence). The total length of fencing available is 240 meters.

- (a) What dimensions will maximize the area of the field?
- (b) What is the maximum area?

Diagram:

Question 2 - Solution

Let: - x = length parallel to the river (no fence needed) - y = width (two sides to be fenced)

From the constraint:

$$x + 2y = 240 \quad \Rightarrow \quad x = 240 - 2y$$

The area is:

$$A = x \cdot y = (240 - 2y)y = 240y - 2y^2$$

Differentiate:

$$\frac{dA}{dy} = 240 - 4y$$

Set derivative to zero:

$$240 - 4y = 0 \quad \Rightarrow \quad y = 60$$

Back-substitute:

$$x = 240 - 2(60) = 120$$

(a) Optimal Dimensions:

$$x = 120 \text{ m}, \quad y = 60 \text{ m}$$

(b) Maximum Area:

$$A = 120 \times 60 = 7200 \text{ m}^2$$