

Maximum Area Problems - Finding Equations

Step 1: State the Perimeter

$$P = ???$$

Step 2: Represent the width of the figure using the variable "x"

$$\text{Let } x = \text{width}$$

Step 3: Use the perimeter and the width to create an expression for the length of the figure

$$\underline{(P - \# \text{ of widths})} = \text{length} \\ \# \text{ of lengths}$$

Step 4: Use the formula for area to determine the equation

$$\text{Area} = \text{length} \times \text{width}$$

Example 1:

**You have 600 m of fencing to enclose a rectangular area.
Write an equation which could be used to determine the area.**

Solution:

$$P = 600 \text{ m}$$

$$\text{Let } x = \text{width}$$

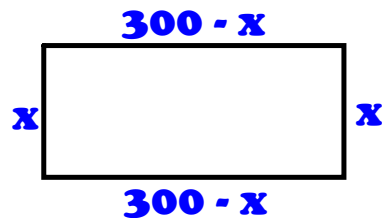
$$\frac{(P - \# \text{ of widths})}{\# \text{ of lengths}} = \text{length}$$

$$\frac{(600 - 2x)}{2} = \text{length}$$

$$300 - x = \text{length}$$

$$\begin{aligned} \text{Area} &= \text{length} \times \text{width} \\ &= (300 - x)(x) \end{aligned}$$

$$= 300x - x^2$$



Example 2:

You have 1200 m of fencing to enclose a rectangular area on 3 sides, leaving one side open.

Write an equation which could be used to determine the area.

Solution:

$$P = 1200 \text{ m}$$

$$\text{Let } x = \text{width}$$

$$(\text{P} - \text{\# of widths}) = \text{length}$$

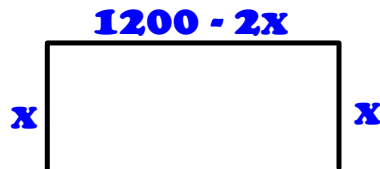
of lengths

$$(1200 - 2x) = \text{length}$$

$$\text{Area} = \text{length} \times \text{width}$$

$$= (1200 - 2x)(x)$$

$$= 1200x - 2x^2$$



Example 3:

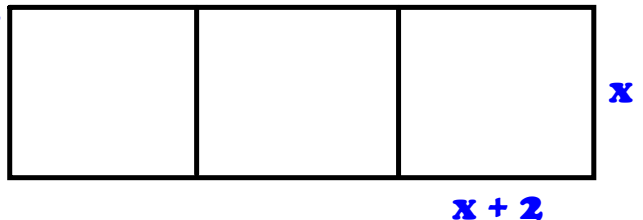
3 identical classrooms have a total area of 1200 m². Find an equation which could calculate the value of "x".

Solution:

$$\text{Total Area} = 1200 \text{ m}^2$$

$$\text{Area of each classroom} = \frac{1200}{3}$$

$$= 400 \text{ m}^2$$



Since:

$$x = \text{width}$$

$$x + 2 = \text{length}$$

Therefore:

$$\text{Area} = \text{length} \times \text{width}$$

$$400 = (x + 2)(x)$$

OR $x^2 + 2x - 400 = 0$