

## 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**

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

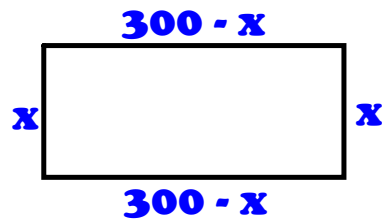
**Example 1:**

**You have 600 m of fencing to enclose a rectangular area.**

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

**Solution:**

$$\begin{aligned} P &= 600 \text{ m} \\ \text{Let } x &= \text{width} \\ \frac{(P - \# \text{ of widths})}{\# \text{ of lengths}} &= \text{length} \\ \frac{(600 - 2x)}{2} &= \text{length} \\ 300 - x &= \text{length} \\ \text{Area} &= \text{length} \times \text{width} \\ &= (300 - x)(x) \end{aligned}$$



**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:**

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

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

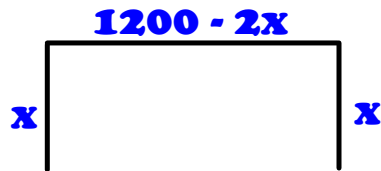
$$(\underline{P - \# \text{ of widths}}) = \text{length}$$

**# of lengths**

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

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

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



**Example 3:**

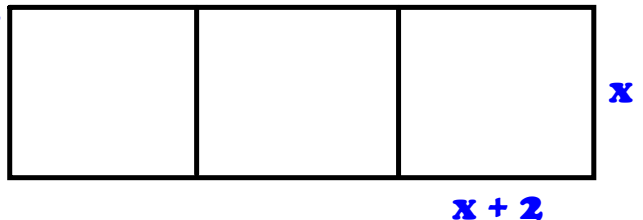
**3 identical classrooms have a total area of 1200 m<sup>2</sup>. Find an equation which could calculate the value of "x".**

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