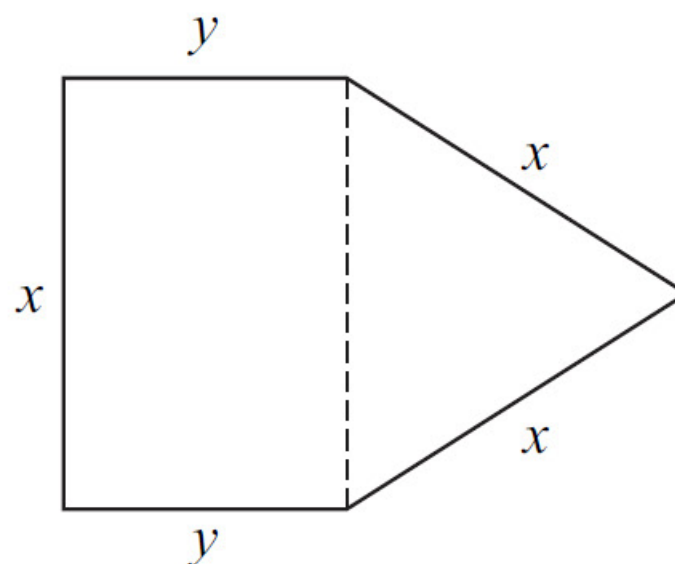


10

A piece of wire of length 66 cm is bent to form the five sides of a pentagon.

The pentagon consists of three sides of a rectangle and two sides of an equilateral triangle.

The sides of the rectangle measure x cm and y cm and the sides of the triangle measure x cm, as shown in the diagram below.



10 (a) (i) You are given that $\sin 60^\circ = \frac{\sqrt{3}}{2}$

Explain why the area of the triangle is $\frac{\sqrt{3}}{4}x^2$

[1 mark]

10 (a) (ii) Show that the area enclosed by the wire, A cm², can be expressed by the formula

$$A = 33x - \frac{1}{4}(6 - \sqrt{3})x^2$$

[3 marks]

10 (b) Use calculus to find the value of x for which the wire encloses the maximum area.

Give your answer in the form $p + q\sqrt{3}$, where p and q are integers.

Fully justify your answer.

[7 marks]