

Task:

The perimeter of a rectangular plot of land is 84 meters and its area is 320 meter². If the length of the plot is represented by x meters, form a quadratic equation in x , and solve it to find the length and width of the plot.

Solution:

Perimeter of a rectangle:

$$P = 2a + 2b, \text{ where } a - \text{length and } b - \text{width.}$$

Let's find width:

$$2b = P - 2a$$

$$b = \frac{P - 2a}{2}$$

Area of a rectangular:

$$S = a \cdot b$$

Let's find width:

$$b = \frac{S}{a}$$

We equate the right-hand sides of definitions of b :

$$\frac{P - 2a}{2} = \frac{S}{a}$$

Multiply equation by $2a$:

$$a(P - 2a) = 2S$$

$$aP - 2a^2 = 2S$$

$$2a^2 - aP + 2S = 0$$

Assuming that length is x , $P = 84$ and $S = 320$ we have an equation:

$$2x^2 - 84x + 2 \cdot 320 = 0$$

Solving it for x :

$$2x^2 - 84x + 320 = 0$$

$$x^2 - 42x + 320 = 0$$

$$D = (-42)^2 - 4 \cdot 1 \cdot 320 = 484$$

$$D = \sqrt{484} = 22$$

$$x_1 = \frac{-(-42) + 22}{2} = 32 \text{ (m)}$$

$$x_2 = \frac{-(-42) - 22}{2} = 10 \text{ (m)}$$

$$b_1 = \frac{320}{32} = 10 \text{ (m)}$$

$$b_2 = \frac{320}{10} = 32 \text{ (m)}$$

Answer: 32 meters and 10 meters.