Question

A rectangular countertop has an area of 15 ft ^2. If the width is 3.5 ft shorter than the length, what are the dimensions of the countertop? Write an equation and solve.

Solution

The area of rectangular countertop is $15 \, ft^2$.

Let the length of the top be x ft and the width of the top is given as 3.5 ft shorter than the length.

So the width is $= (x - 3.5)$ ft

Then the area of the countertop becomes:

$\text{Area} = \text{Length} \times \text{Width} = x \times (x - 3.5) = x^2 - 3.5x$

As per the data given,

$\text{Area} = 15 \text{ ft}^2$

$x^2 - 3.5x = 15$

$x^2 - 3.5x - 15 = 0$

The above is a quadratic equation is x.

This is equivalent to:

$x^2 - \dfrac{7}{2}x - 15 = 0$

$2x^2 - 7x - 30 = 0$

$2x^2 - 12x + 5x - 30 = 0$

$2x(x - 6) + 5(x - 6) = 0$

$(x - 6)(2x + 5) = 0$

Since the length x must be greater than zero, we have:

$x = 6$

Thus the length of the countertop is 6 ft and the width is $(6 - 3.5) = 2.5$ ft.

Hence the dimensions of the countertop are 6 ft and 2.5 ft.

Answer: 6 ft and 2.5 ft, $x^2 - 3.5x = 15$.