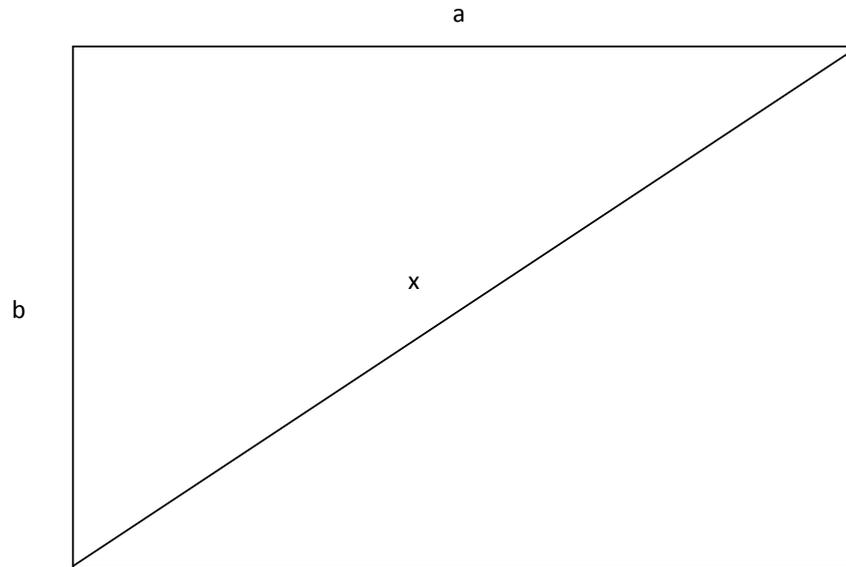I want to find the rate of change of the area of any rectangle with respect to it's hypotenuse. I know how to do derivatives but I don't have any idea what equation to apply it to. Would it be the equation of the area or the hypotenuse I would take a derivative of? Is there a rule in calculus that would make it clear which one to use given (dA/dH), such as..."always take the deriviative of the one on top (dA/dH)? Thanks!

**Solution:**

a



b

x

The area of a rectangle

$$S = a \cdot b$$

Further

$$b = \sqrt{x^2 - a^2}$$

Then

$$S(x) = a \cdot \sqrt{x^2 - a^2}.$$

So

$$\frac{dS(x)}{dx} = \frac{a}{2\sqrt{x^2 - a^2}} \cdot 2x = \frac{ax}{\sqrt{x^2 - a^2}}$$

is the rate of change of the area of the rectangle with respect to hypotenuse $x$ **where $a$ is a constant**.

**Answer**: $\frac{dS(x)}{dx} = \frac{ax}{\sqrt{x^2 - a^2}}$