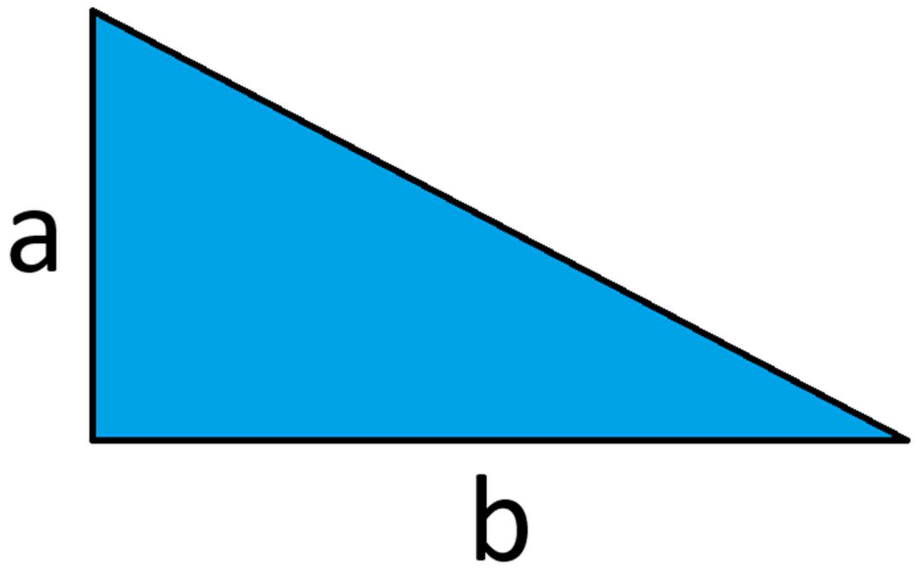
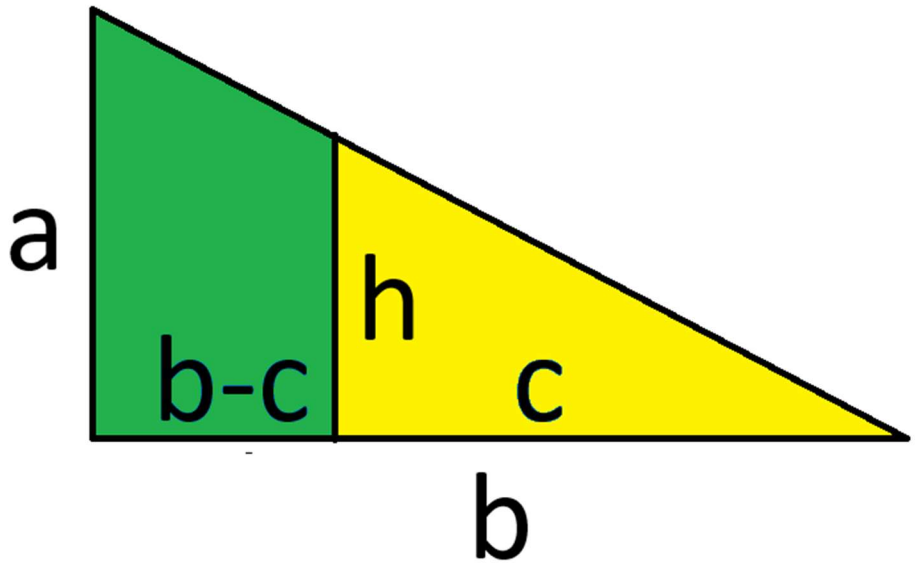
Question

How can you cut the above triangle into two equal areas with just one vertical cut?



Answer

Consider the following diagram with a cut forming lengths c and b-c. Let h equal the height of the yellow triangle with base c.



The area of a rectangle with sides a and b would be ab.

Thus, the area of a right triangle of sides a and b would be ab/2.

We desire the yellow piece to be half of triangle ab, so it should have area ab/4. The area of the yellow triangle is ch/2 In other words:

(1) $ch/2 = ab/4$.

Let's try to put h in terms of a, b and c. By similar triangle we can say:

$h/c = a/b$

(2) $h = ac/b$

Let's put the value for h in equation 2 into equation 1:

c * (ac/b) / 2 = ab/4 *Multiply both sides by 4:*

$2ac^2/b = ab$ *Divide both sides by a:*

$2c^2/b = b$ *Multiply both sides by b:*

$2c^2 = b^2$ *Take the square root of both sides:*

$\sqrt{2}\, c = b$

$c = b/\sqrt{2}$

$c = \frac{\sqrt{2}\, b}{2}$

That makes the length of b – c equal to:

$$\frac{b\,(2-\sqrt{2}\,)}{2}$$

Note that it doesn't matter what a is.

Acknowledgement:

I would like to thank the Black Pen/Red Pen YouTube channel for this problem and solution.

Link: https://youtu.be/WfPew1gRHR0?si=oD2sw88PrLgm9913