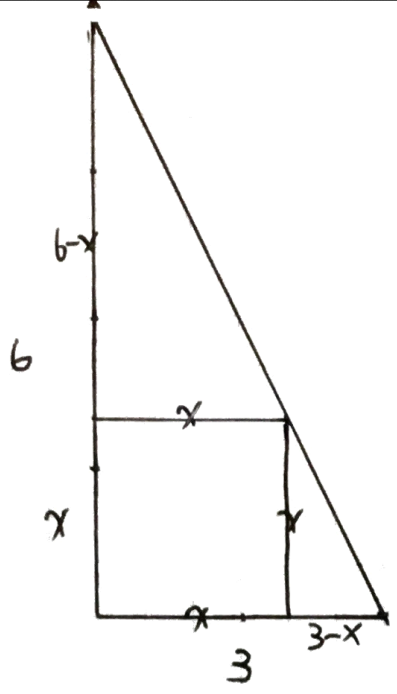


① $\frac{6}{6-x} = \frac{3}{x}$

$6x = 18 - 3x$

$9x = 18$

$x = 2$

Side of square: 2

② $\sqrt{x^2+(6-x)^2} + \sqrt{x^2+(3-x)^2} = \sqrt{6^2+3^2}$

$\sqrt{2x^2-12x+36} + \sqrt{2x^2-6x+9} = \sqrt{45}$

$\sqrt{2x^2-12x+36} = \sqrt{45} - \sqrt{2x^2-6x+9}$

$2x^2-12x+36 = 45 + 2x^2-6x+9 - 2\cdot\sqrt{45}\cdot\sqrt{2x^2-6x+9}$

$2\sqrt{45}\cdot\sqrt{2x^2-6x+9} = 6x+18$

$\sqrt{45}\cdot\sqrt{2x^2-6x+9} = 3x+9$

$45(2x^2-6x+9) = 9x^2+54x+81$

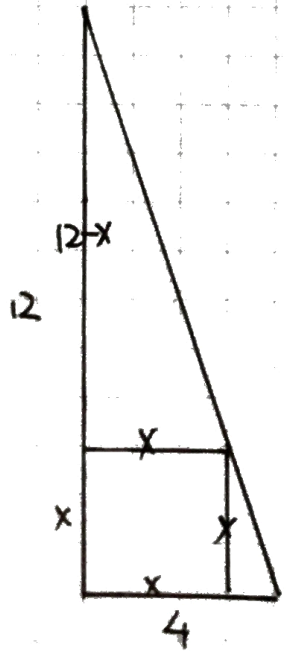
$5(2x^2-6x+9) = x^2+6x+9$

$10x^2-30x+45 = x^2+6x+9$

$9x^2-36x+36 = 0$

$x^2-4x+4 = 0$

$(x-2)^2 = 0 \Rightarrow x = 2$



$\frac{12-x}{12} = \frac{x}{4}$

$12x = 48 - 4x$

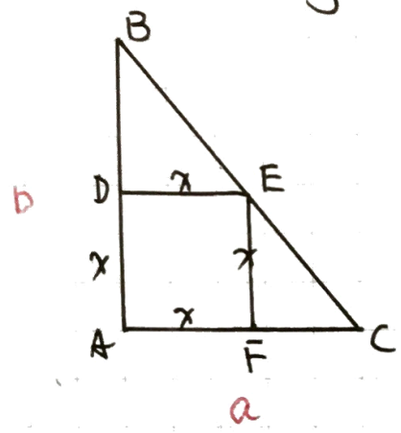
$16x = 48$

$x = 3$

Method 1

Similar triangle

make the side of the square x



$\therefore AD = DE = EF = AF$

$\triangle BDE \sim \triangle BAC$

$\therefore \frac{BD}{BA} = \frac{DE}{AC} \Rightarrow \frac{b-x}{b} = \frac{x}{a}$

$ab - ax = bx$

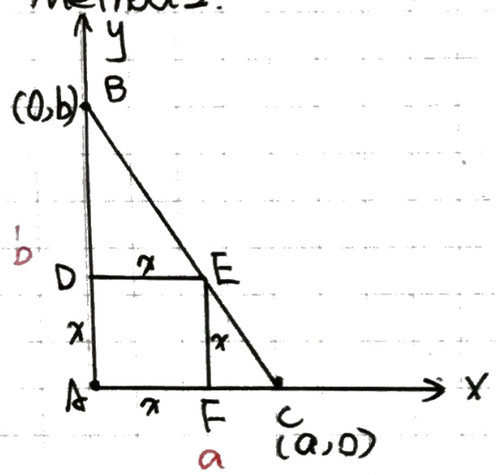
$ab = bx + ax$

$ab = (a+b)x$

$x = \frac{ab}{a+b}$

Method 2.

make the side of the square x



$y = kx + b$

$0 = ak + b$

$k = -\frac{b}{a}$

BC: $y_1 = -\frac{b}{a}x + b$

$E(x, x)$

AE: $y_2 = x$

AE intersects with BC

$y_1 = y_2$

$-\frac{b}{a}x + b = x$

$b = \frac{b}{a}x + x$

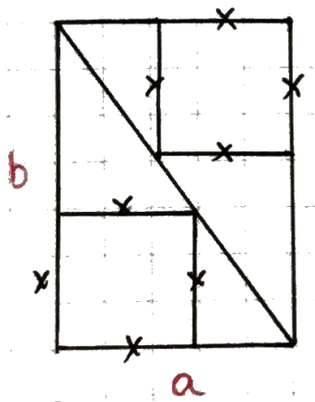
$(\frac{b}{a}+1)x = b$

$x = \frac{b}{\frac{b}{a}+1}$

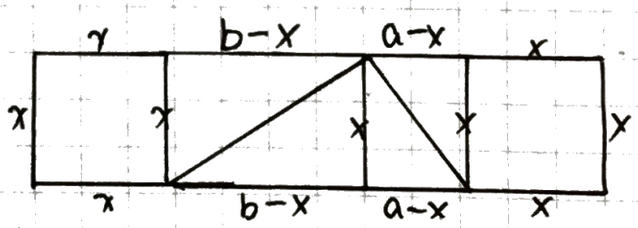
$x = \frac{ab}{b+a}$

Method 3

make the side of square x



Area1 $= ab$



$\text{Area2} = 2x^2 + 2 \cdot \frac{1}{2} \cdot x \cdot (b-x) + 2 \cdot \frac{1}{2} \cdot x \cdot (a-x)$

$= 2x^2 + x(b-x) + x(a-x)$

$= 2x^2 + bx - x^2 + ax - x^2$

$= ax + bx$

Area 1 = Area 2

$ab = ax + bx$

$(a+b)x = ab$

$x = \frac{ab}{a+b}$