

Pythagorean Theorem

The Pythagorean Theorem describes the relationship between the lengths of the legs and the hypotenuse of a right triangle.

$$a^2 + b^2 = c^2 \text{ OR } c = \sqrt{a^2 + b^2}$$

Also

$$a^2 = c^2 - b^2 \text{ OR } a = \sqrt{c^2 - b^2}$$

$$b^2 = c^2 - a^2 \text{ OR } b = \sqrt{c^2 - a^2}$$

Leg of Right Triangle

a

c

Important

The hypotenuse is the side opposite the right angle

Symbol for right angle

b

Leg of Right Triangle



Pythagorean Theorem

The relationship $a^2 + b^2 = c^2$ can be shown visually.

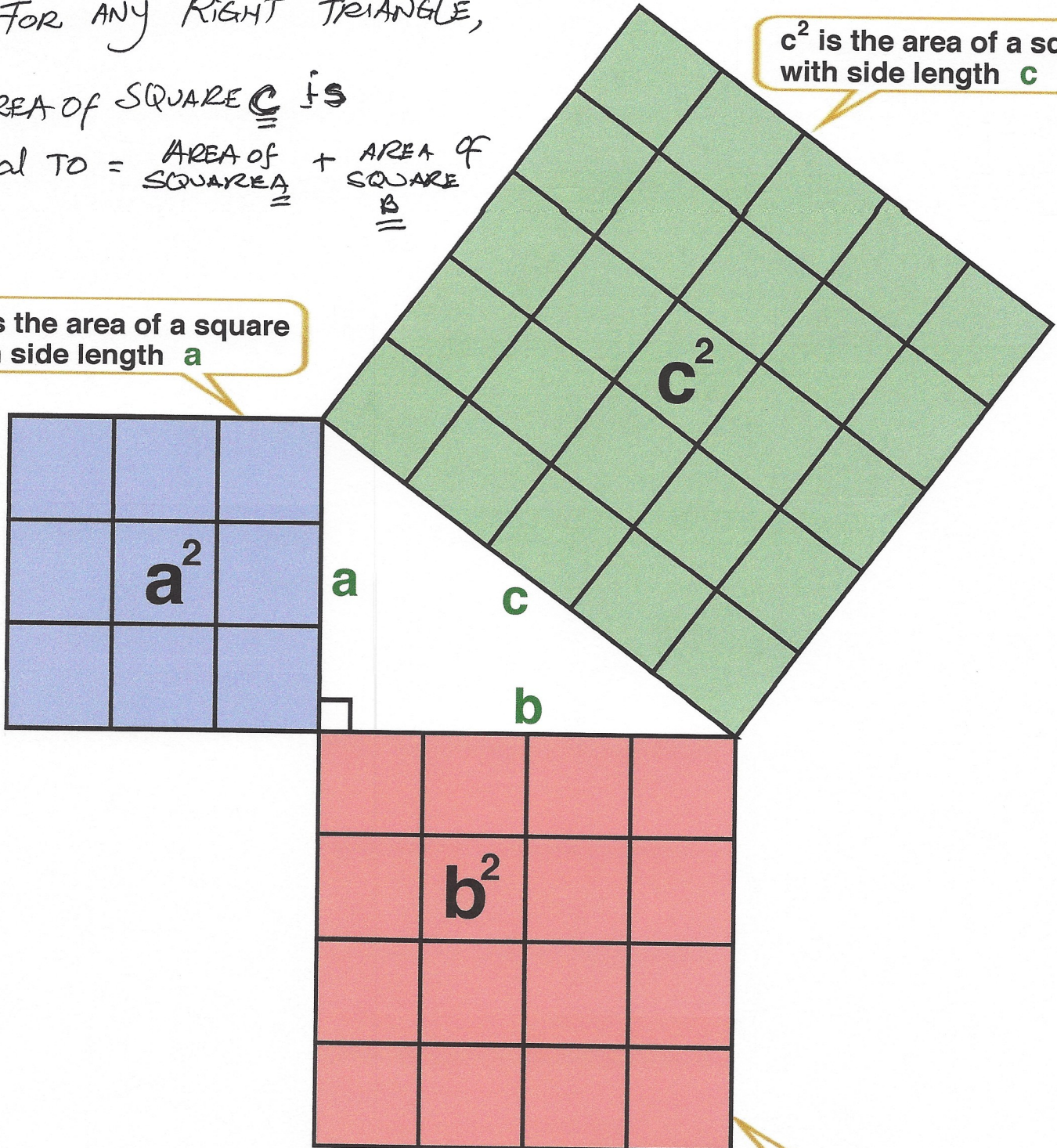
FOR ANY RIGHT TRIANGLE,

AREA OF SQUARE c IS

Equal TO = AREA OF SQUARE a + AREA OF SQUARE b

a^2 is the area of a square with side length a

c^2 is the area of a square with side length c



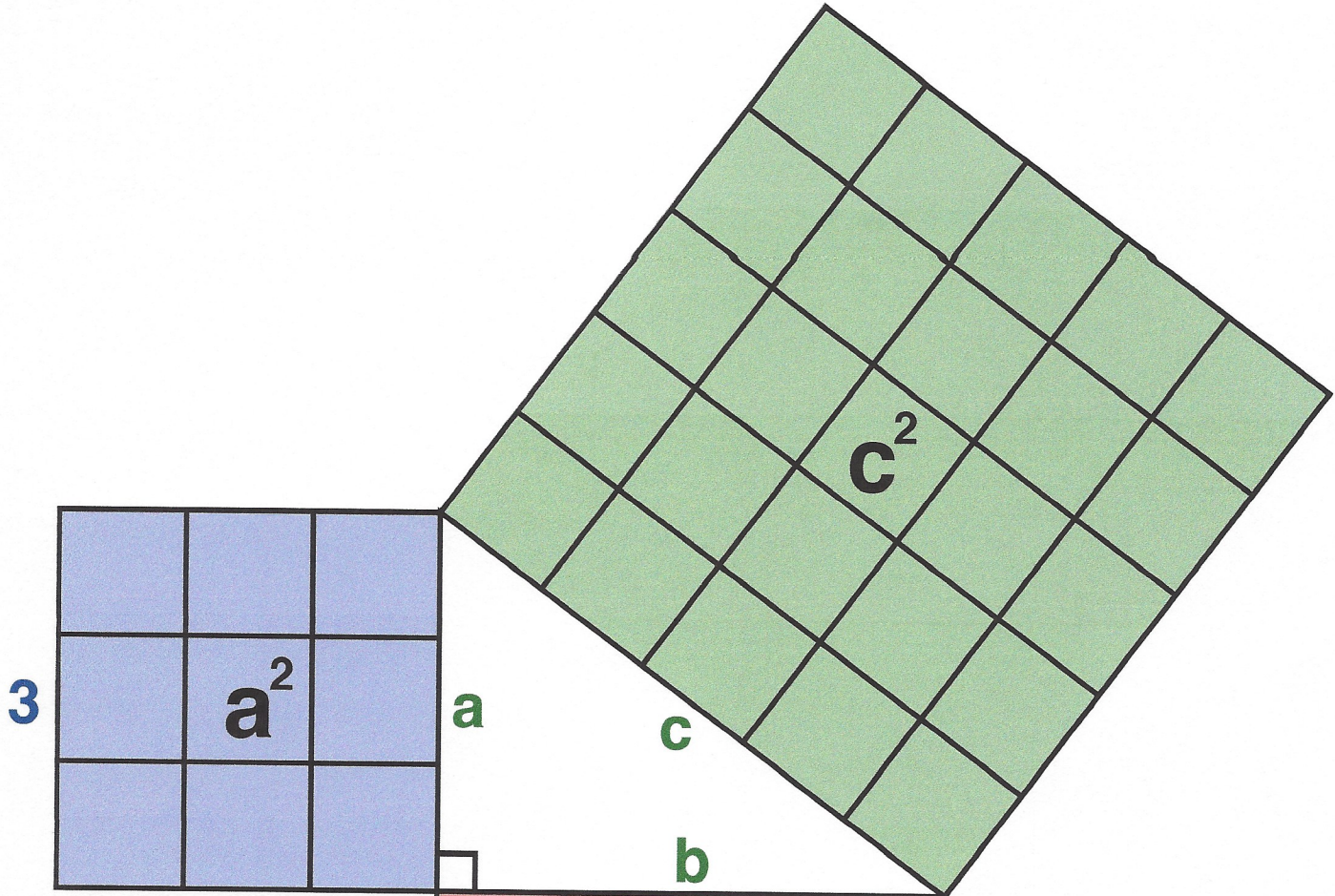
The areas of a^2 and b^2 fit into c^2

b^2 is the area of a square with side length b



Pythagorean Theorem

Given the length of legs **a** and **b**, the length of the hypotenuse can be found using the formula $a^2 + b^2 = c^2$.



Because
 $\text{Area}_{\square c} = \text{Area}_{\square a} + \text{Area}_{\square b}$

a, b, c Form
a

Pythagorean TRIPLET

$$c^2 = a^2 + b^2$$

$$c^2 = 3^2 + 4^2$$

$$c^2 = 9 + 16$$

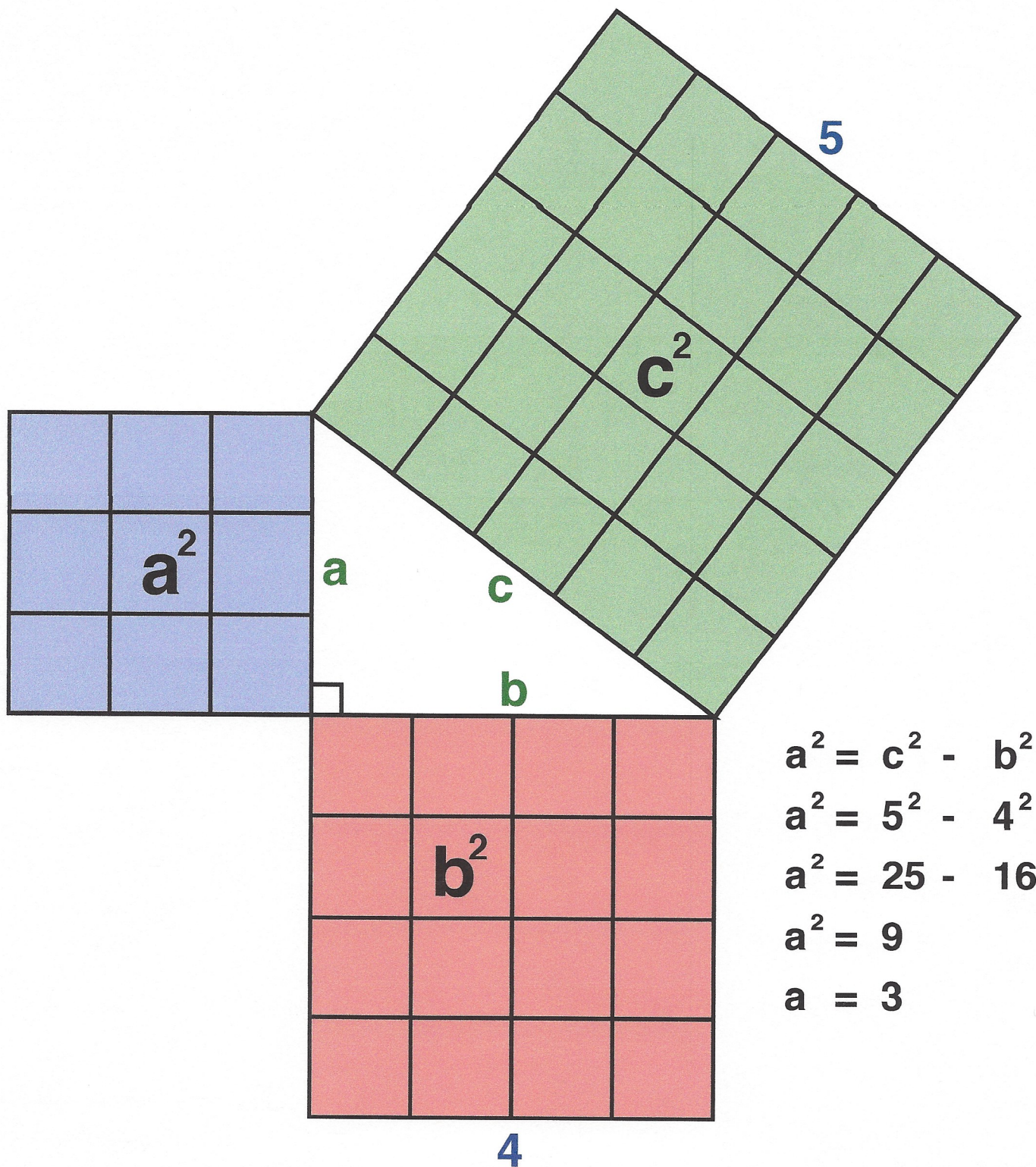
$$c^2 = 25$$

$$c = 5$$



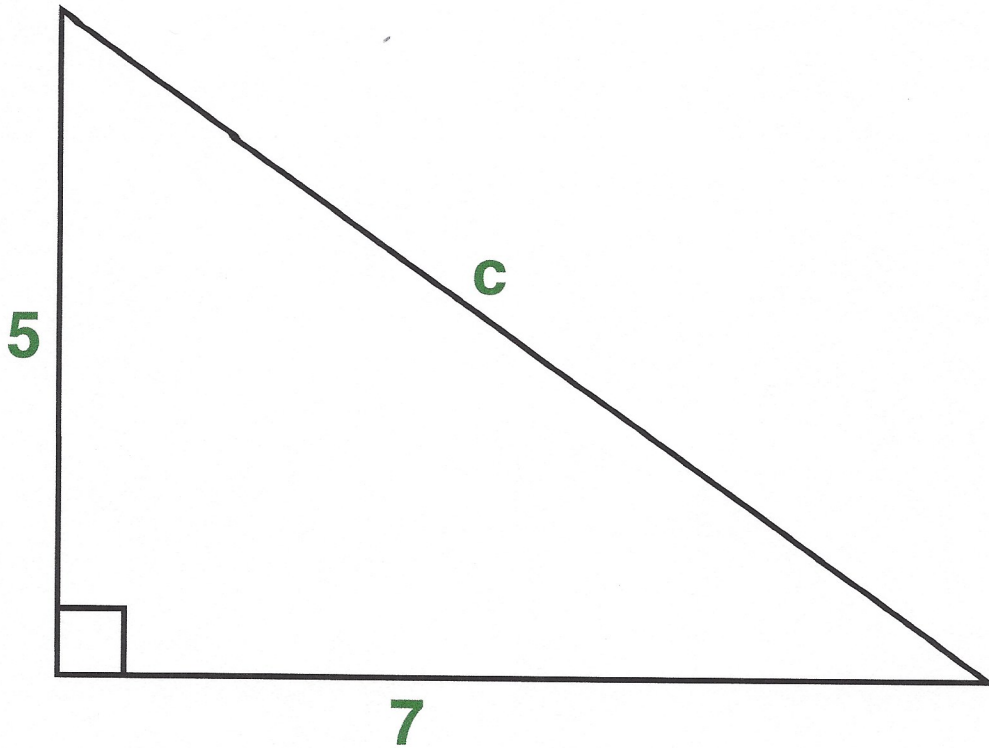
Pythagorean Theorem

Given the length of legs **a** and **b**, the length of the hypotenuse can be found using the formula $a^2 + b^2 = c^2$.



Pythagorean Theorem

The Pythagorean Theorem will work for any right triangle.



$$c^2 = a^2 + b^2$$

$$c^2 = 5^2 + 7^2$$

$$c^2 = 25 + 49$$

$$c^2 = 74$$

$$c = \sqrt{74}$$

$$c \approx 8.6023$$

