

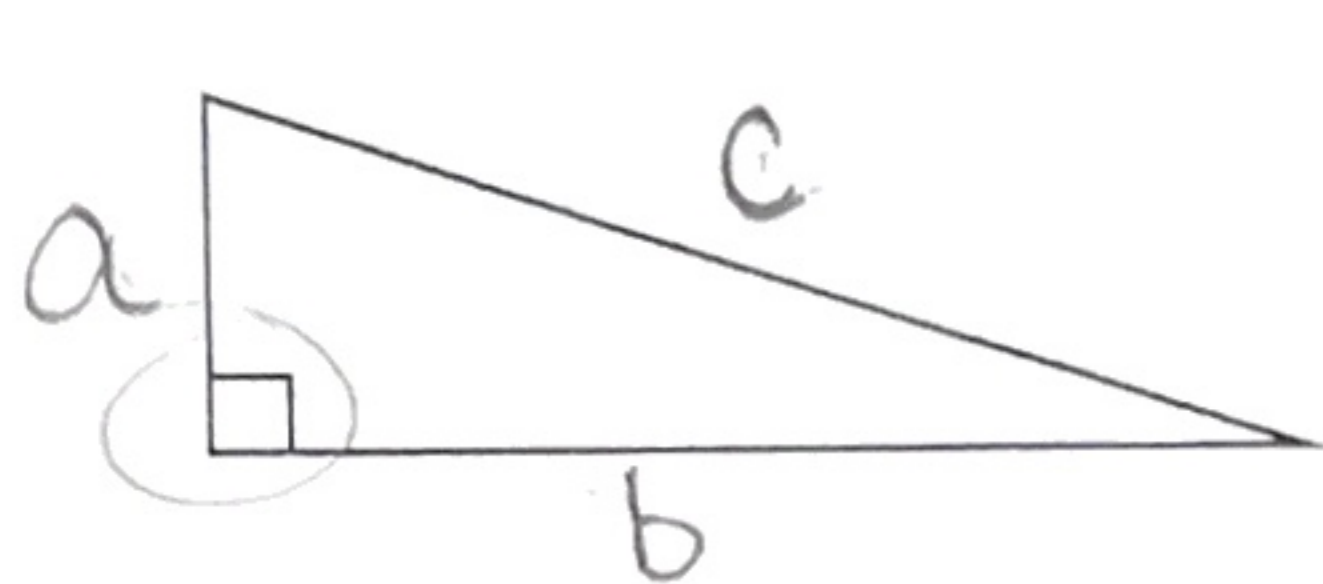
Unit 5a Day 6: The Pythagorean Theorem and its Converse

Focus Question: How does the type of triangle relate to the area of squares?

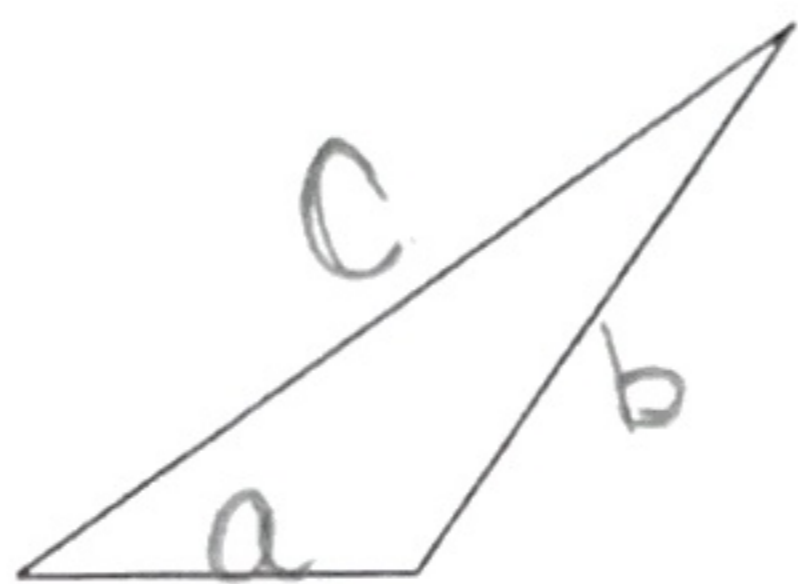
A. The sides of a triangle

The three sides of a triangle are commonly referred to as a , b , and c : " a " is usually the shortest side, " b " is commonly the middle length side, and " c " is **always** the longest side.

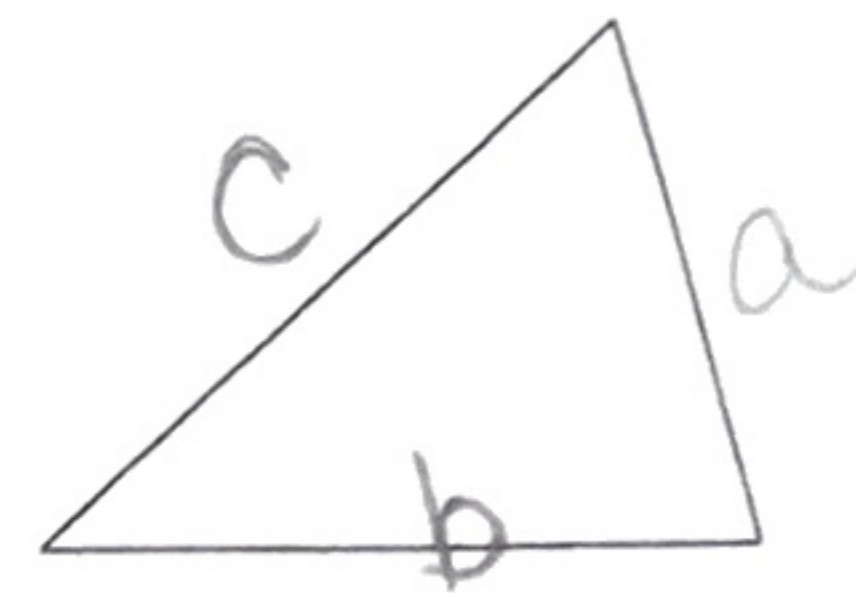
For each triangle below, classify the triangle by its angles, then label the sides with a , b , and c .



Right Δ



Obtuse Δ

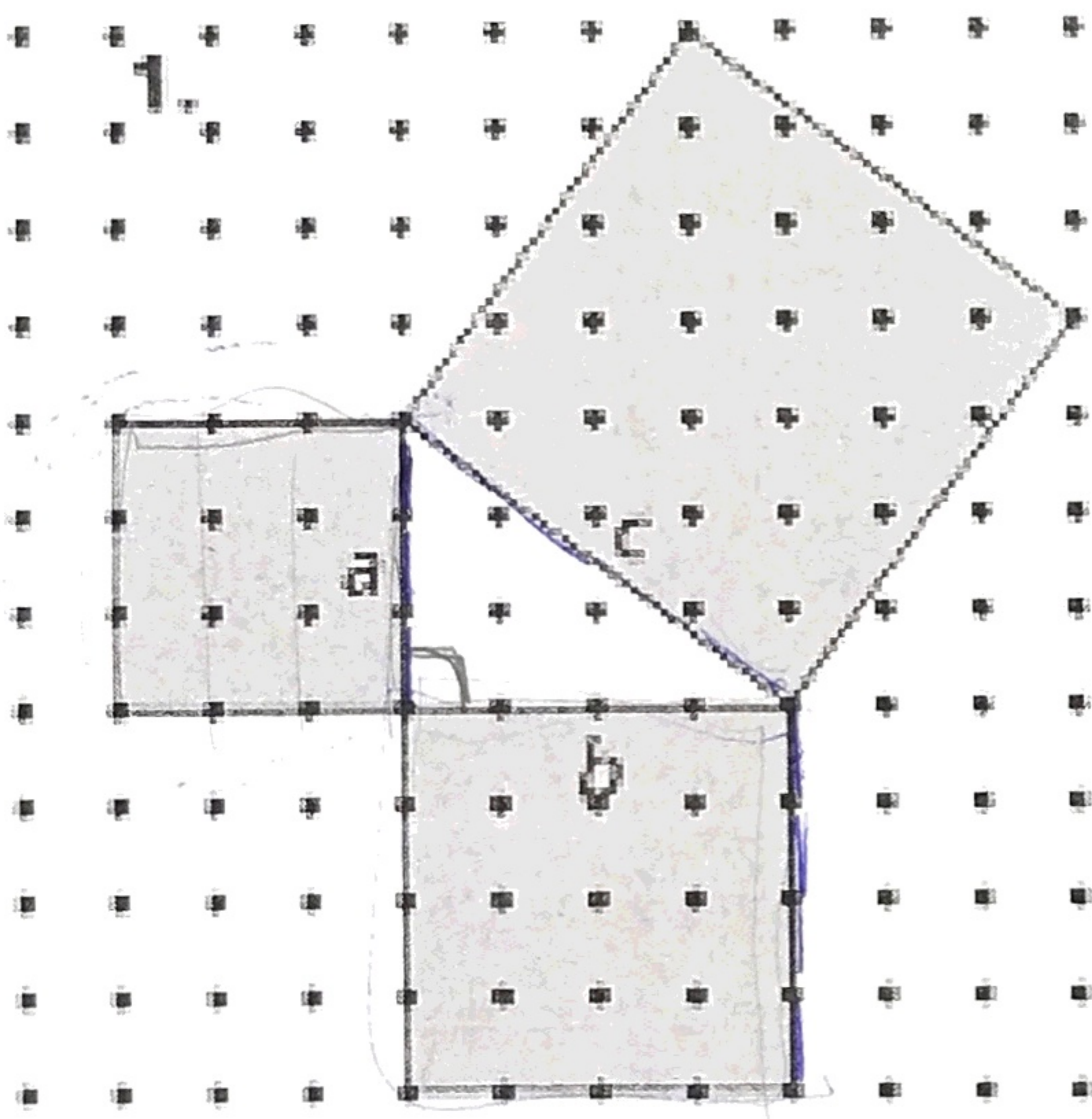


Acute Δ

B. The relationship between triangles and squares.

In each picture below, a triangle is drawn in the middle. Off of each side of the triangle, a square has been drawn. Fill in the chart for each picture.

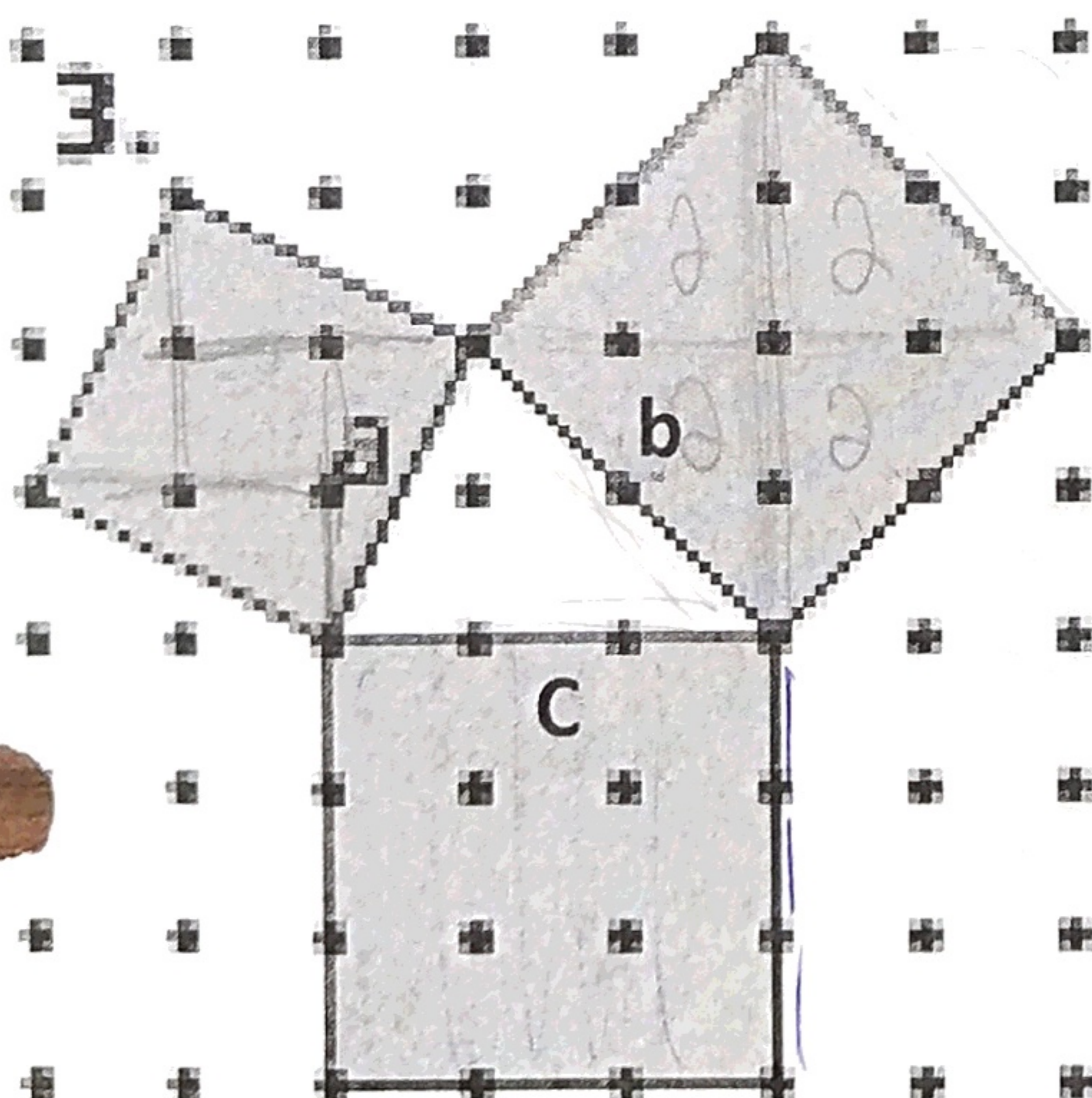
Type of Triangle: Right Δ



Area of smallest square (a^2)	+	Area of medium square (b^2)	< or > or =	Area of largest square (c^2)
9	+	16	=	25

Length of smallest side (a)	+	Length of medium side (b)	< or > or =	Length of longest side (c)
3	+	4	>	5

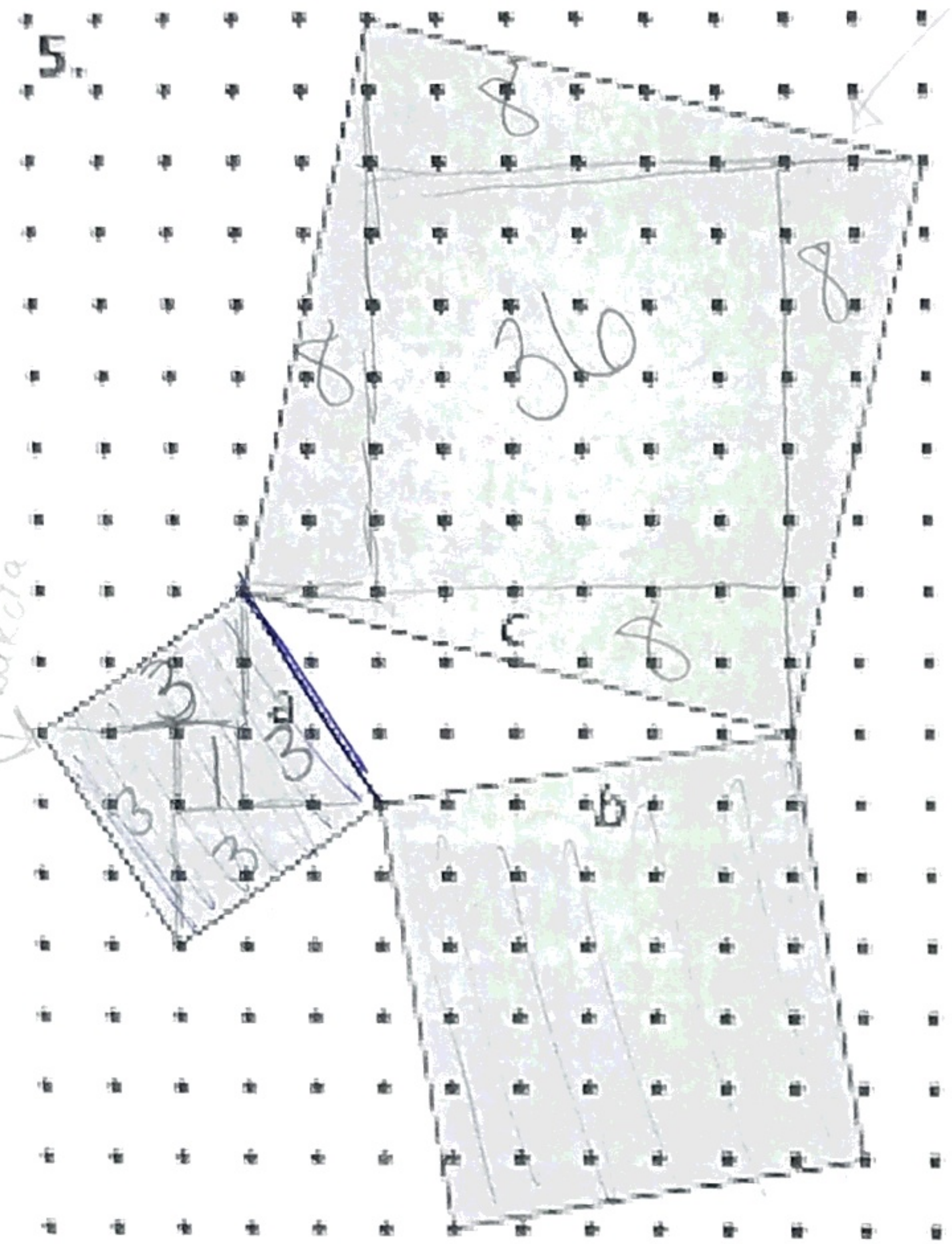
Type of Triangle: Acute Δ



Area of smallest square (a^2)	+	Area of medium square (b^2)	< or > or =	Area of largest square (c^2)
5	+	8	>	9

Length of smallest side (a)	+	Length of medium side (b)	< or > or =	Length of longest side (c)
$\sqrt{5}$	+	$\sqrt{8}$	>	3

$\approx 2.2 + 2.8 = 5$



Type of Triangle: Obtuse Δ

Area of smallest square (a^2)	+	Area of medium square (b^2)	< or > or =	Area of largest square (c^2)
13	+	37	<	68

Length of smallest side (a)	+	Length of medium side (b)	< or > or =	Length of longest side (c)
$\sqrt{13}$	+	$\sqrt{37}$	>	$\sqrt{68}$

3.6 + 6.02 = 9.62 < 8.1

C. Review from 7th grade: Fill in the observation about the **lengths of the sides** and the types of triangle.

For ALL triangles, $a + b > c$

D. Fill in the observation about the **areas of the squares** and the types of triangle.

If a triangle is a right triangle, then $a^2 + b^2 = c^2$

If $a^2 + b^2 = c^2$, then it is a right triangle.

So it follows that if $a^2 + b^2 \neq c^2$, then it is Not a right triangle.

Pyth. Thm

Converse of Pyth. Thm.

In logic, this would be called the contrapositive of what we wrote as our original Pyth. Thm.

E. Using the Pythagorean Theorem and its converse.

Decide if the following lengths make a triangle. If they do, is it a right triangle?

1. $b = 12$ in, $a = 5$ in, $c = 13$ in
 $5 + 12 > 13$
 $17 > 13$
Yes Δ
 $5^2 + 12^2 = 13^2$
 $25 + 144 = 169$
 $169 = 169$
Yes its a right Δ

2. $a = 4$ cm, $b = 8$ cm, $c = 12$ cm
 $4 + 8 > 12$
 $12 > 12$
Not a Δ , so not a right Δ

3. $a = 6$ units, $c = 12$ units, $b = 10$ units
 $6 + 10 > 12$
 $16 > 12$
Yes Δ
 $6^2 + 10^2 = 12^2$
 $36 + 100 = 144$
 $136 = 144$
Not a right Δ