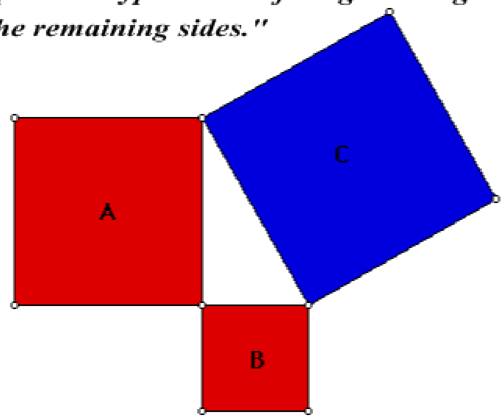
The Pythagorean Theorem is a statement about triangles containing a right angle. The Pythagorea
Theorem states that:

"The area of the square built upon the hypotenuse of a right triangle is equal to the sum of the areas of the squares upon the remaining sides."

Thus, the Pythagorean Theorem stated algebraically is:

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

for a right triangle with sides of lengths a, b, and c, where c is the length of the hypotenuse.



According to the Pythagorean Theorem, the sum of the areas of the two red squares, squares A an
B, is equal to the area of the blue square, square C.

if the sides of a right triangle are whole numbers, it is said to be a Pythagorean Triple

Generating Pythagorean Triples

There is a simple formula that gives all the Pythagorean triples.
Suppose that m and n are two positive integers, with $m < n$. Then $n^2 - m^2$, $2mn$, and $n^2 + m^2$ is a Pythagorean triple.

For example, if n=2 and m=1, we get the Pythagorean Triple 3-4-5 (2x2-1x1=3; 2x2x1=4; and 2x2+1x1=5).

It's easy to check algebraically that the sum of the squares of the first two is the same as the squa of the last one. Why is it that *every* triple can be generated in this manner?
Here are the first few triples for m and n between 1 and 10. Notice any patterns?

the Pythagorean triples highlighted below are primitive in that they cannot be reduced to a proportional ratio; for example, a 6-8-10 triple can be reduced to 3-4-5 by dividing each side by 2, so we call a 6-8-10 an imprimitive; but a 3-4-5 is in its simplest form.

There are 16 primitive triples with a hypotenuse under 100.

n=	m= 1	2	3	4	5	6	7	8	9
2	[3,4,5]								
3	[8,6,10]	[5,12,13]							
4	[15,8,17]	[12,16,20]	[7,24,25]						
5	[24,10,26]	[21,20,29]	[16,30,34]	[9,40,41]					
6	[35,12,37]	[32,24,40]	[27,36,45]	[20,48,52]	[11,60,61]				
7	[48,14,50]	[45,28,53]	[40,42,58]	[33,56,65]	[24,70,74]	[13,84,85]			
8	[63,16,65]	[60,32,68]	[55,48,73]	[48,64,80]	[39,80,89]	[28,96,100]	[15,112,113]		
9	[80,18,82]	[77,36,85]	[72,54,90]	[65,72,97]	[56,90,106]	[45,108,117]	[32,126,130]	[17,144,145]	
10	[99,20,101]	[96,40,104]	[91,60,109]	[84,80,116]	[75,100,125]	[64,120,136]	[51,140,149]	[36,160,164]	[19,180,181]

CAN YOU FIND THE PATTERNS IN THE PYTHAGOREAN TRIPLES OF:

3-4-5

5-12-13

7-20-21

9-40-41

11-60-61

- take the square of any odd whole number greater than 1;
- the sum of the largest leg and the hypotenuse (consecutive numbers), will be the square of the odd whole number.

8-15-17

12-35-37

16-63-65

20-99-101

24-143-145

- multiples of 4 greater than 4 may be the smallest leg of a triple.
- the sum of the larger leg and the hypotenuse which is 2 greater than the largest leg is half of the square of the shortest leg.