Attendance for Dr. Z.'s MathHistory for Lecture 5 (due no later than 10 minutes after class)

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Email to DrZlinear@gmail.com right after class

Subject:p5

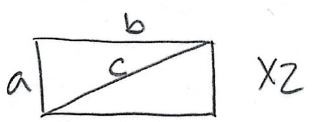
with an attachment p5FirstLast.pdf

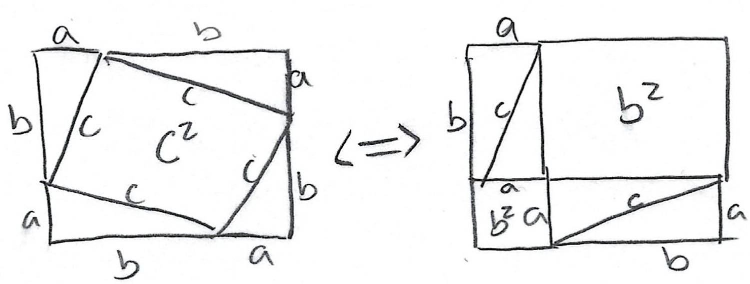
Part I: List all the "attendance questions" during the lecture, followed by your answers.

Part II:

1. State the Pythagorean Theorem and prove it in **two ways**

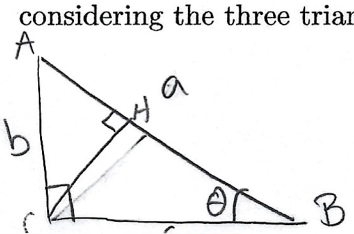
(I) Using the decomposition of an $(a+b) \times (a+b)$ square into an $a \times a$ square, a $b \times b$ square, and four right-angled triangles with sides a, b and hypotheneus c, and comparing it with a decomposition consisting of a $c \times c$ square and four right-angled triangles with sides a, b and hypotheneus c,





Both orientations have the same area
So from this: $a^2+b^2=c^2$

(II) Using similar triangles, by taking a right-angled triangle ABC with such that $|AC| = b$ and $|BC| = a$, and $|AB| = c$, such that AB is horizontal, calling the projection of C to AB, C', and considering the three triangles ABC, ACC' and BCC'.



All 3 triangles are similiar right triangles so all of there areas are proportional to each other by α and the sum of the 2 smaller triangles must be equal to the larger one: $\cancel{\alpha} a^2 + \cancel{\alpha} b^2 = \cancel{\alpha} c^2 \Rightarrow a^2+b^2=c^2$

2. Find the first three smallest *primitive* Pythagorean triples.

We know a pythagorean triplet follows from

$$P(m,n) = [(m^2-n^2), (2mn), (m^2+n^2)]$$

For m and n are integers greater than zero and $m > n$

$P(2,1) = [3, 4, 5]$

$P(3,2) = [5, 12, 13]$

$P(4,3) = [7, 24, 25]$

AQ 1: Find a pythagorean joke

When Eistein meets Pythagoras

$$\left.\begin{array}{l} \text{Einstein: } E = mc^2 \\ \text{Pythagoras: } a^2+b^2=c^2 \end{array}\right\} \begin{array}{l} \text{Therefore} \\ E = m(a^2+b^2) \end{array}$$

AQ 2: Finish the proof

Show: $(m^2-n^2)^2 + (2mn)^2 = (m^2+n^2)$

$\cancel{(m^2-n^2)} = (m^2-n^2)^2 + (2mn)^2 - (m^2+n^2) = 0$

$(m^2-n^2)^2 = m^4 - 2m^2n^2 + n^4$

$(2mn)^2 = 4m^2n^2$

$(m^2+n^2) = m^4 + 2m^2n^2 + n^4$

$(m^4 - 2m^2n^2 + n^4) + 4m^2n^2 - (m^4 + 2m^2n^2 + n^4) = 0$

$\cancel{m^4} - 2\cancel{m^2}n^2 + \cancel{n^4} + \cancel{4m^2}n^2 - \cancel{m^4} - \cancel{2m^2}n^2 - \cancel{n^4} = 0$

$0 = 0$

$\Rightarrow (m^2-n^2)^2 + (2m^2n^2)^2 - (m^2+n^2) = 0$