PHS 111 History of Science Classroom Activity, Plimpton 322

Instructor: Dr. Amy Ackerberg-Hastings

Gather in your assigned groups of 3. Look at the table values below—the numbers in each row relate to each other according to the same mathematical formula. Work with your group to determine the formula and, therefore, the missing column headings.

Two notes:

1) One of the columns is not used in the mathematical formula (why?).
2) The relationship between the numbers is not linear, you might need to square something.

| | | | |
|---|---|---|---|
| 4 | 3 | 5 | 1 |
| 12 | 5 | 13 | 2 |
| 1 | 1 | $\sqrt{2}$ | 3 |
| 2 | 2 | $\sqrt{8}$ | 4 |
| 3 | 3 | $\sqrt{18}$ | 5 |
| 2 | 1 | $\sqrt{5}$ | 6 |
| 3 | 2 | $\sqrt{13}$ | 7 |
| 5 | 4 | $\sqrt{41}$ | 8 |

The actual Plimpton 322 tablet does not make it quite so "easy" to recognize the Pythagorean Theorem. The values that were inscribed on the tablet in Mesopotamia sometime between 1900 and 1600 BCE actually correspond to the table headings that are given below, where a and b are the legs of a right triangle and c is the hypotenuse. The numbers in this table represent the same right triangles that were in the table used in our classroom exercise. However, the original numbers were quite different. They were expressed in sexagesimal notation (as sums of fractions where 60, $60^2$, $60^3$, etc., were the denominators). The values in the first column on the original table descend from almost 2 to almost zero. A good website explaining why historians of mathematics are fascinated by Plimpton 322 is http://aleph0.clarku.edu/~djoyce/mathhist/plimpnote.html .

| $(c/b)^2 = 1 + (a/b)^2$ | a | c | row number |
|---|---|---|---|
| 25/16 | 3 | 5 | 1 |
| 169/144 | 5 | 13 | 2 |
| 2 | 1 | $\sqrt{2}$ | 3 |
| 2 | 2 | $\sqrt{8}$ | 4 |
| 2 | 3 | $\sqrt{18}$ | 5 |
| 5/4 | 1 | $\sqrt{5}$ | 6 |
| 13/9 | 2 | $\sqrt{13}$ | 7 |
| 41/25 | 4 | $\sqrt{41}$ | 8 |