

History of Mathematics

Mathematical Assignment 1: Early Mathematics

Due Monday, Oct. 4

Do all the problems below. I don't mind if you occasionally ask each other for help, but try to maintain some individuality in your assignments. Be sure to write neatly, and write your name on the front page of your paper.

1. On the back of this sheet are translations of the ancient Chinese characters for various numbers, and an example of how to write one number (5625) in that system. (Chinese is written up to down; the number is written in the vertical column on the right.)
 - (a) From the example, figure out how the number system works, and write 367 and 6024 in that system. Is this a simple grouping system? A positional system? Neither? Explain.
 - (b) Also write 367 and 6024 in the Egyptian and Babylonian systems.
2.
 - (a) Find a way to write $5/9$ in the Egyptian number system (unit fractions only!). Use the Rhind papyrus $2/n$ table, on the back of this page.
 - (b) It is possible to understand how the Egyptians might have gotten at least some of the entries in the $2/n$ table. Consider the entries with denominators that are multiples of 3 ($2/9$, $2/15$, $2/21$, etc.) What is the pattern you see in these entries? Use the pattern to determine the entries in the table for $2/39$ and $2/45$.
 - (c) The pattern you saw in the entries above can be written as follows: the fractions $2/(3n)$ are written as the sum of two fractions, $1/(2n)$ and $1/(6n)$. Add these last two fractions together, to confirm that the Egyptians were right.
3.
 - (a) Use the Babylonian method of solving quadratic equations (as we saw in class) to solve: "I have added the area and six sides of my square and it is 40." Confirm that you get the right answer.
 - (b) Can you explain this "Babylonian" sentence? "I have added 3 sides of my square and 5 sides of my square and it is 32. You take the 3 and 5, and it is 8. Take the 32 and divide by the 8. The result is 4, and it is the side of my square." (I'm looking for the equation that s/he is trying to solve, and his/her method of solution.) Is the method correct? Explain.
4. On the back of this sheet, I have reproduced the first four rows of a Babylonian tablet that was discovered a number of years ago.
 - (a) Translate the tablet into our number system. Then, explain the pattern of numbers on the tablet. (HINT: it has to do with the cubes of the numbers on the left.)
 - (b) Using your answer to (a), calculate the next six rows of the table.
 - (c) Use your tablet to find a solution to the equation $x^3 + x^2 = 576$.
5. I Kings 7:23 (and II Chronicles 4:2), given below, describes the building of a large circular reservoir for use in the temple. Use the information in this verse to determine the value of π used by the Hebrews. (Recall that π is the ratio of the circumference to the diameter of a circle.)

"He made the Sea of cast metal, circular in shape, measuring ten cubits from rim to rim and five cubits high. It took a line of thirty cubits to measure around it."

The Rhind Papyrus 2/n Table

$2/5 = 1/3 + 1/15$	$2/13 = 1/8 + 1/52 + 1/104$	$2/21 = 1/14 + 1/42$	$2/29 = 1/24 + 1/58 + 1/174 + 1/232$
$2/7 = 1/4 + 1/28$	$2/15 = 1/10 + 1/30$	$2/23 = 1/12 + 1/276$	$2/31 = 1/20 + 1/124 + 1/155$
$2/9 = 1/6 + 1/18$	$2/17 = 1/12 + 1/51 + 1/68$	$2/25 = 1/15 + 1/75$	$2/33 = 1/22 + 1/66$
$2/11 = 1/6 + 1/66$	$2/19 = 1/12 + 1/76 + 1/114$	$2/27 = 1/18 + 1/54$	$2/35 = 1/30 + 1/42$

Chinese Numerals: Example number (5625) is column at right