

Egyptian Math

I. Egyptian Multiplication

The ancient Egyptians used a method of multiplication that meant children did not need to learn their times tables! Here's what they did need to know: how to double numbers starting at one; how to double any number (either by multiplying by two or by adding the number to itself); and how to add. Here's an example:

Multiply 23 by 19

23	1*
46	2*
92	4
184	8
368	16*

In the first column we're doubling 23. In the second column we're doubling one—writing down powers of two. We stop at 16, because the next one, 32, would be bigger than 19. Then we decide which powers of two we need to add together to get 19. The answer is $16 + 2 + 1 = 19$. I've starred those numbers. Next we add together the numbers in the first column on the same row with the starred numbers.

$$\begin{array}{r} 23 \\ 46 \\ + 368 \\ \hline 437 \end{array}$$

- 1) Multiply 12 by 6 using the Egyptian method. Show all your work neatly!
- 2) Multiply 35 by 13 using the Egyptian method. Show all your work neatly!
- 3) Multiply 427 by 25 using the Egyptian method. Show all your work neatly!
- 4) Try to explain why the Egyptian method works.

II. Egyptian Fractions

The ancient Egyptians used only unit fractions—fractions with one in the numerator. (The only exception was $\frac{2}{3}$.) They did not repeat the same unit fraction in writing a fraction. For example, they did *not* write $\frac{3}{4}$ as

$$\frac{1}{4} + \frac{1}{4} + \frac{1}{4}.$$

They did write $\frac{3}{4}$ as

$$\frac{1}{2} + \frac{1}{4}.$$

One source for our knowledge of ancient Egyptian math is called the Ahmes Papyrus, named after the scribe who wrote it down in about the year 1650 BCE. (This document is now in the British Museum.) Ahmes mentions that he is copying an older text, from perhaps 2000 BCE. In the beginning of the papyrus there is a table that shows how to divide 2 by all the odd numbers from 2 to 101. We can say 2 divided by 59 is the fraction $\frac{2}{59}$. But for the ancient Egyptians,

$$2 \text{ divided by } 59 = \frac{1}{36} + \frac{1}{236} + \frac{1}{531}.$$

Wow! You can see why they'd be glad to have a table and not have to figure that out each time they needed it. Of course, someone had to calculate these the first time, and they didn't have any calculators or computers to help them. Let's see how you can do! Respect your draft and show all your work!

5) Write $\frac{5}{8}$ using only unit fractions.

6) Write $\frac{2}{5}$ using only unit fractions.

7) Write $\frac{2}{17}$ using only unit fractions.

8) The Ahmes Papyrus states that

$$\frac{2}{19} = \frac{1}{12} + \frac{1}{76} + \frac{1}{114}$$

Use paper and pencil arithmetic to check that result!

III. Research Topics

9) Can you learn how the ancient Egyptians wrote numbers? Prepare a neat chart.

10) Find out how ancient Egyptians calculated the area of a circle if they knew its diameter. Compare their method to ours.

Have fun!

