**Why did the Egyptians do fractions so differently?**

The idea of why Egyptians did fractions this way appeared to be quite a debate. Here are some of my findings on the matter:

- It makes some tasks easier such as comparing fractions.
  
  **EX:** Compare 4/5 and 3/4. Written as Egyptian fractions, these would be 1/2 + 1/4 and 1/2, 1/4, and 1/20. This makes comparison easy since the first two terms are obviously equivalent. Therefore, 3/4 is larger and by exactly 1/20.

- It is thought to be based on the practicality of dividing things amongst people (such as bread or the contents of a granary).
  
  **EX:** How can you divide 3 loaves amongst 5 people? Using the Egyptian method, you would first divide the loaves in halves and give each person 1/2. The remaining half would be divided into 5ths (or 1/10) and give each person one of those pieces. Thus, showing the logic in denoting 3/5 as 1/2 + 1/10.

- Because of the ordinal interpretation of fractional notation (i.e. 1/5 means the fifth part), Egyptians could not reason for
there to be more than one fifth part. Thus, it would not make sense to say the fourth fifth part to mean 4/5.

✓ The most widely corroborated idea through my research was the idea that Egyptians may have in fact been able to denote fractions or understand and grasp the concept of fractions such as 3/5 (as displayed in problem 37 of the Rhind Papyrus where summation of 10 unit fractions occurs) but chose the more “elegant” notation of unit fractions as displayed in their writing of fractions.

How do the Egyptians do fractions?

As found in the Rhind Papyrus, Egyptians used fractions very differently from today. 81 out of 87 of the problems in the Rhind Papyrus use fractional notation. From these notations we can tell that Egyptians only used unit fractions (those in the form of 1/n) with the exception of the frequent use of 2/3 and the infrequent use of 3/4. These exceptions were thought of to mean “2 parts when the third is missing” and “3 parts when the fourth is missing.” They would also express them as sums of unit fractions for those amounts that could not be captured in a single unit fraction. For example, 6/7 was most likely denoted as 1/2 + 1/3 + 1/42. Written in hieroglyphics, they used a “mouth” symbol which meant part above the number. 1/5 would have been read as r-5 or part 5. These are often interpreted to have an ordinal meaning to as in “the fifth part.” Some examples are shown here.
The Rhind Papyrus also contains a table known as the 2/n table. It provides a list of unit fractions in the form of 2/n (for the odd values of n) as sums of unit fractions. Many scholars have said the omission of even denominators shows the Egyptian understanding that they can be reduced to equivalencies of the forms given. Furthermore, the first entry in the table is 2/3 and is assigned the value 1/2 + 1/6 and every other entry in the table whose denominator is divisible by 3 is expressed in terms of 2/3. These show that the idea of equivalencies was well understood.

Try These!

1. Share 5 loaves of bread among 8 people.
2. Share 13 loaves among 12 people.
3. Which is larger: 4/7 or 5/8? By how much?
4. List at least 4 different ways to represent ¾ with unit fractions.

Further Questions

· Why didn’t the Egyptians denote other fractions as they did for 2/3 and 3/4? Namely fractions like 4/5 or 7/8?
· Did the Egyptians have a formula or system to determine the “best” combination of unit fractions?
Why study Egyptian fractions?

I chose to study Egyptian fractions because I have dabbled with them in my classroom as a way for kids to show a deeper understanding of fractions. I specifically have had students represent fractions as the infinite combinations of unit fractions and then trying to devise a rule for finding these. As I researched further into this, the idea of devising a rule or formula for converting modern notation fractions to Egyptian fractions seems to be a much larger field than I had expected. There are applications into higher level classes through finding the shortest Egyptian fraction or ones with the smallest denominators, exploring the Erdos-Straus conjecture, Sylvester’s Sequence, and Fibonacci’s Greedy Algorithm. The Egyptian notation of fractions is interesting but also has further application into the classroom to extend students understanding of fractions and their ability to extend this knowledge into algebraic proofs.
Sources Used


MacTutor  *An Overview of Egyptian Mathematics*  [http://www-history.mcs.st-and.ac.uk/HistTopics/Egyptian_mathematics.html](http://www-history.mcs.st-and.ac.uk/HistTopics/Egyptian_mathematics.html)

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