








The Egyptian Numeration System

Egyptian numerals have been found on the writings on the stones of monument walls of ancient time. Numbers have also been found on pottery, limestone plaques, and on the fragile fibers of the papyrus. The language is composed of hieroglyphs, pictorial signs that represent people, animals, plants, and numbers.

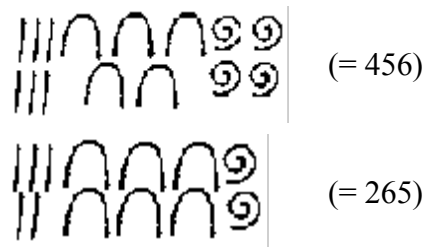
The Egyptians used a written numeration that was changed into hieroglyphic writing, which enabled them to note whole numbers to 1,000,000. The system had a decimal base and allowed for the additive principle. In this notation there was a special sign for every power of ten. For 1, a vertical line; for 10, a sign with the shape of an upside down U; for 100, a spiral rope; for 1000, a lotus blossom; for 10,000, a raised finger, slightly bent; for 100,000, a tadpole; and for 1,000,000, an “astonished man” with upraised arms.

Decimal Number	Egyptian Symbol	
1 =		staff
10 =		heel bone
100 =		coil of rope
1000 =		lotus flower
10,000 =		pointing finger
100,000 =		tadpole
1,000,000 =		astonished man

This hieroglyphic numeration was a written version of a concrete counting system using material objects, i.e., a “**grouping tally system**”. To represent a number, the sign for each decimal order was repeated as many times as necessary. To make it easier to read the repeated signs they were placed in groups of two, three, or four and arranged vertically.

Addition and Subtraction: The techniques used by the Egyptians for these are essentially the same as those used by modern mathematicians today. The Egyptians added by combining symbols. They would combine all the units (\downarrow) together, then all of the tens (\frown) together, then all of the hundreds (\cap), etc. If the scribe had more than ten units (\downarrow), he would replace those ten units by \frown . He would continue to do this until the number of units left was less than ten. This process was continued for the tens, replacing ten tens with \cap , etc.

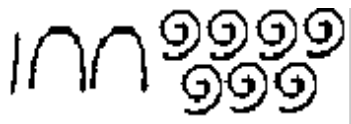
For example, if the scribe wanted to add 456 and 265, his problem would look like this



The scribe would then combine all like symbols to get something like the following



He would then replace the eleven units (\downarrow) with a unit (\downarrow) and a ten (\frown). He would then have one unit and twelve tens. The twelve tens would be replaced by two tens and one one-hundred. When he was finished he would have 721, which he would write as



Subtraction was done much the same way as we do it except that when one has to borrow, it is done with writing ten symbols instead of a single one.

Homework:

1. Rewrite the following numbers using Egyptian symbols:

(a) 512

(b) 9,000,300

(c) 4,020

2. Add the given numbers, using Egyptian symbols. Show the regrouping step.

729 + 486

3. Subtract the given numbers, using Egyptian symbols. Show the borrowing step.

302 - 28