

Mathematics 3810H – Ancient and Classical Mathematics

TRENT UNIVERSITY, Fall 2017

Assignment #1

Math Like an Egyptian!

Due on Friday, 22 September.

1. The Greek historian Herodotus asserted that the Egyptians invented geometry to deal with surveying problems (see §1-2 of the text). What evidence do we have one way or the other? Can you think of any other hypotheses that fit the available evidence? [3]

The relevant passage from Herodotus' *Histories*, as translated by G.C. Macaulay (from an edition published in 1890), is:

108. Then Sesostris, having returned to Egypt and having taken vengeance on his brother, employed the multitude which he had brought in of those whose lands he had subdued, as follows: these were they who drew the stones which in the reign of this king were brought to the temple of Hephaistos, being of very great size; and also these were compelled to dig all the channels which now are in Egypt; and thus (having no such purpose) they caused Egypt, which before was all fit for riding and driving, to be no longer fit for this from thenceforth: for from that time forward Egypt, though it is plain land, has become all unfit for riding and driving, and the cause has been these channels, which are many and run in all directions. But the reason why the king cut up the land was this, namely because those of the Egyptians who had their cities not on the river but in the middle of the country, being in want of water when the river went down from them, found their drink brackish because they had it from wells.

109. For this reason Egypt was cut up; and they said that this king distributed the land to all the Egyptians, giving an equal square portion to each man, and from this he made his revenue, having appointed them to pay a certain rent every year: and if the river should take away anything from any man's portion, he would come to the king and declare that which had happened, and the king used to send men to examine and to find out by measurement how much less the piece of land had become, in order that for the future the man might pay less, in proportion to the rent appointed: and I think that thus the art of geometry was found out and afterwards came into Hellas also. For as touching the sun-dial and the gnomon and the twelve divisions of the day, they were learnt by the Hellenes from the Babylonians.

Keep in mind that Herodotus was not the most reliable historian: he would tell a good story even if it was inconsistent with other stories he'd already told. No Pharaoh conquered the known world, as Herodotus relates Sesostris did. The name Sesostris may be a corruption of Senusret or Senwosret, a name used by several Pharaohs of the Twelfth Dynasty of the Middle Kingdom. In particular, Senusret III was a conqueror (on a more modest scale than Sesostris) and set up some monuments as memorials to his campaigns similar to those Herodotus described Sesostris as having put up.

2. §1-4 Exercises 3(c) & 4(c) [1] and Exercise 5 [1]

§1-4 *Exercise 3(c)*. Without translating into hieroglyphics, compute by repeated doubling and adding: 19×28 .

§1-4 *Exercise 4(c)*. Write the computation of Exercise 3b in hieroglyphics.

§1-4 *Exercise 5*. (a) Write 426 in hieroglyphics. (b) Multiply 426 by 10, by changing the symbols. (c) Multiply 426 by 5, halving the number of each kind of symbol obtained in (b). Check your results by translating the symbols back into modern notation.

3. §1-5 Exercises 1(b) [1] & 2(b) [1]

§1-5 *Exercise 1(c)*. Compute the following by using ancient Egyptian multiplication:
 58×692 .

§1-5 *Exercise 2(c)*. Repeat Exercise 1(c), using the Russian peasant method.

4. §1-6 Exercises 2(h) [1] and 5(b) [2]

Exercise 2(h). Compute in the ancient Egyptian way: $51 \div 18$.

Exercise 5(b). If m is an odd number, prove that $\frac{2}{m} = \frac{1}{m \cdot \frac{m+2}{2}} + \frac{1}{\frac{m+1}{2}}$.

5. Determine, as accurately as you can, how high the top of the southwest corner of the south wing of Gzowski College is above the parking lot just south of the building. Give a complete description of the method you employed. Aside from a calculator or computer to do your arithmetic, you may *not* use any other tools that would not have been available in, say, ancient Egypt, nor may you just ask for or look up the answer. Please observe all applicable laws and regulations in the course of your work ... [10]

Feel free to ask about this in tutorial or office hours!