MAT3100: Additional Facts about Egyptian Mathematics

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1. Fun quote from Anglin-Lambek: the Rhind Papyrus begins by promising the reader "a thorough study of all things, insight into all that exists, knowledge of all obscure secrets". Wow! What a let-down to discover it's just a solution manual for elementary math problems for student scribes.

2. **The method of false position.** A method of solving linear equations, by guessing a reasonable answer, then adjusting to make it work. Used in many ancient cultures, starting with the Egyptians. Here's a problem from the Rhind Papyrus:

   > *A number and its seventh make 19. Suppose 7. Its seventh is 1. Together 8. Divide 19 by 8. Multiply by 7. Solution* $16\,\overline{2}\,\overline{8}$.

   So, we begin by supposing $x + \frac{1}{7}x = 19$. Guess: $x = 7$. This gives $7 + 1 = 8$. Not quite 19. So the guess was too small. To get to 19, we multiply by $\frac{19}{8}$. That will give us the right value. So

   $$x = \frac{19}{8} \cdot 7 = \frac{133}{8} \quad (= 16\frac{5}{8} \text{ in modern notation})$$

   .

   Instead, the Egyptian priests might have checked it as follows:

1	–	8	
2	–	16	
4	–	32	From this, notice that $16 + \frac{5}{8} = 16 + \frac{1}{2} + \frac{1}{8} = 16\,\overline{2}\,\overline{8}$
8	–	64	
✓16	–	128	rem 5.

3. **Egyptian Calendar** (from Katz's book) The Egyptian calendar influenced both the more modern Julian and Gregorian calendars. The main concept was the year had 365 days. Both Egyptians and Babylonians used phases of the moon to establish the months, but in different ways. The Egyptians used a 12 month calendar of 365 days in a year. Unfortunately, this is not completely accurate. Extra days at the end were used for religious purposes. The priests also discovered that the annual Nile flood always began just after the bright star Sirius first appeared in the eastern sky before dawn after a period of invisibility. This enabled them to accurately predict the flood, so giving them political power and influence.

4. According to Anglin and Lambek, as well as Katz, Problem 14 of the Moscow papyrus asked for the computation of the volume of a truncated square pyramid. The papyrus gives a recipe, suggesting the Egyptians knew the formula for the volume of truncated pyramids, thus (it easily follows) for ordinary non-truncated pyramids. Curiously, they never discussed the volume of ordinary pyramids, which they were always building! According to Katz, no one knows for sure how the Egyptians found their algorithm, nor the one for the volume for the surface of a hemisphere, which they also had. Katz (3rd ed, p. 10) gives a reasonable idea of how scholars have reconstructed the Egyptian ideas.

5. The original translation of hieroglyphics arose from the discovery of the Rosetta Stone, discovered in 1799, giving a decree of King Ptolemy V, issued at Memphis, Egypt (originally the

capital) about 196 BC. It was a trilingual decree, written in Ancient Egyptian hieroglyphs, Demotic script, and ancient Greek script. A brilliant French linguist, Jean Champollion (1790-1832) managed to begin translating the hieroglyphs, introducing at the same time new techniques and observations in translation of such documents. It's a dramatic story: see the Wikipedia website on the Rosetta Stone.