Special Topics in Advanced Math: *History of Mathematics*

Math 395 Fall 2023 Fowler 310 TR 1:30pm - 2:55pm

 http://sites.oxy.edu/ron/math/395/23/

Homework #1

ASSIGNED: Thu Aug 31 2023 **DUE: Thu Sep 7 2023**

The homework consists of questions for which you can produce formal and/or informal responses.

Informal Homework Responses

1. The first set of questions counts as one informal homework response. These problems can be worked on in groups with each student submitting their own solutions. They can be handwritten and can provide the "usual" amount of work to demonstrate how the solutions were obtained.

   (a) (**Katz, Chapter 1, p.28, #2**) Use Egyptian techniques to multiply 34 by 18 and to divide 93 by 5.

   (b) (**Katz, Chapter 1, p.28, #5**) Show that the solution to the problem of dividing 7 loaves among 10 men is that each man gets $\overline{\overline{3}}.\overline{30}$ (This is problem 4 of the *Rhind Mathematical Papyrus*.)

   (c) (**Katz, Chapter 1, p.28, #10**) Solve by the method of false position: A quantity and its 2/3 are added together and from the sum 1/3 of the sum is subtracted, and 10 remains. What is the quantity? (problem 28 of the *Rhind Mathematical Papyrus*.)

   (d) (**Katz, Chapter 1, p.29, #17**) Convert the fractions 7/5, 13/15, 11/24, and 33/50 to sexagesimal notation.

   (e) (**Katz, Chapter 1, p.29, #20**) In the Babylonian system, multiply 25 by 1,04 and 18 by 1,21. Divide 50 by 18 and 1,21 by 32 (using reciprocals). Use our standard multiplication algorithm modified for base 60.

(Optional) Formal Homework Responses

The following is eligible for submission as a formal homework response. This means that the solution is written up in LaTeX with complete sentences in narrative form and the work is done individually.

1. (Adapted from (**Katz, Chapter 1, p.29, #22**) This problem involves Babylonian "bulls-eye" from Class #2 consisting of a shape formed from two arcs where each is one-third of a circle. (Use the Babylonian values/approximations of $\frac{C^2}{12}$ for the area of a circle of circumference C and 7/4 for $\sqrt{3}$.)

   (a) Show that the area of the bulls-eye is $A = \frac{9}{32}a^2$, where a is the length of the arc (one-third of the circumference).

   (b) Show that the length of the long transversal of the bulls-eye is $\frac{7}{8}a$, whereas the length of the short transversal is $\frac{a}{2}$.

   (c) Compare your answers in (a) and (b) using the Babylonian approximations to exact answers involving π and $\sqrt{3}$ to compute the percentage relative error in all 3 calculations and comment on the results.