1. This question is about Egyptian arithmetic and numerical representation.
   (a) Multiply 173 by 12 and divide 173 by 12 using the ancient Egyptian method of doubling. Show your work.
   (b) Demonstrate the the decomposition of a fraction into unique unit fractions is not unique.
   (c) Explain the purpose of the table that begins the Rhind Papyrus as described in your text book: "At the beginning of the Rhind Papyrus, there is ... a table giving the breakdown for fractions with numerator 2 and denominator an odd number between 5 and 101."
2. For this problem we will use the text's notation for numerals base 60.
   (a) Explain, with computation, how $3;20$ can be the reciprocal of 18.
   (b) What would be the analog of the reciprocal of 18 in base 10.
   (c) Describe two advantages of the Babylonian base 60 representation of numbers.
3. Know about the method of false position. You should know how to solve a problem using this method, when the method is appropriate and what its advantages are over our modern methods.
4. Give two concrete examples from our textbook in support of the statement that **how we write mathematics impacts how we do mathematics**. Each example requires the comparison of two different cultures, their writing, and their mathematics. Full points for breadth of your examples. That is, avoid having both examples be about numerical representation.
5. This question is about our knowledge of ancient Egyptian mathematics from the Rhind and Moscow papyri.
   (a) Provide some context: when, where, and what are these documents made of
   (b) What sort of mathematics is in these texts and what is the nature of the exposition.
   (c) Describe three specific results.
6. Give a concrete example of cut-and-paste algebra. This requires describing a particular text, time period, algebraic problem, and cut-and-paste picture solution.
7. This question is about the curve called the **quadtratrix**.
   (a) How is it defined, by whom, roughly when.
   (b) Why is it important in the history of mathematics? Give two specific reasons.
8. Give a brief argument in favor of and in opposition to the statement that ancient Babylonians knew the quadratic equation and/or the Pythagorean Theorem.
9. Incommensurable Quantities
   (a) What did ancient Greek mathematicians mean by the words "line segments AB and BC are incommensurable"?
   (b) How, when and who discovered the existence of incommensurable line segments.

(c) Describe (with pictures) how ancient Greek mathematicians could have constructed a line segment of length $\sqrt{n}$ for any positive integer n.

(d) Why is their existence a crisis for mathematicians?

10. What are the three construction problems of antiquity and why are they important?

11. The following question is about the quadrature of regions.

(a) Demonstrate how to construct the quadrature of an arbitrary rectangle or triangle.

(b) What is a lune and what is meant by Hippocrates' quadrature of a lune.

(c) Why is the quadrature of a lune important?

12. This question is about Euclid's Elements.

(a) Provide some basic historical facts: when and where was it written

(b) Describe its contents. What was its structure? What mathematical topics? Its style of exposition?

(c) What were some specific notable results in the Elements?

(d) State the 5th Postulate and describe its importance to the Elements and to the history of mathematics.

(e) Explain what is meant by geometric algebra using the solutions to $ac = bc$ as an example.

(f) How does Euclid's proof of the infinitude of primes differ from a modern one?

(g) Describe its influence on mathematics.

13. This question is about some of the mathematics of Archimedes.

(a) Provide some basic historical facts: when and where did Archimedes live.

(b) Give a brief comparison between Archimedes and Euclid (time, location, nature of writing)

(c) Describe the method Archimedes used to estimate the circumference of a circle.

(d) Explain how estimating that the circumference a circle of radius 20 is about 63.1 can be interpreted as an estimation of π.

(e) Describe the method Archimedes used in his quadrature of a parabolic segment.

14. This question is about Diophantus' work in *Arithmetica*.

(a) When this text was written and what sort of problems does it contain?

(b) Be able to solve a problem from *Arithmetica* that you have seen before but with slightly different numbers.

(c) Compare Diophantus' in Arithmetica and Euclid's Elements as mathematical texts.