

Test 1 will cover material from Chapters 1, 2, 3, 4 and 5 as well as from the handouts given in class. We covered a great deal of material so far in this course. The questions from the in-class portion of the test will be chosen from the following list.

Half of this test will be in-class, half take-home. You will be allowed to have a 4×6 index card for the in-class portion. You may use your notes and the texts, **but no other source** for the take-home portion. Sources which are not allowed for the take-home portion are, for example, another text, a web-based source, or another person, whether in this class or not. The computations on the in-class portion of the test will be of such a nature that electronic calculating devices will not be allowed.

For this test, you should

- be able to express decimal numbers in Babylonian notation and be able to express decimal numbers in Babylonian notation,
- know how, in Plimpton 322, a simple table could be interpreted to determine the numeration system of a culture,
- be able to express rational numbers as a sum of distinct Egyptian unit fractions,
- be able to solve simple geometrical problems involving similar triangles,
- know how to express numbers, including fractions, in bases other than 10. In particular, be able to express decimal numbers in sexigesimal notation,
- know about figurate numbers, including the general formula for P_n^r , that was derived in class,
- know how to find Pythagorean triples,
- be able to find the continued fraction expansion of numbers of the form \sqrt{b} , $b, \in \mathbb{N}$,
- be able to find the sequence of convergents, i.e. $\{|b_n|/|a_n|\}$, for a rational number or a quadratic surd,
- know how to find the continued fraction expansion of a rational number,
- know a “pictorial” proof of the Pythagorean theorem,
- know how to solve quadratic equations in the “Greek style”,
- be able to show the root of an integer is irrational by either “divisibility” or “magnitude”,
- be able to prove a result by mathematical induction,
- know about the geometric, arithmetic, harmonic mean and know which is the smallest, which is next and which is the largest,
- be able to find rational points on a conic, (This will not be on the in class portion of the test, but may be on the take home portion.)
- be able to use the extended Euclidean algorithm to find integer solutions to equations in two variables,
- be able to solve linear congruences,
- know the three famous problems of antiquity, and
- be familiar with the basic facts concerning divisibility.

Essay topics.

There will be one essay question. It will be chosen (at random) from the following list

- Advantages and disadvantages of bases other than ten.

- Strengths and weaknesses of the Babylonian numeral system.
- The three famous construction problems of antiquity.
- The mathematics of Plimpton 322.
- The "Elements" and the postulational form of thinking.

Note: There may be material on the take-home portion on the test that is not on the list above, but that you should be able to do based upon what has been discussed in this course.