1. Write the following numbers in Babylonian cuneiform using 𐤉 for 1 and 𐤊 for 10:
   (a) 26,   (b) 46,   (c) 32,   (d) 17,   (e) 58.

2. Write the following decimal numbers using the Babylonian sexagesimal position system (base 60) in two forms, once in the cuneiform and then in our Hindu-Arabic numerals separated by comma, and using a semi-colon, if necessary, to indicate where the fractional part begins.
   (a) 90,   (b) 75,   (c) 3660,   (d) 7200,   (e) 3/4.

3. Express these Babylonian numbers using our modern decimal number system (comma separates the digit, semicolon is the "sexagesimal" point):
   (a) 1, 1   (b) 1, 1, 0 ; 10   (c) 1; 30
   (d) 1, 2, 3 ; 30, 20   (e) 1, 0 ; 0, 1

4. This strip is the line number 10 on the Plimpton 322 tablet. The rightmost marks the line number 10. Ignore the second to last entry which stands for the words 'line number', read the other columns carefully.

   (a) Convince yourself that the row of numbers is (in Hindu-Arabic notation)

$(c/a)^2$	b	c	n
[1] ; 35, 10, 2, 28, 27, 24, 26, 40	1,22,41	2,16,1	10

   (b) Translate the Babylonian numbers $(c/a)^2$, b, and c into our decimal notation.
   (d) Show that the value in the first column is indeed *exactly* $(c/a)^2$, where $a^2=c^2-b^2$. Feel free to use calculator, note down as many digits as it has.

5. The Maya civilization developed a base-20 (vigesimal) system. The numbers 1 to 19 and 0 are presented as:
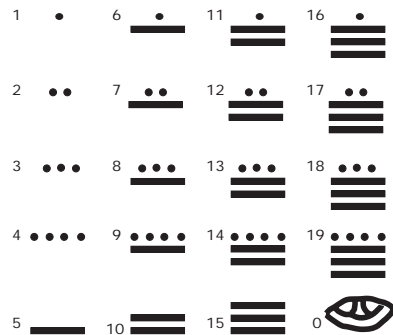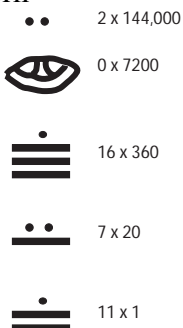

   It is a positional system reading from top (most significant digit) to bottom (least significant digit). Curiously, the third position stands for 18×20, not 20^2, as it

would in a strictly base-20 system. Thus, the decimal value of a Maya number represents:
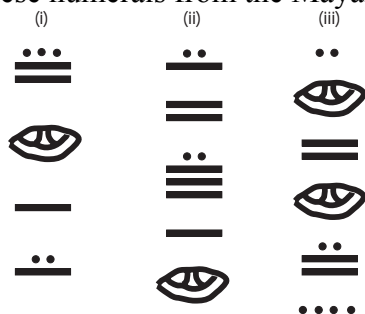
$$a_1 + a_2 \times 20 + a_3 \times 360 + a_4 \times 7200 + a_5 \times 144000 + \cdots$$

For example, the pattern

Stand for 2×144000+0×7200+16×360+7×20+11 = 293911.

(a) Convert these numerals from the Mayan system into ours:

(b) Write in the Mayan numerals corresponding to our decimal numbers:
   (i) 34,   (ii) 1492,   (iii) 1999,   (iv) 57942,   (v) 3040279.

Home Work (*hand in the following week tutorial*)

6. (**Homework**) Calculate the square root of 15, $\sqrt{15}$, accurate to at least 7 decimal digits, using the Babylonian method of averaging. Give the steps or sequence of iterations, not just the final answer. You can use a calculator to add, subtract, multiply, or divide, but of course, not square root.

7. (**Homework**) The Babylonians had a method of solving quadratic equations similar to that of completing the square that you may be familiar with from an algebra course you may have taken. Consult a college algebra textbook if necessary to solve a quadratic equation of the general form

$$ax^2 + bx + c = 0$$

by completing the square. Completing square means that you rewrite the equation in a form similar to $(\alpha x + \beta)^2 = \gamma$. Write down all the steps carefully, leading to the familiar formula for the solution x. Compute results when a=1, b=−3, and c=2.