Tenth Assignment (due Tuesday, Nov. 14th)

1) Start by proving that the bent fingers trick works for multiplying two numbers that are between 11 and 15. Recall that one bends down the fingers over 10 on each hand then the answer is given as 100 + number of bent fingers (for the tens place) + product of bent fingers (units place). For example for 13 times 13 you'd have 3 fingers bent down on each hand. The sum of the number of bent fingers on each hand is 3 +3 = 6, which implies a 60 in the answer. The product of the number of bent fingers on one hand times the other is 3 times 3 which equals 9. Then 13 times 13 should be 100 + 60 + 9 --> correct!

2) Time for a bit of historical sleuthing - please use the web to find out Brahmagupta and his most famous work *Brahmasphutasiddhanta*. Please jot down some of the information you find most interesting, including (a) something about Brahmagupta's use of zero (what did he determine 0/0 equals?), (b) Brahmagupta's formula, and (c) Brahmagupta's determination of the value of Pi (and as typically the case, please practice proper sourcing by writing down the sources you used for your answer).

3) Next, on a lighter side, give a shot at creating your own "computer" - i.e. the Napier's Bones that we started working with in class. Please either 1) print out and cut up the strips in the following handout (**Napier's Bones**) and then glue them to the backs of popsicle sticks (or just leave them in paper form if you'd prefer to keep it simple!) or 2) use the nifty online version of Napier's Bones that I showed you in class, which you can find at **http://demonstrations.wolfram.com/** (http://demonstrations.wolfram.com/) - just type in "Napiers Bones" in the search box at the upper left - you can then either use the applet in the browser or download it (either way it will probably prompt you to download and install the free CDF reader needed to use the applet) - you might want to explore and find some other "demonstrations"/applets while you're at the Wolfram site too.

Next, go ahead and use them to calculate the following: 13 x 234 and 467 x 1532 (just turn in the scratch work for these to show you did them).

4) And, just for fun, go to **http://en.wikipedia.org/wiki/Napier's_bones** (http://en.wikipedia.org/wiki/Napier's_bones) to read more about Napier's Bones. For this problem, please show that you went to this website by explaining when a description of Napier's Bones was first published, by whom, where, and also what other types of calculations the Bones were often used for.

5) Next, time to think about a few last (somewhat peculiar!) approaches to multiplication. First take a look at

this short excerpt: **Line Multiplication**. Next read about a whole host of multiplication approaches in **Weird Multiplication** (another of Jim Tanton's newsletters). Now calculate 131 x 122 using the Line Multiplication approach that Zhanat had showed us a class ago, along with the approach called "the Slider Method" in the newsletter (jotting down your calculations for each to turn in to show that you did indeed try out each method).

6) Now give a detailed explanation as to why the Slider Method works (it's also known as the Paper Strip method) using three digit numbers in your explanation. To do this you'll probably want to use our usual approach of writing out a three digit number "ABC" as A x 100 + B x 10 + C.

7) To start your mind thinking about fractions to get ready for the last problem, please go ahead and read the two following articles (nothing to turn in for this problem) - please read one of Jim Tanton's recent **Curriculum Newsletters on the intricacies of fractions**, and then, please read the following short excerpt (**Issues with Fraction Arithmetic**) from Liping Ma's classic 1999 text *Knowing and Teaching Elementary Mathematics*.

8) Finally, to get ready for next week's discussions, please think hard about how you can explain the meaning of 3/4 divided by 2/3. If we have just 3 divided by 2 then we can explain this as 3 cookies being divided among 2 people, but what can we do with 3/4 divided by 2/3? Of course we have an algorithm to handle such computations, i.e. 3/4 divided by 2/3 just equals 3/4 times 3/2... but, again, why? For this problem, please jot down some thoughts about this, and please come to class prepared to discuss this. For those of you not in the classroom, please consider emailing me your thoughts about this before Tuesday's class so I can share them in class.