Project (9pts)

Choose one of the following projects. The deadline for submission is posted on my website. Early and electronic submissions are encouraged as you'll get timely feedback. All projects must be word processed (unless otherwise stated) to earn full credit (text: font size not exceeding 12, single or 1.5 line spacing). State your ideas clearly using complete sentences and correct grammar and spelling. Extent: 1.5 – 3 pages.

If you are submitting an electronic copy of your paper, name the file in the format **YourLastName_Proj#** , where proj# is the number from the list below. For example, a student Samantha Smith, who worked on "nonstandard algorithm" project would send a file named "Smith_Proj3".

1. **Math Autobiography** (individual project, no groups!)

Project description: Write a description of how you have learned mathematics from the time you remember learning to count up through your most recent college math class(es). It includes pre-school, elementary, middle school, high school and college experience. Discuss how your experience may or will influence the way you will be teaching mathematics someday.

Write your own definition of mathematics (use your own words). What is your opinion on "the importance of mathematics" in school and life? Is it important? Why or why not? Based on your own experience, what is the best way to teach mathematics? What is the best way to learn mathematics? Note that the last two questions are different and you need to address both of them.

2. **Division in non-base-10 numeration system.** (individual or group project – 4 students maximum)

This is a theoretical project. Choose a numeration system with base different from 10 (base-2, base-5 etc.). Solve several division problems in your numeration system without converting any numbers into base 10. You must solve and explain at least 4 division problems:

- Start with a division of a two-digit number by a one-digit number. Solve the problem and explain the solution (draw cubes, base-n pieces, etc.).
- Continue with division of a two-digit number by a one-digit number but now use the table of basic multiplication facts to explain your solution.
- Continue with division of a three-digit number by a two-digit number with a non-zero remainder. Explain the solution.
- Perform a long division algorithm with two numbers of your choice. Your algorithm must contain at least 4 steps.

If it is a group project, state clearly each student's role and/or input. If you use a lot of drawings, you may hand in a neat handwritten report.

3. **Nonstandard Algorithms** (individual or group project - 3 students maximum)

The objective is to teach one of the nonstandard algorithms to at least 2 people per group member. None of your subjects should be or have been enrolled in MTH 151.

Teach the algorithm of your choice (it must be nonstandard) and give your subjects a problem or two to practice it. Then give them two more problems and tell them that they can use any method they want. Observe your subject's method and result.

Keep track of all questions the subject asked and do not forget to specify conditions: amount of time, available resources etc.

In your write-up, do not identify your subject by name in the report. Provide only background information (age/gender, attitude towards mathematics, etc.).

Explain briefly which operation you used and the algorithm you taught.

Discuss your observations. Did your subjects know the algorithm before? Was the algorithm difficult for you subject to learn? Were your subjects comfortable to use it even for problems, in which they were allowed to use any method? What were the biggest obstacles? Compare strategies of all your subjects.

4. Textbook analysis (individual or group project - 4 students maximum)

Choose a mathematics textbook for elementary grades and try to identify concepts, models or methods discussed in the class. Keep in mind that many concepts are not explicitly stated – for example, the textbook would not state that a subtraction word problem is a "missing addend" or "take-away"- it is something that you will have to identify based on what you learned in the class. Although there are no strict guidelines on what the write-up should contain, try to make your report coherent (for example, by concentrating on a specific unit or a certain concept that runs across several units or even several grades).

- Clearly indicate what textbook you are analyzing (author, publisher, …).
- Include as much information as needed (give full text of word problems, include pictures if they are significant part of the problem, etc.)

If you are doing it as a group project, state clearly each student's role and/or input. It is expected that some kind of comparison will be included for group projects (for example, one member may focus on subtraction, another student on division and compare the variety of the approaches. Or both may focus on the same concept, say subtraction, but they will be looking at different textbooks and comparing the results.)

5. **Basic addition facts in other bases** (individual or group project - 3 students maximum)

Choose a base different from 10 and greater than 7. Generate the basic addition facts table in that base and discuss strategies that may help somebody to learn the table. Recall all the strategies and addition properties that are used in base-10 and explain how they would look or work in your base. For example, what would "doubles" look like or how would "numbers adding up to 10" work in your base? Then choose 5 interesting basic addition facts and describe how these strategies can be applied to find their answer. For example, in base 10, we discussed the basic fact 7+8 and saw that we can solve it in different ways:

7+8 = 7 + (7 + 1) = (7 + 7) + 1 = 14 + 1 = 15 ….. Break down 8, associative property, doubles, adding 1
7 + 8 = (5 + 2) + 8 = 5 + (2 + 8) = 5 + 10 = 15 …. Break down 7, associative property, adding to 10, adding 10
7 + 8 = 7 + (5 + 3) = 7 + (3 + 5) = (7 + 3) + 5 = 10 + 5 …. Break down 8, commutative property, associative property, adding to 10, adding 10

Etc.

If it is a group project, you must choose base-8 or greater (2 students) or base base-11 or greater (3 students). State clearly each student's role and/or input.