Math 211- Extra Credit Assignment
Exploring Student Work and Alternative Algorithms

Addition/Subtraction:

1. Mrs. Jackson is getting ready for the state assessment, and is planning mini-lessons for students focusing on particular difficulties they are having with addition and subtraction. To target her instruction more effectively, she wants to work with groups of students who are making the same kind of error, so she looks at recent quizzes to see what they tend to do.

She sees the following three students' mistakes with addition:

A)   B)   C)

      1   1   1
     38   45   32
     49   37   14
  + 65   + 29   + 19
  ─────   ─────   ─────
    142   101   64

Explain the errors. Which have the same kind of error? Why might the students who are making the same error be making this error? What does she need to explain to them to help them understand this kind of addition problem better?

2. Mrs. Jackson sees the following three students' mistakes with subtraction:

A)   B)   C)
4   12   4   15   6 9 8 15
 502   35005   7005
− 6   −   6   − 7
─────   ──────   ──────
 406   34009   6988

Explain the errors. Which have the same kind of error? Why might the students who are making the same error be making this error? What does she need to explain to them to help them understand this kind of addition problem better?

3. Here are three methods, described in the February issue of *Teaching Children Mathematics*, that were invented by different children. In each case, study the child's work. Then solve 904 – 367 using each of the methods and then explain why that method works! Your explanations need to be based on **PROPERTIES** of addition and subtraction.

A)

872	872 – 300 = 572
- 345	572- 40 = 532
	532 – 5 = 527

B)

872	345 + 7 = 352
- 345	352 + 20 = 372
	372 + 500 = 872

C)

872	872 – 340 = 532
- 345	532 – 5 = 527

4. Here is an alternative algorithm that subtracts from left to right. Here is how 837 – 375 is done with this method:

837	8 – 3 = 5, now look to the right: 3 < 7, so put a 4 in the hundreds place.
- 375	13 – 7 = 6, now look to the right: 7 > 5, put the 6 in the tens place.
462	7 – 5 =2, put the 2 in the ones place.

Will this method always work? Explain why or why not (referring to properties, not to the standard algorithm). Now try the subtraction 904 – 367 using this method.

Multiplication:

1. Imagine that you are working with your class on multiplying large numbers. Among your students' papers, you notice that some have displayed their work in the following ways:

Student A	Student B	Student C

Student A

$$35$$
$$\times\ \ 25$$
$$\overline{125}$$
$$+\ 75$$
$$\overline{875}$$

Student B

$$35$$
$$\times\ \ 25$$
$$\overline{175}$$
$$+\ 700$$
$$\overline{875}$$

Student C

$$35$$
$$\times\ 25$$
$$\overline{25}$$
$$150$$
$$100$$
$$+600$$
$$\overline{875}$$

Each of the students has the correct answer, but as the teacher you must also evaluate their methods. Which of the students would you judge to be using a method that could be used to multiply any two whole numbers?

Explain each method (your explanation should refer to properties for justification, not comparisons with the standard algorithm):

A)

B)

C)

Do the following multiplication using each of the methods above: 23 x 46

A)   B)   C)

2. As Mr. Callahan was reviewing his students' work from the day's lesson on multiplication, he noticed that Todd had invented an algorithm that was different from the one taught in class.

Todd's work looked like this:

$$
\begin{array}{r}
983 \\
\times \quad 6 \\
\hline
488 \\
+ \ 5410 \\
\hline
5898
\end{array}
$$

Explain what Todd is doing (Hint: Todd's method is similar to an alternative algorithm we discussed in class).

Use Todd's Method for: 729 x 8

What would you do/say to Todd?