

Math 130 Midterm

Name: _____

Section 1 - Student Algorithms

The following three algorithms have been created (and used) by students. In each case, the problem/s the student is solving is given, and then the student's work is shown. For each algorithm, you must write a brief description of the student's method (worth 4 points), state if it will work (i.e. always give you the correct answer) for any pair of numbers (worth 2 points) and explain why it does or does not work for any pair of numbers (worth 7 points). Your explanation of why it does or does not work must be more than "it works (or doesn't work) because it is (or isn't) the same method as the standard algorithm."

1. $53 - 34 =$ and $72 - 17 =$

$$\begin{array}{r} 53 \\ -34 \\ \hline 19 \end{array}$$

$$\begin{array}{r} 72 \\ -17 \\ \hline 55 \end{array}$$

2. $725 \times 164 =$ and $189 \times 243 =$

$$\begin{array}{r} \overset{1}{7} \overset{2}{2} 5 \\ \times 164 \\ \hline 840 \end{array}$$

$$\begin{array}{r} \overset{3}{1} \overset{2}{8} 9 \\ \times 243 \\ \hline 547 \end{array}$$

3. $124 - 79 =$

$$\begin{array}{r} 79+1 \\ 80+40 \\ 120+4 \\ 124 \quad \underline{45} \end{array}$$

Section 2 - Problem Solving

4. In base ten, even numbers end in an even digit (for example, 316 ends in 6, which is an even digit). Is this true in all number bases? If not, in which ones is it true? If you can't come up with a general solution, you can make a conjecture and use examples to provide evidence. (16 points)

Section 3 - On Your Own

5. (a) What base did the Babylonians use in their number system? What base did the Mayans use? (2 points)

(b) What would blocks, rods and flats look like in the Babylonian and Mayan number systems? (7 points)

6. The Greeks did not use a base in their number system. How can you tell that their number system had no base? (7 points)

7. Describe what carrying (when adding two numbers) means in terms of blocks, rods, flats and cubes. (10 points)

8. What digit can the Arabic and Mayan systems represent that the Babylonian system can not represent? Why might this make representing numbers difficult for the Babylonians? (7 points)

9. In base 3, subtract $1001 - 122$. (6 points)

10. In base 11, multiply $92 \times 1X$ (where X is the digit "ten"). (6 points)