# Math 130 - Midterm 1 - February 22, 2011

Name:

| Question | Max | Score |
|---|---|---|
| 1 | 15 | |
| 2 | 15 | |
| 3 | 15 | |
| 4 | 10 | |
| 5 | 15 | |
| 6 | 15 | |
| 7 | 15 | |
| Total | 100 | |

Instructions:

Do not open the exam until instructed to do so.

The exam will be over 75 minutes from when you are allowed to open it.

Justify all of your work. If you do not show all of your work and explain steps where appropriate, you will not receive full credit. Where applicable, you will be graded on clarity and "niceness" of solution as well as correctness.

1. (15 pts) Here are three questions about the partitive and measurement interpretation of division. They are completely independent; the answer to one part will not help you answer another part.

   (a) (5 pts) Draw the bar diagram for the operation $12 \div 4$ that would accompany the solution to a word problem using the partitive interpretation of division.

   (b) (5 pts) Consider the following word problem:
   Julia has \$20, and t-shirts cost \$5 each. How many t-shirts can she buy?
   What interpretation of division is this word problem using?

   (c) (5 pts) In the long division

$$\begin{array}{rr} & \begin{array}{rrr} 2 & \mathbf{0} & 3 \end{array} \\ 4 \;) & \overline{\begin{array}{rrr} 8 & 1 & 2 \end{array}} \\ & \begin{array}{rrr} -8 & & \end{array} \\ & \overline{\begin{array}{rrr} \mathbf{0} & \mathbf{1} & \end{array}} \\ & \begin{array}{rrr} - & \mathbf{0} & \end{array} \\ & \overline{\begin{array}{rrr} & \mathbf{1} & 2 \end{array}} \\ & \begin{array}{rrr} & -1 & 2 \end{array} \\ & \overline{\begin{array}{rrr} & & 0 \end{array}} \end{array}$$

   give a measurement interpretation of the step that is bolded.

2. (15 pts) We have learned two models for interpreting counting: the set model and the measurement model. We have also learned three interpretations of subtraction: take-away, part-whole, and comparison.

   (a) (3 pts) What is the difference between the two counting models?

   (b) (4 pts) Write a word problem that uses the measurement model of counting which corresponds to the problem $15 - 4$.

   (c) (2 pt) Which interpretation of subtraction does your problem use in part (b)?

   (d) (4 pts) Write a word problem that uses the set model of counting AND a different interpretation of subtraction which corresponds to the problem $15 - 4$.

   (e) (2 pt) Which interpretation of subtraction does your problem use in part (d)?

3. (15 pts) You are at an establishment with 5 different denominations of chips that can be exchanged according to the following rules:

   5 white = 1 yellow
   5 yellow = 1 red
   5 red = 1 green
   5 green = 1 blue.

   Suppose that you place a bet with 1 red chip, 4 yellow chips, and 2 white chips and that you win, leaving you with three times as many of each color of chip as you started with.

   (a) (5 pts) If you trade your chips in so that you have no more than 4 of any one color, how many chips of each color will you have?

   (b) (8 pts) Write down the corresponding multiplication problem in base five, and solve it using a method of your choice.

   (c) (2 pts) Where in your answer to (b) did you trade yellow chips in for red chips?

4. (2 pts each - 10 pts total) For each of the following equalities, write if the statement is true or false:

   (a) $(9+9+9)-(7+7+7)+(3+3+3)-(1+1+1)=3\times(9-7+3-1)$

   (b) $a\div(b\div c)=a\times c\div b$

   (c) $9\times 54=540-54$

   (d) $\dfrac{4\times 14\times 26\times 16\times 9}{8\times 7\times 13\times 8\times 18}=\dfrac{1\times 2\times 2\times 2\times 1}{2\times 1\times 1\times 1\times 2}=\dfrac{6}{4}$

   (e) $a\times(b+c+d)=a\times b+a\times c+a\times d$

5. (5 pts each - 15 pts total) Solve each of the mental math problems. Show the steps you used to get to the answer, and write down the thinking strategies and properties of operations that you have used. Solutions that are not believable (i.e. you could not have done this in your head) will receive a score of zero.

   (a) $2 \times 7 \times 8 \times 5$

   (b) $700 \div 25$

   (c) $37 \times 63 + 63 \times 63$

6. (15 pts) In this problem you will be graded on clarity, conciseness, and presentation as well as correct mathematics. Write a teacher's solution to the following problem:

   3000 exercise books are arranged into 3 piles. The first pile has 10 more books than the second pile. The number of books in the second pile is twice the number of books in the third pile. How many books are there in the third pile?

7. (15 pts) Consider the following student algorithm for addition:

$$
\begin{array}{rrrr}
 & 7 & 6 & 5 \\
+ & 9 & 3 & 6 \\
\hline
1 & 6 & & \\
 & & 9 & \\
+ & & 1 & 1 \\
\hline
1 & & & \\
 & 6 & & \\
 & 1 & 0 & \\
+ & & & 1 \\
\hline
1 & & & \\
 & 7 & & \\
 & & 0 & \\
 & & & 1
\end{array}
$$

(If you wish to see more examples of this algorithm, pick a problem, raise your hand, and I will show you what this student would write.)

(a) (10 pts) Does the algorithm work in general? If yes, show WHY it works using expanded form - your expanded form steps should mirror the student's steps. If no, come up with a problem on which the algorithm fails (and do both this algorithm and the standard one on the problem).

(b) (5 pts) Compare this algorithm with the standard algorithm for addition by listing some "pro"s and some "con"s of this algorithm.