NAME _____

Math 130: Arithmetical Problem Solving
Midterm 1 – Monday, October 9, 2006

Instructions: You have 90 minutes for this exam. You may not use any book, notes, or calculator. If any problem seems unclear to you, ask. Do not simply solve problems; explain your solutions as well!

1. (5 pts each)

(a) State the definition of *rational numbers*.

(b) State the definition of *place value*.

(c) State the definition of *percent*.

2. (9 pts) Write the fractions $\frac{2}{3}$ and $\frac{1}{5}$ with a common denominator. Explain your method, using the meaning of fractions.

3. (9 pts) Melissa says that the only number between -2.87 and -2.89 is -2.88. Show her, using a number line, how to find more numbers between these two.

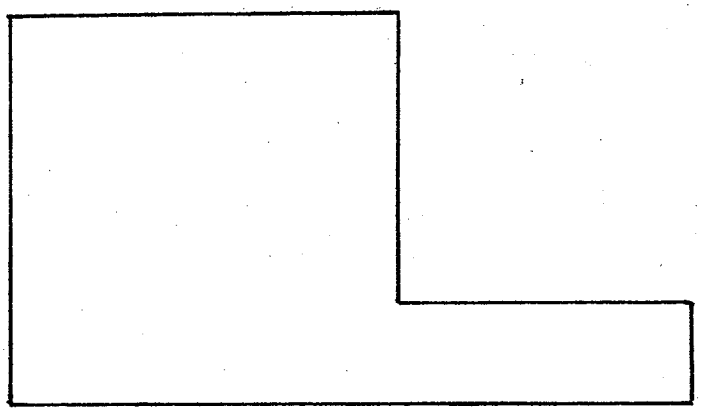
4. (5 pts each)

(a) Write a word problem involving the fractions $\frac{1}{2}$ and $\frac{3}{8}$, in which both fractions are *of* the same whole.

(b) Write a word problem involving the fractions $\frac{1}{2}$ and $\frac{3}{8}$, in which the two fractions are *of* different wholes.

5. (9 pts) Carefully explain the process that we use to determine which of two decimal numbers is larger. Illustrate your explanation by comparing 94.9 and 94.6251, and also 94.9 and 202.27.

6. (9 pts) Shade in $\frac{3}{4}$ of the area of the shape below. Use the meaning of fractions to explain why your solution is correct.



7. (9 pts) Suppose you read that the population of Madison is 210,000 people. Should you assume that this number is the *exact* population? If not, what could the exact population actually be?

8. (5 pts each) Consider the fractions $\frac{11}{30}$ and $\frac{10}{33}$.

(a) Determine which fraction is larger by cross-multiplying. Explain why this method is valid.

(b) Show another way to determine which of the two fractions is larger, using reasoning instead of computation.

9. (10 pts) Solve the following problem. Draw a diagram and explain your reasoning.

In 2004, BigCorp made a profit of \$40 million. Of that amount, 10% came from the Widget Division, and the rest from the Gizmo Division. In 2005, the Widget Division increased its profits, while the Gizmo Division made the same profit as the previous year. If 20% of BigCorp's 2005 profit came from the Widget Division, what was BigCorp's total profit in 2005?

10. (10 pts) Consider the following difficult problem:

There are 100 light switches in a row, numbered from 1 to 100, and initially all of them are turned off. A student walks along the row and flips every switch on. A second student then flips every *second* switch (numbers 2, 4, 6, ...) back off. A third student then flips every *third* switch (numbers 3, 6, 9, ...), turning them off if they were on or vice versa. Then a fourth student flips every fourth switch, and so on, until the 100th student flips only the 100th switch. At the end of this process, which switches are turned on and which are off?

Try to solve this problem. Explain the methods you use or attempt to use. If you need more space, continue on the next page. (A clear description of how you tried to solve the problem, and of what progress you made, is more important to your score than a full solution.)