

Mathematics 130, Lecture 2 (Wilson)

Midterm Exam 10/20/97

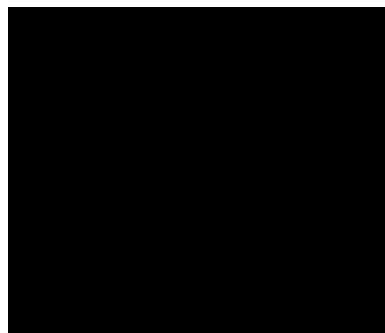
Your Name: _____

1. There are SEVEN problems. One of them is on the back of this sheet.
2. Write your answers to the seven problems in the spaces provided. If you must continue an answer somewhere other than immediately after the problem statement, be sure (a) to tell where to look for the answer, and (b) to label the answer wherever it winds up. In any case, be sure to circle your final answer to each problem.
3. There is scratch paper on the back of the last problem, but I won't look there for an answer unless you direct me to do so with a note where the answer belongs.

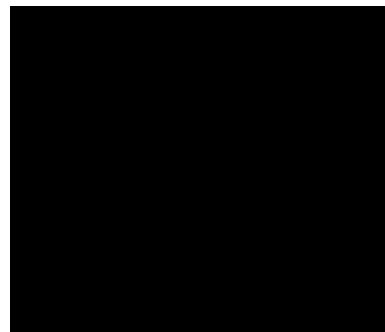
Problem	Points	Score
1	16	
2	18	
3	14	
4	14	
5	14	
6	14	
7	10	
TOTAL	100	

Problem 1:

- (a) On the diagram to the right, shade the region denoting $(A \cap \overline{B} \cap \overline{C}) \cup (B \cap C)$.



- (b) Describe the region shaded on the diagram at the right, using the symbols A , B , C , $\cap$, $\cup$, $\overline{}$, and/or parentheses.



Problem 2: In a class of 26 students, 11 like the color red, and 13 like the color blue. Of the 11 who like red, 6 *do not* like blue. How many students don't like either color?

Problem 3: Let $\odot$ be an operation defined on the set of all integers $(\cdots - 3, -2, -1, 0, 1, 2, 3, \cdots)$ by the rule $a \odot b = a + b - a \times b$. (+ and $\times$ are just the usual operations of addition and multiplication of integers.)

- (a) What is $2 \odot 5$?
- (b) Is this operation closed?
- (c) Is this operation commutative?
- (d) Is this operation associative?
- (e) Show that the integer 0 is an identity for this operation.
- (f) What is $2 \odot 2$? Show that 2 has an inverse with this operation.

Problem 4:

- (a) How would you write the number 435_{six} in base ten?
- (b) How would you write the number 57_{ten} in base four?
- (c) Which is larger, 43_{five} or 43_{seven} ?

Problem 5:

- (a) Add the following numbers, which are given in base 6. (You can work the problem in base ten as a **check** on your answer, but you should show the work in base six needed to get it.)

$$\begin{array}{r} 4 \ 1 \ 5 \ 3 \\ + \ 3 \ 4 \ 3 \ 4 \\ \hline \end{array}$$

- ((b) Multiply the following numbers, which are given in base 4. (You can work the problem in base ten as a **check** on your answer, but you should show the work in base four needed to get it.)

$$\begin{array}{r} 1 \ 2 \ 1 \ 3 \\ \times \quad \quad 1 \ 3 \\ \hline \end{array}$$

Problem 6: Consider the set of all automobiles. Define two relations on this set by:

For any two cars Car_1 and Car_2 , $\text{Car}_1 \asymp \text{Car}_2$ if Car_1 and Car_2 are the same color.

For any two cars Car_1 and Car_2 , $\text{Car}_1 \succeq \text{Car}_2$ if Car_1 has been driven at least as many miles as Car_2 .

For each relation, tell whether it is reflexive, whether it is symmetric, whether it is transitive, and whether it is an equivalence relation.

Problem 7: Discuss the problem solving strategies which your group tried in solving Poison and the page folding problem. Which were most effective? Did some strategies work better for one problem than the other? What other strategies might you apply if you went back to those problems now? For the various strategies you consider, try to describe what kinds of problems they might work best on: You might want to think about problems which are purely mental *vs* those which involve physical activity, problems which are mainly verbal *vs* those which are more numeric, *etc.* (You don't have to fill up this whole page! Do write at least a paragraph, using complete sentences.)

Scratch Paper