Math 104: Finite Mathematics
Summer 2002, Exam 1

This exam is meant to test your mastery of stuff we've done so far. If at any point it looks like I'm trying to trick you, or if it looks like you'd need something we haven't done, that's probably a clue that you're looking at it the wrong way. Of course, you're welcome to ask me if you have any questions about the statements of the problems.

Answer each question, *showing all work which is necessary to do the problem.* Answers may be left in the form of factorials unless otherwise noted.

1. Consider the universe of all lightbulbs produced by a given factory. Let E be the set of all lightbulbs that burn for less than 50 hours before burning out. Let F be the set of all bulbs that burn less than 100 hours. Describe the set $E \cap F$ as simply as possible.

2. When researching affirmative action, I found 846 law review articles dealing with affirmative action in either education or employment. Six hundred twelve of them talked about affirmative action in empoyment. Seven hundred forty five talked about affirmative action in education. How many talked about both?

3. The following is a portion of the table of contents of J. Herndon's *A Survey of Modern Grammars*:

   Structural Grammar

5.	Structural Grammar Methods	65
6.	The Phonology of English	71
7.	The Morphology of English	81
8.	Structural Analysis of English Syntax	88

   What is the cardinality of the set of words used? [Don't count numbers.]

4. What is the value of $\frac{5!6!}{2!3!4!}$? [A number]

5. Math 104 has 11 students and Math 108 has 19. Suppose the two classes play a baseball game. How many batting orders (of 9 players) are possible for Math 104?

6. A "flush" is a poker hand consisting of five cards of the same suit. How many flushes are possible in a standard deck (52 cards, 13 of each suit)?

7. If we toss a coin five times, how many possible outcomes are there? How many with at least two heads? Exactly 2? Exactly 3?

8. Consider the universe

$$U = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$$

and the following sets:

$$\begin{aligned} R &= \{\text{odd members of U}\} \\ S &= \{1, 2, 3, 4, 5, 6, 7, 8\} \\ T &= \{0, 2, 3, 5, 7, 8\} \end{aligned}$$

(a) Draw a venn diagram to represent this situation, writing each member of U in the appropriate region.

(b) List the elements in the following sets:

i. $R \cap S$

ii. $R \cup S$

iii. $(R \cap S') \cup T$

(c) Use R, S, T, and set-theoretic notations to describe the set $\{2, 8\}$.