Math 104: Finite Mathematics
Fall 2002, Exam 1

This exam is meant to test your mastery of stuff we've done in class. 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* (i.e. "my calculator says so" does not suffice). Answers may be left in the form of factorials or as products, sums, square roots, etc. of numbers unless otherwise noted.

1. (12pts) Consider the universe of all lightbulbs produced by a given factory. Let E be the set of all lightbulbs that burn for less than 200 hours before burning out. Let F be the set of all bulbs that burn less than 1000 hours. Describe the set $E \cup F$ as simply as possible.

2. (12pts) Among the numbers from 1 to 50 (inclusive), there are 25 numbers that are multiples of 2. There are 16 numbers that are multiples of 3. There are 8 numbers that are multiples of both (i.e. are multiples of 6). How many are multiples of either 2 or 3.

3. (9pts) A certain group of students has the following set of first names: Katie, Mary, Sean, Michael, Katie, Dillon, Daniel, Katie, Cindy, Keith, Mary. What is the cardinality of this set?

4. (9pts) What is the value of $\frac{7!5!}{4!6!}$? [A number]

5. (12pts) I love having volunteers in class. If 75 students are present and there are 6 problems, each to be done by a volunteer, if no student may volunteer more than once, in how many ways can the volunteers be selected?

6. (12pts) A "flush" is a poker hand consisting of five cards of the same suit. How many flushes are possible in a standard decks (52 cards, 13 of each suit)?

7. (17pts) If we toss a coin five times, how many possible outcomes are there? How many with exactly two heads? At least 2?

8. (17pts) 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. $(R \cap S') \cup T$

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