Math 301
Quiz 5
Spring 2005

Be neat and organized. Clearly indicate your answers. 20 points possible.

1. (5 pts.) A study was done to determine the efficacy of three different drugs—A, B, and C—in relieving headache pain. Over the period covered by the study, 100 subjects were given the chance to use all three drugs. The following results were obtained:

37 reported relief from drug A

34 reported relief from drug B

45 reported relief from drug C

25 reported relief from both drugs A and B

21 reported relief from both drugs A and C

22 reported relief from both drugs B and C

66 reported relief from at least one of the drugs

Note that some of the 37 subjects who reported relief from drug A may also have reported relief from drugs B or C. A similar occurrence may be true for the other data.

(a) How many people got relief from none of the drugs?

(b) How many people got relief from all three drugs?

(c) How many people got relief from A only?

2. (5 pts.) A club is considering changing its by-laws. In an initial straw vote on the issue, 18 of the 50 members of the club favored the change and 32 did not. A committee of eight is to be chosen from the 50 club members to devote further study to the issue.

[You may leave your answers in symbolic form. You do not have to simplify to a single number.]

(a) How many committees of eight can be formed from the club membership?

(b) How many of the committees will contain at least four club members who, in the initial straw vote, favored the change in the by-laws?

3. (5 pts.) (a) Find all binary relations from $\{a\}$ to $\{b, c\}$.

(b) Find all functions from $\{a\}$ to $\{b, c\}$.

4. (5 pts.) (In this problem, $\mathcal{P}(A)$ denotes the power set of A.)

Let $A = \{v, w, x, y, z\}$ and define a function $F : \mathcal{P}(A) \to \mathbf{Z}$ as follows: For all sets X in $\mathcal{P}(A)$,

$$F(X) = \begin{cases} 3 & \text{if } X \text{ has an even number of elements} \\ 2 & \text{if } X \text{ has an odd number of elements} \end{cases}$$

Find the following. (Clearly mark your answer—put a box around it.)

(a) $F(\{v, x, y, z\})$

(b) $F(\varnothing)$

(c) $F(\{w, x, y\})$

Optional Bonus Problem. (4 optional bonus points possible) How many (positive) factors does 1,620,000,000 have?