

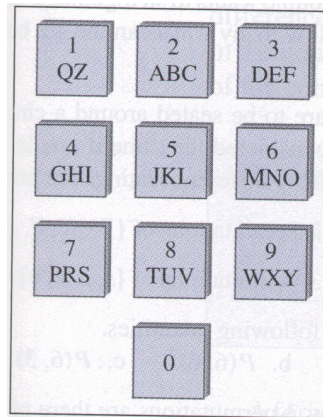
You must work alone on your homework, and homework must be **written legibly**, single-sided on your own lined paper, **or typed**, with the answers clearly labeled and in the sequential order as assigned. You must write your name and university ID number in the upper right-hand corner of your homework. Staple all pages together and be sure that your name appears on every sheet.

1. (4 points) Write your name clearly on each page. Write the time and place of Exam 2.
2. (15 points) Let $P(A)$ be the power set of A . Prove that for all sets A and B ,
 $P(A \cap B) = P(A) \cap P(B)$.
3. (10 points) Consider the following statements:
 - 100 students are majoring in CS, Math, and/or Engineering
 - 20 CS students are also engineering majors, but are not Math majors
 - 10 CS students are also math majors students
 - 40 students are CS majors only
 - 15 students are majoring in both Math and Engineering
 - 25 students are math majors
 - 5 students are majoring in all three
 - (a) (2 points) How many CS majors are there?
 - (b) (2 points) How many Engineering students are there?
 - (c) (2 points) How many students are only majoring in Engineering?
 - (d) (4 points) Draw and label a Venn diagram indicating how many students are in each subset.
4. (10 points) Consider the numbers 1 through 99,999 in their ordinary decimal representations. How many contain exactly one of each of the digits 2, 3, 4, and 5?
5. (15 points) Answer the following:
 - (a) How many integers from 1 through 100,000 contain the digit 6 exactly once?
 - (b) How many integers from 1 through 100,000 contain the digit 6 at least once?
 - (c) If an integer is chosen at random from 1 through 100,000, what is the probability that it contains two or more occurrences of the digit 6?
6. (12 points) Answer each of the following:
 - (a) How many distinguishable ways can the letters of the word MILLIMICRON be arranged in order?
 - (b) How many distinguishable orderings of the letters of MILLIMICRON begin with M and end with N.
 - (c) How many distinguishable orderings of the letters of MILLIMICRON contain the letters CR next to each other in order and also the letters ON next to each other in order?

HW #10

Student: _____
ID #: _____

7. (10 points) The diagram below shows the keyboard for an automatic teller machine. As you can see, the same sequence of keys represents a variety of different PINs. For instance, 2133, AZDE, and BQ3F are all keyed in exactly the same way.



- (a) How many different PINs are represented by the same sequence of keys as 5031?
- (b) At an automatic teller machine, each PIN corresponds to a four-digit numeric sequence. For instance, TWJM corresponds to 8956. How many numeric sequences contain no repeated digit?
8. (12 points) Suppose that three computer boards in a production run of forty are defective. A sample of five is to be selected to be checked for defects.
- (a) (4 points) How many different samples can be chosen?
- (b) (4 points) How many samples will contain at least one defective board?
- (c) (4 points) What is the probability that a randomly chosen sample of five contains at least one defective board?
9. (12 points) Consider the strings of length n over the set $\{a, b, c, d\}$.
- (a) How many such strings contain at least one pair of adjacent characters that are the same?
- (b) If a string of length ten over $\{a, b, c, d\}$ is chosen at random, what is the probability that it contains at least one pair of adjacent characters that are the same?
10. (+10 points) A calculator has an eight-digit display and a decimal point that is located at the extreme right of the number displayed, at the extreme left, or between any pair of digits. The calculator can also display a minus sign at the extreme left of the number. How many distinct numbers can the calculator display? (Note that certain numbers are equal, such as 1.9, 1.90, and 1.900, and should, therefore, not be counted twice.)
11. (No points will be awarded for this assignment unless this is done) Sign your name to the following honor code statement: "I pledge on my honor that I have not given or received any unauthorized assistance on this assignment".