Homework 1

Please complete the problems on a separate sheet of paper with your name at the top. Make sure to show your work and/or provide an explanation for each problem. Please be clear in your work. Partial credit will be given when merited. The total credit is 5 points.

Problem 1. Suppose that A and B are two events. Write expressions involving unions, intersections, and complements and A and B to describe an event C for the following:

(a) C occurs only if both events occur. (0.25 point)

(b) C occurs if at least one event occur. (0.25 point)

(c) C occurs if neither occurs. (0.25 point)

(d) C occurs if the event A occur, but B does not occur. (0.25 point)

Problem 2. Samples of a cast Samples of a cast aluminum part are classified on the basis of surface finish (in microinches) and edge finish. The results of 100 parts are summarized as follows: Let A denote the event that a sample has excellent surface finish, and let B denote

		Edge Finish	
		Excellent	Good
Surface Finish	Excellent	69	11
	Good	1	19

the event that a sample has excellent edge finish. **Describe the events in words** and determine the number of samples in each of the following events.

(a) $A^c \cap B$(0.25 point)

(b) $(A \cap B^c) \cup (A \cap B)$ (0.5 point)

(c) $(A \cup B^c) \cap (A \cup B)$ (0.5 point)

(d) $(A \cup B)^c$ (0. 5 point)

Problem 3. Provide a reasonable description of the sample space for each of the following random experiments. Two bits are transmitted over a digital communications channel. Each bit is either distorted or received without distortion. Let A_i denote the event that the i-th bit is distorted but other bits could be distorted or not distorted, $i = 1, 2$.

(a) Describe the sample space for this experiment (list all the possible outcomes in the sample space). (0.25 point)

(b) List the outcomes in each event A_i. Are the A_1, A_2 mutually exclusive (disjoint)? (0.25 point)

Problem 4. Suppose two dice are tossed and the numbers on the upper faces are observed. Let S denote the set of all possible pairs that can be observed. The pairs can be listed, for example, by letting $(2, 3)$ denote that a 2 was observed on the first die and a 3 on the second. Define the following subsets of S:

- A: The number on the first die is odd.
- B: The sum of the two numbers is even.

Describe the events $A^c \cap B$ and $A \cup B^c$ in words and list all the outcomes in the events. (0.25 each)

Problem 5 Five cards are dealt from a standard 52-card deck. Note that there are 13 kind of cards and each kind has 4 cards in a standard deck.

(a) How many ways that one can draw 2 aces and 2 kings? (0.5 point)

(b) How many ways that one can draw a full house (3 cards of one kind, 2 cards of another kind)? (0.75 point)