1.1 (Feller p.24, problem 1) Among the digits 1,2,3,4,5 first one is chosen, and then a second selection is made among the remaining four digits. Build a sample space. Assume that all outcomes are equally likely. Find the probability that an odd digit will be selected (a) the first time, (b) the second time, (c) both times, by writing each of these events as a list of outcomes.

1.2 (Feller p.24, problem 5) Three equally strong players A, B, and C take turns at a game. At the start A and B play while C is out. At the second trial the winner plays against C while the loser is out. The game continues in this way until a player wins twice in succession, thus becoming the winner of the game. (We disregard the possibility of ties.) Build a sample space describing outcomes by a (finite or infinite) sequence of letters representing the winners at the trials. Assign probability $1/2^k$ to any outcome which contains exactly $k$ (finitely many) letters.

(a) Show that the probabilities of the finite sequences add up to one, so the infinite sequences receive probability zero (though they are possible).

(b) Show that the probability A wins is $5/14$, the probability of B winning is the same, while C has only probability $4/14$ of winning.

(c) Show that the probability that no decision is reached at or before the $k$th turn is $1/2^{k-1}$.

1.3 (Feller p.24, problem 9) Two dice are thrown. Let $A$ be the event that the sum of the faces is odd, $B$ the event of at least one ace. Describe the events $A \cap B$, $A \cup B$, $A \cap \overline{B}$ by writing them as a list of outcomes. Find their probabilities assuming that all the 36 sample points have equal probabilities.

1.4 (Feller p.25, problem 15) Find simple expressions for

(a) $(A \cup B) \cap (A \cup \overline{B})$,
(b) $(A \cup B) \cap (A \cup \overline{B}) \cap (A \cup \overline{B})$,
(c) $(A \cup \overline{B}) \cap (B \cap C)$.

1.5 (Feller p.25, problem 16) State which of the following relations are correct and which are incorrect:

(a) $(A \cup B) \setminus C = A \cup (B \setminus C)$,
(b) $A \cap B \cap C = A \cap B \cap (C \cup B)$,
(c) $A \cup B \cup C = A \cup (B \setminus (A \cap B)) \cup (C \setminus (A \cap C))$,
(d) $A \cup B = (A \setminus (A \cap B)) \cup B$,
(e) $(A \cap B) \cup (B \cap C) \cup (C \cap A) \cap A \cap B \cap C$,
(f) $(A \cup B) \cup (B \cap C) \cup (C \cap A) \cap A \cup B \cup C$,
(g) $(A \cup B) \setminus A = B$,
(h) $A \cap B \cap C \subset A \cup B$,
(i) $(A \cup B \cup C) = A \cap B \cap C$,
(j) $(A \cup B) \cap C = (A \cap C) \cup (B \cap C)$,
(k) $(A \cup B) \cap C = A \cap B \cap C$,
(l) $(A \cup B) \cap C = C \setminus (C \setminus (A \cup B))$. 

1.6 (Feller p. 25, problem 17) Let $A, B, C$ three arbitrary events. Find expressions for the events that of $A, B, C$:
(a) only $A$ occurs, (b) both $A$ and $B$, but not $C$, occur, (c) all three events occur, (d) at least one occurs, (e) at least two occur, (f) one and no more occurs, (g) two and no more occur, (h) none occurs, (i) not more than two occur.