COMP 312
Assignment 6
Due at 9:00, Tuesday, November 13, 2007
All problems are of equal value.

Reading

Brassard & Bratley, Sections 1.7.4, 7.4.2, Chapter 10.

Practice

Brassard & Bratley, 1.45, 1.47, 10.12, 10.14, 10.19, 10.21, 10.27, 10.28, 10.33, 10.36.

To Be Handed In

1. Consider the event space consisting of flipping a coin four times. Assume the probability of getting a heads on each flip is p and of tails $1 - p$.
   (a) What is the probability of the event: the second coin flip results in heads and the fourth coin flip results in tails?
   (b) What is the probability of the event: the number of heads is even?
   (c) Let X be the random variable that is equal to the the number of heads minus the number of tails. What is the expected value of X?
2. Brassard & Bratley 10.1.
3. Brassard & Bratley 10.11.
4. Brassard & Bratley 10.29. Only consider the portion of the problem up to the sentence starting "Modify algorithm ...".
5. Consider the following program for computing the maximum of n distinct values stored in an array:

```
max := a[0]
for i = 1, ..., n-1
    if a[i] > max then
       max := a[i] (*)
```

   What is the expected number of times statement (*) is executed if the values appear in random order. For full marks express your answer using Θ-notation as a function of n.

Bonus

A prison warden has randomly picked one prisoner among three (X,Y and Z) to go free. The other two will be executed. The guard knows which one will go free but is forbidden to give any prisoner information regarding his/her status. Prisoner X asks the guard which of Y or Z will be executed, arguing that since he already knows that at least one of them must die, the guard won't be revealing any information about his/her own status. The guard tells X that Y is to be executed. Prisoner X feels happier now, since he figures that either he or Z will go free, which means that his probability of going free is now 1/2. Is he right, or are his/her chances still 1/3? Explain.