

**Chennai Mathematical Institute**  
**Probability Theory: January-April 2014**

**Assignment 2**

1. A single die is tossed; then  $n$  coins are tossed, where  $n$  is the number shown on the die. Find the probability of exactly two heads.
2. A player tosses a coin and scores one point for every head and two points for every tail. The game continues until his score reaches or exceeds  $n$ . Let  $P_n$  represent the probability of attaining a score of exactly  $n$ . Find a recursive formula for  $P_n$  and find its value.
3. A public health researcher examines the medical records of a group of 937 men who died in 1999 and discovers that 210 of the men died from causes related to heart disease. Moreover, 312 of the 937 men had at least one parent who suffered from heart disease, and, of these 312 men, 102 died from causes related to heart disease.  
  
Determine the probability that a man randomly selected from this group died of causes related to heart disease, given that neither of his parents suffered from heart disease.
4. Consider series and parallel systems with  $n$  independent components. Let  $p_i$  denote the probability of failure for the  $i$ -th component. Find the probability that the system fails. If  $p_i = p$  for all  $i$ , compute the probability of system failure for different values of  $p$  and  $n$ . Comment on the effect of  $n$ .