

Introduction to Probability and Statistics - 18.05

Problem set 2

Due Friday, Feb. 29, 2008

1. You are playing a board game. You first flip a coin and then roll a fair die. If the coin comes up "heads", then you move the number of steps showing on the die; if the coin comes up "tails", then you move twice as many steps as the die shows. What is the probability of moving (on a given turn) at least 5 steps?
2. A drunk man comes home. He has 5 keys on his keychain and he is too drunk to remember which is the key to the front door. So he randomly chooses one key after another until he picks the right one. In fact he is so drunk that he is just likely to pick the same key again even though he just tried it. What is the probability that the first 5 tries are all wrong?
3. A fair die is rolled until the sum of the results of all the rolls exceeds 6. The random variable X is the number of throws needed for this. Let F be the distribution function of X . Determine $F(1)$, $F(2)$ and $F(7)$.
4. Five Amateur skiers ski down from the summit. At each turn in the trail, each one of them has probability 0.3 to fall, and the event of falling at a turn is independent of other skiers and also independent of whether the skier fell at previous turns. What is the probability that exactly two skiers do not fall in the first four turns?
5. Suppose that the ski trail in the previous question is infinitely long (and has infinitely many turns).
 - (a) What is the probability that a skier that starts at the summit (again with probability 0.3 to fall at each turn) never falls?

- (b) Given that a skier hasn't fallen in the first 10 turns, what is the probability that she will fall for the first time in the 20'th turn?