

**Due: Thursday, August 20th, 2015**

*Problem to be turned in: 6,7*

- Two bookies, Gupta and Netika, bet Rupees 100 each on successive tosses of a coin. Each has Rupees 600 in hand.
  - What is the probability that they break even after six tosses of the coin?
  - What is the probability that Netika wins all of the money on the tenth toss of the coin?
- Suppose that airplane engines operate independently in flight and fail with probability  $p$  ( $0 \leq p \leq 1$ ). A plane makes a safe flight if at least half of its engines are running. Kingfisher Air lines has a four-engine plane and Paramount Airlines has a two-engine plane for a flight from Bangalore to Delhi. Which airline has the higher probability for a successful flight ?
- At Indian Statistical Institute, Bangalore there are 98 students. What is the probability that more than five students were born on Independence day ? Assume that birthrates are constant throughout the year and that each year has 365 days.
- Suppose a fair coin is tossed 15 times. Find
  - $P(\{4 \text{ heads occur}\}|\{3 \text{ or } 4 \text{ heads occur}\})$ ,
  - $P(\{k - 1 \text{ heads occur}\}|\{k - 1 \text{ or } k \text{ heads occur}\})$ , and
  - $P(\{k \text{ heads occur}\}|\{k - 1 \text{ or } k \text{ heads occur}\})$ .
- Two intramural volleyball teams have eight players each. There is a 10% chance that any given player will not show up to a game, independently of any another. The game can be played if each team has at least six members show up. How likely is it the game can be played ?
- Mark is a 70% free throw shooter. Assume each attempted free throw is independent of every other attempt. If he attempts ten free throws, answer the following questions.
  - How likely is it that Mark will make exactly seven of ten attempted free throws?
  - What is the most likely number of free throws Mark will make?
  - How do your answers to (a) and (b) change if Mark only attempts 9 free throws instead of 10?
- Continuing the previous exercise, Kalyani isn't as good a free throw shooter as Mark, but she can still make a shot 40% of the time. Mark and Kalyani play a game where the first one to sink a free throw is the winner. Since Kalyani isn't as skilled a player, she goes first to make it more fair.
  - How likely is it that Kalyani will win the game on her first shot?
  - How likely is it that Mark will win this game on his first shot? (Remember, for Mark even to get a chance to shoot, Kalyani must miss her first shot).
  - How likely is it that Kalyani will win the game on her second shot?
  - How likely is it that Kalyani will win the game?
- A fair die is rolled repeatedly.
  - What is the probability that the first 6 appears on the fifth roll?
  - What is the probability that no 6's appear in the first four rolls?
  - What is the probability that the second 6 appears on the fifth roll?