CS 70 Discrete Mathematics and Probability Theory
Spring 2018 Satish Rao and Babak Ayazifar

Discussion 08B

1 Head Count

Consider a coin with $\mathbb{P}(\text{Heads}) = 2/5$. Suppose you flip the coin 20 times, and define X to be the number of heads.

(a) What is the distribution of X?

(b) What is $\mathbb{P}(X = 7)$?

(c) What is $\mathbb{P}(X \geq 1)$?

(d) What is $\mathbb{P}(12 \leq X \leq 14)$?

2 To Pay or Not to Pay?

Alice goes to Berkeley and she drives to school everyday. Tired of always paying for parking, Alice decides one day not to pay her parking fees. Assume that there is a probability of 0.05 that she gets caught by the meter maid. The parking fee is \$0.25 and if she is caught, her parking ticket is \$10.

(a) How does the expected cost of parking 10 times without paying the meter compare with the cost of paying the meter each time? (*Hint*: Think of Alice getting caught or not as a single biased coin flip with probability 0.05.)

(b) If she parks at the meter 10 times, what is the probability that she will have to pay more than the total amount she could end up saving by not putting the money?

3 Maybe Lossy Maybe Not

Let us say that Alice would like to send a message to Bob, over some channel. Alice has a message of length 4 and sends 5 packets.

(a) Packets are dropped with probability p. What is probability that Bob can successfully reconstruct Alice's message?

(b) Again, packets can be dropped with probability p. The channel may additionally corrupt 1 packet. Alice realizes this and sends 3 additional packets. What is the probability that Bob receives enough packets to successfully reconstruct Alice's message?

(c) Again, packets can be dropped with probability p. This time, packets may be corrupted with probability q. Consider the original scenario where Alice sends 5 packets for a message of length 4. What is probability that Bob can successfully reconstruct Alice's message?