STAT/MA 41600

In-Class Problem Set #2: August 24, 2018

1. Suppose 6 bears (a daddy bear and two daughter bears and three son bears) sit around a circular campfire. The daddy bear always sits in the same place, but the locations of the other five bears are random. Assume that all arrangements of the daughter bears and son bears are equally likely.

1a. What is the probability that the two daughter bears sit next to each other?

1b. What is the probability that the two daughter bears sit next to each other *and* (simultaneously) the three son bears sit next to each other?

1c. What is the probability that none of the son bears are sitting next to each other?

2. Consider a bear family with 6 bears that have 6 different colors. Pick three of the bears, with replacement in between the selections. Keep track of the bears selected, in order.

2a. Let B denote the event that at least one purple bear is selected among the three bears chosen. What is $P(B)$?

2b. Let C_j denote the event that exactly j colors appear altogether, in the selection of the three bears. Do C_1, C_2, C_3 form a partition of the sample space?

2c. Calculate the probability of each of the events C_j.

3. Same setup as question #2. In this setup, suppose that Mary loves purple and orange bears. Let A_j denote the event that her jth selection was purple or orange.

3a. Do the events A_1, A_2, A_3 form a partition of the sample space?

3b. Calculate $P(A_1 \cap A_2 \cap A_3)$.

3c. Calculate $P(A_1 \cup A_2 \cup A_3)$.

4. Suppose that Mary draws bears (with replacement) according to the setup in question #2, until she gets her first bear that is either purple or orange, and then she quits drawing immediately afterwards. What is the probability that she does not select any yellow bears during this process?