Stat 134: Section 2

Brett Kolesnik

January 27th, 2020

Conceptual Review

Please discuss these short questions with those around you in section. These problems are intended to highlight concepts that will be relevant for today's problems.

a. What is the conditional probability rule? Bayes' Rule?

b. Write the inclusion-exclusion rule for three events (i.e. $P(A \cup B \cup C)$).

c. What are the steps for a proof by induction?

Problem 1

Events A, B, and C are defined in an outcome space. Find expressions for the following probabilities in terms of $P(A)$, $P(B)$, $P(C)$, $P(AB)$, $P(AC)$, $P(BC)$, and $P(ABC)$. (Recall that $P(AB) = P(A \cap B)$.)

a. The probability that exactly two of A, B, C occur.

For these questions, it might prove helpful to first draw a Venn diagram.

b. The probability that exactly one of these events occurs.

c. The probability that none of these events occur.

In part c, use what you already know to avoid doing unnecessary work.

Ex 1.3.10 in Pitman's Probability

Problem 2

A hat contains $f + b$ coins, f of which are fair, b of which are biased to land heads with probability 2/3. A coin is drawn from the hat and tossed twice. The first time it lands heads, and the second time it lands tails. Given this information, what is the probability that it is a fair coin?

Ex 1.rev.11 in Pitman's Probability

Again, it might prove helpful to first draw a diagram here; use a tree diagram this time.

Problem 3

A box contains n tickets, labeled $1, 2, \ldots, n$. Two tickets are drawn at random from the box. Find the chance that the numbers on the two tickets differ by two or more if the draws are made:

a. with replacement;

b. without replacement.

Ex 1.rev.19 in Pitman's Probability

Prepared by Yiming Shi