Stat 134: Section 8

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Problem 1

A collection of tickets comes in four colors: red, blue, white, and green. There are twice as many reds as blues, equal numbers of blues and whites, and three times as many greens as whites. I choose 5 tickets at random with replacement. Let X be the number of different colors that appear.

a. Find $\mathbb{E}X$.

b. Use Markov's inequality to find an upper bound for $P(X \geq 3)$.

Ex 3.2.19 in Pitman's Probability

Problem 2

a. Show that if X and Y are independent random variables, then $Var(X - Y) = Var(X + Y)$

b. Let D_1 and D_2 represent two draws at random with replacement from a population, with $\mathbb{E}D_1 = 10$ and $SD(D_1) = 2$. Find a number c so that $P(|D_1 - D_2| < c) \geq 99\%$.

Ex 3.3.15 in Pitman's Probability

Problem 3

Let X be the number of Bernoulli(p) trials required to produce at least one success and at least one failure. Find

a. the distribution of X;

b. $\mathbb{E}X$;

c. $Var(X)$.

Ex 3.4.10 in Pitman's Probability

Problem 4

Bill, Mary, and Tom have coins with respective probabilities p_1, p_2, p_3 of turning up heads. They toss their coins independently at the same times.

a. What is the probability it takes Mary more than n tosses to get a head?

b. What is the probability that the first person to get a head has to toss more than n times?

c. What is the probability that the first person to get a head has to toss exactly n times?

d. What is the probability that neither Bill nor Tom get a head before Mary?

Ex 3.4.5 in Pitman's Probability