Stat 134: Section 11

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Problem 1

Suppose that A tosses a coin which lands heads with probability p_A, and B tosses one which lands heads with probability p_B. They toss their coins simultaneously over and over again, in a competition to see who gets the first head. The one to get first head is the winner, except that a draw results if they get their first heads together. Calculate:

For d., think about the probability that a game is undecided on a particular turn.

a. $P(A \text{ wins})$;

b. $P(B \text{ wins})$;

c. $P(\text{draw})$;

d. the distribution of the number of times A and B must toss.

Ex 3.4.11 in Pitman's Probability

Problem 2

How many raisins must cookies contain on average for the chance of a cookie containing at least one raisin to be at least 99%?
Ex 3.5.2 in Pitman's Probability

Problem 3

On average, one cubic inch of Granma's cookie dough contains 2 chocolate chips and 1 marshmallow.

a. Granma makes a cookie using three cubic inches of her dough. Find the chance that the cookie contains at most four chocolate chips. State your assumptions.

b. Assume the number of marshmallows in Granma's dough is independent of the number of chocolate chips. I take three cookies, one of which is made with two inches of dough, the other two with three cubic inches each. What is the chance that at most 1 of my cookies contains neither chocolate chips nor marshmallows?

Hint: Define a "goodie" as either a marshmallow or a chocolate chip. Let X_1 be the number of goodies in cookie 1; X_2 be the number of goodies in cookie 2, and X_3 be the number of goodies in cookie 3. Phrase the question in terms of X_1, X_2, and X_3.

Ex 3.5.16 in Pitman's Probability

Problem 4

The horn on an auto operates on demand 99% of the time. Assume that each time you hit the horn, it works or fails independently of all other times.

a. How many times would you expect to be able to honk the horn with a 50% probability of not having any failures?

b. What is the expected number of times you hit the horn before the fourth failure?

Be careful! What is the difference between "number of times you hit the horn **before** the fourth failure" and "number of times you hit the horn **until** the fourth failure"?

Ex 3.rev.26 in Pitman's Probability

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