Stat 50 – Worksheet #13: The Geometric and Hypergeometric Distributions, Part II

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1. Suppose a bowl contains 2 blue and 8 red balls. Balls are randomly selected **with replacement** until the first blue ball is drawn. Let $X=$ the draw on which the first blue ball occurs.

   (a) What is the probability the first blue ball is drawn on the 3rd draw?

   (b) What is the probability it takes 5 or more draws to get the first blue ball?

   (c) Write a formula for $P(X = x)$. Be sure to specify the values of X for which the formula is valid.

   (d) On average, how many draws will it take to obtain the first blue ball?

2. A coin is biased so that the probability of heads is 0.6. Suppose the coin is tossed until the second heads occurs.

   (a) Suppose the second heads occurs on the 4th toss. Write out all possible outcomes in this event. For example, HTTH is one outcome, write out two other outcomes.

   (b) Let $X=$ the toss on which the 2nd heads occurs. Compute $P(X = 4)$ by summing the probabilities of all the three outcomes in 2a.

   (c) List all the outcomes in the event $X = 6$. Two outcomes are HTTTTH and THTTTH. Find $P(X = 6)$.

   (d) Use the reasoning from the last two parts to derive a formula for $P(X = k)$ where $k = 2, 3, 4, ...$

   (e) Why does k start at 2 in the last part?