

**True/False** - No explanation needed. (For each: 1 point if correct, 0 points if not answered, -1 points if incorrect)

1. Sampling without replacement begins to look like sampling with replacement as I increase the population size and as I increase the probability of being sampled. True/False

False. It begins to look like sampling with replacement as I increase population size and **decrease** the probability of being sampled.

2. I have 10 red ties and one blue tie. I randomly choose ties until I pick the blue tie. If  $X$  is the random variable signifying the number of red ties picked, then  $X$  is geometric. True/False

False. We do not have independence of samples, and the range is not infinite.

**Problems** - Needs justification.

1. What is the expected number of Jacks in a five card hand? Assume a normal 52 card deck. (10 points)

Call  $X_i$  a random variable that is 1 if the  $i$ th card is a Jack and 0 otherwise. Then we can write this problem as

$$\begin{aligned} E(X_1 + X_2 + X_3 + X_4 + X_5) &= E(X_1) + E(X_2) + E(X_3) + E(X_4) + E(X_5) \\ &= P(X_1) + P(X_2) + P(X_3) + P(X_4) + P(X_5) \\ &= \frac{1}{13} + \frac{1}{13} + \frac{1}{13} + \frac{1}{13} + \frac{1}{13} \\ &= \frac{5}{13} \end{aligned}$$