

## STAT 134: Section 5

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Sep. 13, 2021

### Conceptual Review (Poisson approximation and random sampling)

1. What is the Poisson distribution?
2. Suppose  $X$  has a Binomial( $n, p$ ) distribution. What is the Poisson approximation to the probability  $P(X = k)$ ?
3. "If we already have Normal approximation to the Binomial, why do we care to have Poisson approximation as well?"
4. "Does the Poisson approximation have a continuity correction like the Normal approximation?"
5. Suppose there are  $G$  good items and  $B$  bad items in a collection of  $N = G + B$  items and you draw  $n$  of them. What is the probability that exactly  $g$  of the  $n$  items are good if:
  - (a) you draw  $n$  items with replacement; or if
  - (b) you draw  $n$  items without replacement?

### Problem 1

A cereal company advertises a prize in every box of its cereal. In fact, only about 95% of their boxes have prizes in them. If a family buys one box of this cereal every week for a year, estimate the chance that they will collect more than 45 prizes.

*Ex 2.4.9 in Pitman's Probability*

What assumptions are you making?

*Problem 2*

A lot of 50 items (10 bad) is inspected by the following two-stage plan: (i) A first sample of 5 items is drawn. If all are good, the lot is passed; if two or more are bad, the lot is rejected. (ii) If the sample contains exactly one bad item, a second sample of 10 more items is drawn from the remaining 45; the lot is rejected if two or more are bad. Otherwise, the lot is accepted.

- a. What is the probability that a second sample is drawn, and contains more than one bad item?
- b. Find the chance the lot is accepted.

*Ex 2.5.9 in Pitman's Probability*