Week 8 Monday

Review

1. Here are some of the functions we've been using that aren't computable by hand:

Distribution	Observation to percentile	Percentile to observation
Standard Normal	`pnorm(-)`	`qnorm(-)`
T Distribution (`df`)	`pt(-, df)`	`qt(-, df)`
Chi-square Distribution (`df`)	`pchisq(-, df)`	`qchisq(-, df)`

How would you use these functions to compute the percentage of observations of a t-distribution with 10 degrees of freedom that are greater than 1.5?

2. The alien inhabitants of a distant planet have one, two, or three arms; 10% have one arm, 50% have two arms, and 40% have three arms. These aliens have also colonized a moon that orbits their planet, and in a simple random sample of 100 aliens who inhabit this lunar colony, you find the following distribution of arm numbers:

1 arm	2 arms	3 arms
5	40	55

Calculate and interpret a p-value for the hypothesis that the distribution of arm numbers for aliens in the lunar colony matches the distribution of arm numbers on their home planet.

3. Suppose that roughly one out of every 5000 clovers has four leaves. Which of the following types of random variables might you use to model the number of clovers you need to pick before you find your first four-leaf clover?

(A) Binomial random variable

(B) Geometric random variable

(C) Poisson random variable

(D) Bernoulli random variable

Follow-up. For each of the wrong answers above, describe a situation involving four-leaf clovers that might be modelled with that type of random variable.

4. Bwrbwr is an alien who normally looks like a beige orb, but sometimes he randomly turns into a disco ball for an hour before reverting back. This happens about twice a year.

Bwrbwr just turned into a disco ball. What is the probability that the next time he turns into a disco ball is within in the next 3 months?

"Dendrology" is the study of woody plants (eg, trees).

5. You are a North American dendrologist and the oak trees you're familiar with have normally distributed heights with mean 60 feet. On a trip to a small Mediterranean island, you encounter a subspecies of oak unfamiliar to you. You measure the height of a simple random sample of 20 of these oak trees and find a sample mean of 50 feet with a standard deviation of 10 feet.

Calculate a p-value for your data under the hypothesis that the height distribution for this subspecies of oak matches the distribution that you're familiar with. Then interpret this p-value as a probability in context.

Recall that roughly 95% of observations in a normal distribution are contained within 2 standard deviations of the mean.

6. A simple random sample of heights of 100 mature oak trees is roughly normal with sample mean 60 feet and sample standard deviation 5 feet. Which of the following is a reasonable conclusion?

(A) Roughly 95% of mature oak trees are between 50 and 70 feet tall.

(B) We can be 95% confident that the true mean height of a mature oak tree is between 50 and 70 feet.

(C) We can be 95% confident that the true mean height of a mature oak tree is between 59 and 61 feet.

(D) None of the above OR more than one of the above.