

# Stat 140 - Quiz 3

What's Your Name? \_\_\_\_\_

This is a sample quiz. On the real quiz, I will pick a different example of inference for a population proportion and ask questions similar to those below.

## Garden Seeds

A garden center wants to store leftover packets of vegetable seeds for sale the following spring, but the center is concerned that the seeds may not germinate at the same rate a year later.

The manager randomly selects 200 seeds from a variety of packets from different companies and different batches of seeds, and plants them. She carefully prepares similar soil for the seeds in a greenhouse, and randomizes where the seeds are planted within the greenhouse. She finds that 171 of the 200 test seeds grew. The seed packets all claimed that 95% of the seeds would grow.

In answering the questions below, use the following output from R:

```
binom.test(x = 171, n = 200, p = 0.95, alternative = "less")

##
## Exact binomial test
##
## data: 171 and 200
## number of successes = 171, number of trials = 200, p-value =
## 2.948e-07
## alternative hypothesis: true probability of success is less than 0.95
## 95 percent confidence interval:
## 0.0000000 0.8942866
## sample estimates:
## probability of success
## 0.855
```

```
binom.test(x = 171, n = 200, p = 0.95, alternative = "greater")

##
## Exact binomial test
##
## data: 171 and 200
## number of successes = 171, number of trials = 200, p-value = 1
## alternative hypothesis: true probability of success is greater than 0.95
## 95 percent confidence interval:
## 0.8075994 1.0000000
## sample estimates:
## probability of success
## 0.855
```

```
binom.test(x = 171, n = 200, p = 0.95, alternative = "two.sided")

##
## Exact binomial test
##
## data: 171 and 200
## number of successes = 171, number of trials = 200, p-value =
## 2.948e-07
## alternative hypothesis: true probability of success is not equal to 0.95
## 95 percent confidence interval:
## 0.7984385 0.9006914
## sample estimates:
## probability of success
## 0.855
```

1) Describe the population parameter in a sentence. What symbol would you use for the population parameter?

2) Describe the sample statistic in a sentence. What symbol would you use for the sample statistic? What is the value of the sample statistic in this data set?

3) What are the null and alternative hypotheses for a test of the claim that after a year of storage, the seeds germinate at a lower rate than the package label indicates?

4) What would you use for the sampling distribution of the sample statistic, if the null hypothesis for the test were true? Check all relevant conditions for using this sampling distribution.

Regardless of your answer about checking the conditions, let's go ahead with inference, for the sake of this quiz.

5) Draw a conclusion for the hypothesis test at the  $\alpha = 0.05$  significance level. Explain what your answer means about germination rates of seeds after they've been stored for a year.

6) State a 95% confidence interval in the context of this problem. As part of your answer, explain what the phrase "95% confident" means.