

Math 21 Project 2

Simulating Samples for Qualitative Data

In this project we will use StatCrunch's "Coin Flipping" simulator.

To access the simulator: StatCrunch > Applets > Simulation > Coin Flipping

- On the first screen, the probability of heads is the claimed population proportion (in decimal form). For example, if it is claimed that 64% of COS students are female, use 0.64.
- On the first screen, the number of tosses is the sample size n .
- In the applet, next to Number of heads you can change the sign (\leq or \geq) as well as the actual number of successes in the sample.

Part 1

You took a sample of 100 COS students and found that 57 were female. You have been told that 50% of COS students are female.

Use the simulator to draw a sample of 100 students (# of tosses = 100) 1000 different times (1000 runs), assuming that 50% of COS students are female (probability of heads = 0.50).

a) How many times did your simulated sample contain 57 or more females?

b) Is "57 or more females" an unusual event? (*Recall that an unusual event occurs less than 5% of the time.*)

c) Find the critical values for this experiment.

The lower critical value is the largest number of females for which fewer than 5% of the samples have that number of females or fewer. Find the largest number "a" for which $x \leq a$ is below 5%.

The upper critical value is the smallest number of females for which fewer than 5% of the samples have that number of females or more. Find the smallest number "b" for which $x \geq b$ is below 5%.

Part 2

You took a sample of 1000 COS students and found that 360 owned an iPhone. Apple claims that 40% of college students own an iPhone.

Use the simulator to draw a sample of 1000 students, 1000 different times, assuming that 40% of students own an iPhone.

a) How many times did your simulated sample contain 360 or fewer iPhone owners?

b) Is "360 or fewer iPhone owners" an unusual event?

c) Find the critical values for this experiment.

Part 3

You took a sample of 40 COS students and found that only 4 smoked cigarettes. A recent article claimed that 20% of college students smoke cigarettes.

Use the simulator to draw a sample of 40 students, 1000 different times, assuming that 20% of students smoke cigarettes.

- a) How many times did your simulated sample contain 4 or fewer smokers?
- b) Is “4 or fewer smokers” an unusual event?
- c) What are the critical values of this experiment?
- d) Convert the critical values to percentages of smokers by dividing the critical values by 40.

Part 4

You took a sample of 250 COS students and found that only 25 smoked cigarettes. A recent article claimed that 20% of college students smoke cigarettes.

Use the simulator to draw a sample of 250 students, 1000 different times, assuming that 20% of students smoke cigarettes.

- a) How many times did your simulated sample contain 25 or fewer smokers?
- b) Is “25 or fewer smokers” an unusual event?
- c) What are the critical values of this experiment?
- d) Convert the critical values to percentages of smokers by dividing the critical values by 250.
- e) Compare the critical percentages from (d) to the critical percentages from Part 3 (d). Are the new critical percentages closer to each other or further away from each other? Why did this happen?

Part 5

Your statistics instructor claimed that only about 60% of Math 21 students pass the class. Your friend in the research office took a random sample of 800 students who took Math 21, and 510 of them passed the class.

Use the simulator to draw a sample of 800 students, 1000 different times, assuming that 60% of students pass Math 21.

- a) How many times did your simulated sample contain 510 or more students who passed?
- b) Is “510 or more students passed” an unusual event?
- c) Based on these results, has your friend provided you with biased results or has your instructor lied to you? Explain your choice.