

Chapters covered: Chapter 9.1, 9.2

Show your work to receive full credit.

- **Problem 1** A normal z -test for testing $H_0 : p = 0.3$ against $H_a : p \neq 0.3$ resulted in a positive test statistic value and a p -value of 0.08. Based on the same sample, we consider another normal z -test with $H_0 : p = 0.3$ against $H_a : p > 0.3$. Which of the following claims is (are) correct? Explain why.
 - a. The test statistics of the two tests are different.
 - b. We don't have enough information to draw a conclusion of the second test at the significance level of 0.1.
 - c. In the second test, we will reject H_0 at significance level 0.05.
 - d. In the second test, We fail to reject H_0 at significance level 0.01.

- **Problem 2** Write down the hypotheses for the test H_0 versus H_a in the following scenarios. Use p to denote the population proportion.
 - a. A TV network claims that 95% of the audience likes one of its TV series and looks forward to the next season. We want to determine whether the series is less popular than the network claims.
 - b. We wish to know whether or not 50% of STAT 3011 students prefer on-line courses to in-person courses.
 - c. A student wants to investigate whether a dice is unfair in the way that 3 is more likely to occur.

- **Problem 3** A clothing company wishes to know if the majority of their customers like their Summer 2021 collection. Suppose that they take a random sample of 300 customers and 60% of them say they like the Summer 2021 collection. Does this sample provide evidence that the majority of all customers like the collection? Walk through all 5 elements of a hypothesis test and use $\alpha = 0.05$.

- **Problem 4** A training camp claims that 70% of its trainees get more than 80 in a skill test. In order to investigate whether this information is accurate, a group collected a random sample of 100 trainees. 20 trainees said they got lower than 70, 20 trainees said they got between 70 to 80, 30 trainees said they got between 80 to 90, and the rest 30 trainees said they got more than 90. Write down the five steps to perform the hypothesis test at the 0.01 significance level.

R Problem

Assume that the **Getting To Know You Survey** is a random sample drawn from the population of all U of M students. Use the following code to access data from the Getting To Know You Survey.

```
survey_f22 <- read.csv("http://users.stat.umn.edu/~parky/Fall2022Survey.csv", header=TRUE)
survey_f22$TrafficTickets
```

Suppose we are interested in the proportion of college students that had at least one traffic ticket in the past. Many people are complaining that now young college students are driving more carelessly than in the past. It is known that many years ago the proportion of college students that had at least one traffic ticket was 25%. You want to conduct a statistical test to see whether the complaint is correct or not.

- (a) State the null and alternative hypotheses. Note you need to clearly define your notations (what p means).
- (b) Perform the five steps with `prop.test()` function in R to test your hypotheses under significance level of 0.05. Note that students entered -1 if they didn't have a driver's license. (You don't have to calculate the value of the test statistic in the third step.)