

### Problem 1: What value of $z_{\alpha/2}^*$ or $t_{\alpha/2}^*$ is used to construct:

- a 92% confidence interval to estimate  $p$  if the number of successes is 100 and the number of failures is 70 in a random sample.
- a 98% confidence interval to estimate  $p$  if the number of successes is 100 and the number of failures is 70 in a random sample.
- a 95% confidence interval to estimate  $\mu$  if the sample size is 23. (assume random sample assumption and normal population distribution assumption are met. )
- a 98% confidence interval to estimate  $\mu$  if the sample size is 1982. (assume random sample assumption is met.)

**For Problem 2 and 3: Assume the Survey data set represents a random sample of 391 students from the University of Minnesota.**

### Problem 2: Proportion of students from MN

In this problem, we will construct a confidence interval to estimate the population proportion of UMN students who are from Minnesota.

Use the following command to import the class survey data set.

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

- Use `table()` command to make a frequency table of variable `FromMinnesota`. Calculate the sample proportion ( $\hat{p}$ ) of students from Minnesota. Round your answer to the nearest three decimal number.
- What is the standard error of sample proportion?
- Use `prop.test` command to construct a 95% confidence interval. Insert correct values/options in the blanks below. Interpret.  

```
prop.test(x=_____, n=_____, conf.level= _____, alternative="_____")
```
- How large does the sample size need to be, if we would like to estimate  $p$ , population proportion of U students that are from MN, within  $\pm 0.02$  with 95% confidence level? Use the sample proportion from a) as an educated guess for  $p$ .

### Problem 3: Mean colleg GPA

This time, we will construct a confidence interval to estimate students' average college GPA using the same data set.

- Construct a histogram and Q-Q plot of college GPA. Include both plots in your submission. Describe the shape of the distribution.
- What is the point estimate of population mean GPA ( $\mu$ )?
- Use `t.test()` to compute the 95% confidence interval to estimate the population mean GPA. Interpret the result.

```
t.test(x=_____, conf.level = _____, alternative="_____")
```

- What are the assumptions / conditions we rely on to construct a confidence interval for mean ( $\mu$ )? Do you think Problem 3 meets the assumptions? Do you think the result is reliable? Explain.