MAT 222
Spring 2019
Quiz 5

"There's no advantage to hurrying through life."

$-Shikamaru, Naruto$

Problem 1: A software developer is interested in analyzing the population proportion of doctors that use a certain medical software.

(a) How many observations, i.e. what sample size, should be taken to estimate, at a 90% confidence level, the population proportion within $\pm 1\%$, if no prior estimate is available?

Because we want a 90% confidence interval, we have $z^* = 1.645$. We also have $p^* = 0.50$. But then

$$n = \frac{1}{4}\left(\frac{1.645}{0.01}\right)^2 = 6765.06$$

Therefore, we need to use at least 6,766 observations.

(b) Redo the previous part if the developer has reason to believe that 53% of doctors use the software.

Because we want a 90% confidence interval, we have $z^* = 1.645$. We also have $p^* = 0.53$. But then

$$n = \left(\frac{1.645}{0.01}\right)^2 0.53(1 - 0.53) = 6740.70$$

Therefore, we need to use at least 6,741 observations.

(c) A random sample of 190 doctors was collected. Out of these, 85 doctors reported using the software. Find a 90% confidence interval for the proportion of doctors that use that particular software. Interpret your result.

We have $X = 85$ and $n = 190$. Therefore, $\hat{p} = 85/190 = 0.4474$. Because we are using a 90% confidence interval, we have $z^* = 1.645$. But then

$$0.4474 \pm 1.645\sqrt{\frac{0.4474(1 - 0.4474)}{190}} = 0.4474 \pm 1.645(0.0361) = 0.4474 \pm 0.06.$$

Therefore, we are 90% certain that the proportion of doctors that use this software is between 38.7% and 50.7%.