UNIVERSITY OF TEXAS AT AUSTIN

Quiz # 11

Confidence intervals: One proportion.

Provide your **complete solutions** to the following problems.

Problem 11.1. $(4 + 4 = 8$ points) *Source: "Mathematical Statistics with Applications" by Ramachandran and Tsokos.*
Suppose that a local TV station in a city wants to conduct a survey to estimate support for the president's policies on economy within 3% error with 95% confidence.

(i) (4 points) How many people should the station survey if they have no information on the support level?

(ii) (4 points) Suppose they have an initial estimate that 70% of the people in the city support the economic policies of the president.

How many people should the station survey?

Solution: For a 95% confidence level, the critical value $z^* = 1.96$.

(i) Without any previous knowledge, we use $\tilde{p} = 1/2$ and get

$$n \geq \frac{(1.96)^2}{4(0.03)^2} = 1067.111 \quad \Rightarrow \quad n \geq 1068.$$

(ii) With previous knowledge, we use $\tilde{p} = 0.7$ and get

$$n \geq \frac{(1.96)^2(0.7)(0.3)}{(0.03)^2} = 896.3733 \quad \Rightarrow \quad n \geq 897.$$

Problem 11.2. (7 points)
A simple random sample of 120 veterinarian clinics in a certain region reveals that the vast majority of clinics only treat small pets (dogs, cats, rabbits, etc.) and not large animals (cows, horses, etc.). Of the 120 clinics sampled, 88 responded that they do not treat large animals at their clinic.

(i) (2 points) What is the value of the standard error of the sample proportion of clinics which do treat large animals?
Solution:

$$\sqrt{\frac{(88/120)(32/120)}{120}} = 0.0404.$$

(ii) (4 points) What is a 90% confidence interval for the population proportion of vet clinics that do treat large animals?
Solution:

$$\frac{32}{120} \pm 1.645 \times 0.0404 = 0.27 \pm 0.0665.$$

(iii) (1 point) If a 95% confidence interval were calculated instead of 90% confidence interval, what would happen to the width of the confidence interval?
Solution: The width of the interval would increase.