Math 483 HW 18 2023. Due Thursday, Nov. 9. **Two pages, problems A)-F).**

Exam 3, Thursday, Nov. 2.

A) 8.61 Suppose that independent random samples of $n_1 = n_2 = 30$ adults were selected from two regions in the United States, and a day's intake of selenium was recorded for each person. The mean and standard deviation of the selenium daily intakes for the 30 adults in Region 1 were $\overline{y}_1 = 167.1$ $\mu$g and $s_1 = 24.3$ $\mu$g respectively. The corresponding statistics for the 30 adults in Region 2 were $\overline{y}_2 = 140.9$ $\mu$g and $s_2 = 17.6$ $\mu$g respectively. Find a 95% confidence interval for the difference in the mean selenium intake for the two regions.

comment: Use the formula (given in class or p. 415): $(\overline{Y}_1 - \overline{Y}_2) \pm z_{\alpha/2}\sqrt{\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}}$
Do not forget to square the sample standard deviations.

B) In a 1983 Harris poll of $n = 1250$ individuals, the proportion who used seat belts was 0.19. In a 1992 poll of $n = 1251$ individuals, the proportion who used seat belts was 0.70.

i) Find a 90% confidence interval for $p_1 - p_2$ where $p_1$ corresponds to the 1983 poll.

ii) Do you think that the (population) proportion was higher in 1992? Why?

comment: Use the formula given in class (or ex. 8.8):

$$(\hat{p}_1 - \hat{p}_2) \pm z_{\alpha/2}\sqrt{\frac{\hat{p}_1(1-\hat{p}_1)}{n_1} + \frac{\hat{p}_2(1-\hat{p}_2)}{n_2}}.$$

CI is about $(-.54, -.48)$, but use more digits.

C) 8.70 Let $Y$ be a binomial random variable with parameter $p$. Find the sample size necessary to estimate $p$ to within 0.05 with probability 0.95 in the following situations.

a) The value of $p$ is thought to be about 0.9.

b) No information about $p$ is known.

comment for C) and D): (See ex. 8.9 or) use the formula given in class:

$n \approx \left(\frac{z_{\alpha/2}}{B}\right)^2 p^*(1-p^*)$, round up.

D) In a 1986 newspaper poll of 221 children, 2/3 said they would like to travel in space. How many children should have been interviewed to estimate the proportion of children who would like to travel in space correct to within 0.02 with probability 0.99? (Use $p^* = 2/3$.)

E) 8.75 Suppose that you wish to estimate the difference between the mean acidity for rainfalls at two different locations, one in a relatively unpolluted area along the ocean and one in an area subject to heavy air pollution. If you wish your estimate to be correct to the nearest 0.1 PH with probability 0.90, approximately how many rainfalls (PH values) must you include in each sample? (Assume that the variance of the PH measurements is approximately 0.25 at both locations and that the two samples are to be of equal size.)

comment: Follow example 8.10.

F) In 1991, the mean SAT verbal score was 422 and the mean SAT math score was 474. Suppose that a random sample of test scores of 20 seniors from a large high school produced the results tabled below.

| | Verbal | Math |
|---|---|---|
| Sample Mean | 419 | 455 |
| Sample Standard Deviation | 57 | 69 |

a) Find a 90% confidence interval for the mean verbal SAT scores for the high school seniors.

b) Does the interval that you found in a) include the value 422, the true mean SAT verbal score in 1991? What can you conclude?

comment: Follow example 8.11. For a) the CI is about (397,441), but use more digits. For b), is it reasonable that the high schools seniors who took the SAT performed at the national average?