

Honors Statistics
Review 6.2 and 6.3

1)

Salaries: College Administrators How much do college administrators (not teachers or service personnel) make each year? Suppose you read the local newspaper and find that the average annual salary of administrators in the local college is $\bar{x} = \$58,940$. Assume that σ is known to be \$18,490 for college administrator salaries (Reference: *The Chronicle of Higher Education*).

- (a) Suppose that $\bar{x} = \$58,940$ is based on a random sample of $n = 36$ administrators. Find a 90% confidence interval for the population mean annual salary of local college administrators. What is the margin of error?
- (b) Suppose that $\bar{x} = \$58,940$ is based on a random sample of $n = 64$ administrators. Find a 90% confidence interval for the population mean annual salary of local college administrators. What is the margin of error?
- (c) Suppose that $\bar{x} = \$58,940$ is based on a random sample of $n = 121$ administrators. Find a 90% confidence interval for the population mean annual salary of local college administrators. What is the margin of error?
- (d) Compare the margins of error for parts (a) through (c). As the sample size increases, does the margin of error decrease?

2)

Medical: Blood Type A random sample of medical files is used to estimate the proportion p of all people who have blood type B.

- (a) If you have no preliminary estimate for p , how many medical files should you include in a random sample in order to be 85% sure that the point estimate \hat{p} will be within a distance of 0.05 from p ?
- (b) Answer part (a) if you use the preliminary estimate that about 8 out of 90 people have blood type B. (Reference: *Manual of Laboratory and Diagnostic Tests*, F. Fischbach.)

3)

Zoology: Hummingbirds Allen's hummingbird (*Selasphorus sasin*) has been studied by zoologist Bill Alther (Reference: *Hummingbirds*, K. Long and W. Alther). A small group of 15 Allen's hummingbirds has been under study in Arizona. The average weight for these birds is $\bar{x} = 3.15$ grams. Based on previous studies, we can assume that the weights of Allen's hummingbirds have a normal distribution, with $\sigma = 0.33$ gram.

- (a) Find an 80% confidence interval for the average weights of Allen's hummingbirds in the study region. What is the margin of error?
- (b) What conditions are necessary for your calculations?
- (c) Give a brief interpretation of your results in the context of this problem.
- (d) **Sample Size:** Find the sample size necessary for an 80% confidence level with a maximal error of estimate $E = 0.08$ for the mean weights of the hummingbirds.

4)

Myers-Briggs: Actors Isabel Myers was a pioneer in the study of personality types. The following information is taken from *A Guide to the Development and Use of the Myers-Briggs Type Indicator*, by Myers and McCaulley (Consulting Psychologists Press). In a random sample of 62 professional actors, it was found that 39 were extroverts.

- Let p represent the proportion of all actors who are extroverts. Find a point estimate for p .
- Find a 95% confidence interval for p . Give a brief interpretation of the meaning of the confidence interval you have found.
- Do you think the conditions $np > 5$ and $nq > 5$ are satisfied in this problem? Explain why this would be an important consideration.

5)

Auto Insurance: Claims Anystate Auto Insurance Company took a random sample of 370 insurance claims paid out during a 1-year period. The average claim paid was \$1570. $\sigma = \$250$.

- Find the 92% and 98% confidence intervals for the mean claim payment.
- Compare the two confidence intervals. Does the width of the confidence intervals increase as the confidence level increases?

6)

Lifestyle: Smoking In a survey of 1000 large corporations, 250 said that, given a choice between a job candidate who smokes and an equally qualified nonsmoker, the nonsmoker would get the job (*USA Today*).

- Let p represent the proportion of all corporations preferring a nonsmoking candidate. Find a point estimate for p .
- Find a 0.95 confidence interval for p .
- As a news writer, how would you report the survey results regarding the proportion of corporations that would hire the equally qualified nonsmoker? What is the margin of error based on a 95% confidence interval?

Answers

- 1a. (\$53,871, \$64,009); \$5069
- 1b. (\$55,138, \$62,742); \$3802
- 1c. (\$56,175, \$61,705); \$2765
- 1d. Yes

- 2a. 208
- 2b. 68

- 3a. (3.04 g, 3.26 g); .11 g
- 3b. SRS; σ known; $n > 30$ or normal
- 3c. I am 80% confident that the true mean of weights of Allen hummingbirds in Arizona is between 3.04 g and 3.26 g.
- 3d. 28

- 4a. $\hat{p} = 0.6290$
- 4b. (0.51, 0.75)
- 4c. Yes

- 5a. (\$1,547.26, \$1,592.74); (\$1,539.72, \$1,600.28)
- 5b. yes

- 6a. $\hat{p} = 0.25$
- 6b. (0.22, 0.28)
- 6c. It appears that less than 50% of employers would hire a candidate that smokes. 50% is not within the confidence interval.