Exercises 9–1

1. What is the difference between a point estimate and an interval estimate of a parameter? Which is better? Why?

2. What information is necessary to calculate a confidence interval?

3. What is the margin of error?

4. What is meant by the 95% confidence interval of the mean?

5. What are three properties of a good estimator? A good estimator should be unbiased, consistent, and relatively efficient.

6. What statistic best estimates μ? $\overline{X}$

7. What is necessary to determine the sample size?

8. In determining the sample size for a confidence interval, is the size of the population relevant?
No, as long as it is much larger than the sample size needed.

9. Find each.

a. $z_{\alpha/2}$ for the 99% confidence interval 2.58
b. $z_{\alpha/2}$ for the 98% confidence interval 2.33
c. $z_{\alpha/2}$ for the 95% confidence interval 1.96
d. $z_{\alpha/2}$ for the 90% confidence interval 1.65
e. $z_{\alpha/2}$ for the 94% confidence interval 1.88

10. Number of Faculty The numbers of faculty at 32 randomly selected state-controlled colleges and universities with enrollment under 12,000 students are shown below. Use these data to estimate the mean number of faculty at all state-controlled colleges and universities with enrollment under 12,000 with 92% confidence. Assume $\sigma = 165.1$.

211	384	396	211	224	337	395	121	356
621	367	408	515	280	289	180	431	176
318	836	203	374	224	121	412	134	539
471	638	425	159	324				

Source: *World Almanac.* $295.15 < \mu < 397.35$

11. Playing Video Games In a recent study of 35 ninth-grade students, the mean number of hours per week that they played video games was 16.6. The standard deviation of the population was 2.8.

a. Find the best point estimate of the mean. 16.6 hours
b. Find the 95% confidence interval of the mean of the time playing video games. $15.7 < \mu < 17.5$
c. Find the 99% confidence interval of the mean time playing video games. $15.4 < \mu < 17.8$
d. Which is larger? Explain why.

12. Freshmen's GPA First-semester GPAs for a random selection of freshmen at a large university are shown. Estimate the true mean GPA of the freshman class with 99% confidence. Assume $\sigma = 0.62$. $2.55 < \mu < 3.09$

1.9	3.2	2.0	2.9	2.7	3.3
2.8	3.0	3.8	2.7	2.0	1.9
2.5	2.7	2.8	3.2	3.0	3.8
3.1	2.7	3.5	3.8	3.9	2.7
2.0	2.8	1.9	4.0	2.2	2.8
2.1	2.4	3.0	3.4	2.9	2.1

13. Workers' Distractions A recent study showed that the modern working person experiences an average of 2.1 hours per day of distractions (phone calls, e-mails, impromptu visits, etc.). A random sample of 50 workers for a large corporation found that these workers were distracted an average of 1.8 hours per day and the population standard deviation was 20 minutes. Estimate the true mean population distraction time with 90% confidence, and compare your answer to the results of the study. $1.72 < \mu < 1.88$; lower

Source: *Time Almanac.*

14. Number of Jobs A sociologist found that in a sample of 50 retired men, the average number of jobs they had during their lifetimes was 7.2. The population standard deviation is 2.1.

a. Find the best point estimate of the mean. 7.2 jobs
b. Find the 95% confidence interval of the mean number of jobs. $6.6 < \mu < 7.8$
c. Find the 99% confidence interval of the mean number of jobs. $6.4 < \mu < 8.0$
d. Which is smaller? Explain why.

15. Actuary Exams A survey of 35 individuals who passed the seven exams and obtained the rank of Fellow in the actuarial field finds the average salary to be $150,000. If the standard deviation for the population is $15,000, construct a 95% confidence interval for all Fellows.

Source: www.BeAnActuary.org $145,030 < \mu < 154,970$

16. Number of Farms A random sample of the number of farms (in thousands) in various states follows. Estimate the mean number of farms per state with 90% confidence. Assume $\sigma = 31$.

47	95	54	33	64	4	8	57	9	80
8	90	3	49	4	44	79	80	48	16
68	7	15	21	52	6	78	109	40	50
29									

Source: *New York Times Almanac.* $34.3 < \mu < 52.7$

17. Television Viewing A study of 415 kindergarten students showed that they have seen on average 5000 hours of television. If the sample standard deviation of the population is 900, find the 95% confidence level of the mean for all students. If a parent claimed that his children watched 4000 hours, would the claim be believable?

Source: U.S. Department of Education.