

## 9.12 Review

Date:

Key

- 1) A sample of 16 students finds that the average age is 22 years. All student ages have a standard deviation of 6 years. Construct a 95% confidence interval for the average age of students.

$$\frac{1-c\%}{2} \rightarrow \frac{1-0.95}{2} \rightarrow 0.025 \quad \left| \begin{array}{l} n=16 \\ \bar{x}=22 \\ \sigma=6 \end{array} \right. \quad \left. \begin{array}{l} CI = \bar{x} \pm z \left( \frac{\sigma}{\sqrt{n}} \right) \\ = 22 \pm 1.96 \left( \frac{6}{\sqrt{16}} \right) \end{array} \right| \begin{array}{l} 22 \pm 2.94 \\ (19.06, 24.94) \end{array}$$

M.F.

- 2) Construct a 99% confidence interval for the population mean lifetime of fluorescent lightbulbs. Assume the population has a Normal distribution with a standard deviation of 31 hours. A sample of 16 fluorescent light bulbs have a mean life of 645 hours.

$$\begin{array}{l} n=16 \\ \bar{x}=645 \\ \sigma=31 \end{array} \left| \begin{array}{l} \frac{1-c\%}{2} \rightarrow \frac{1-0.99}{2} \rightarrow 0.005 \\ z = -2.575 \end{array} \right. \quad \left. \begin{array}{l} \bar{x} \pm z \left( \frac{\sigma}{\sqrt{n}} \right) \\ 645 \pm 2.575 \left( \frac{31}{\sqrt{16}} \right) \end{array} \right| \begin{array}{l} 645 \pm 19.956 \\ (625.043, 664.956) \end{array}$$

- 3) A sample of 100 bean cans showed an average weight of 13 ounces. If all bean cans have a standard deviation of 0.8 ounces, construct an 85% confidence interval for the mean weight of the population.

$$\begin{array}{l} n=100 \\ \bar{x}=13 \\ \sigma=0.8 \end{array} \left| \begin{array}{l} \frac{1-0.85}{2} \rightarrow 0.075 \\ z = -1.44 \end{array} \right. \quad \left. \begin{array}{l} \bar{x} \pm z \left( \frac{\sigma}{\sqrt{n}} \right) \\ 13 \pm 1.44 \left( \frac{0.8}{\sqrt{100}} \right) \end{array} \right| \begin{array}{l} 13 \pm 0.1152 \\ (12.885, 13.115) \end{array}$$

- 4) A researcher wants to know the percentage of Columbus residents who would favor a two cent increase in the gasoline tax to fund road repairs. A random sample of 900 residents finds 278 favor the increase.

- a. Specify the parameter and statistic for this problem.

parameter is the unknown proportions of all Columbia residents in favor of tax  
 statistic  $\rightarrow \frac{278}{900}$  (proportion of the sample size)  $\rightarrow 0.309$

- b. Find an 80% confidence interval for the parameter.

$$\hat{p} = \frac{278}{900} \approx 0.309 \quad \left| \quad 0.309 \pm 1.28 \left( \sqrt{\frac{0.309(1-0.309)}{900}} \right) \quad \right| \quad \begin{array}{l} 0.309 \pm 0.0197 \\ (0.2893, 0.329) \end{array}$$

- 5) A random sample of female college students has a mean height of 64.5 inches, which is greater than the 63-inch mean height of all adult American women. Determine if each bold-faced number is a parameter or a statistic.

64.5 inches : statistic (from the sample of population)  
 63 inches : parameter (entire population)

$$\bar{x} = 20 \quad \sigma = 3$$

- 6) In a certain Normal distribution of scores, the mean is 20 and the standard deviation is 3.

a. Find the z-score corresponding to a score of 24.  $z = \frac{x - \bar{x}}{\sigma} \rightarrow \frac{24 - 20}{3} \rightarrow 1.33$

- b. Find the percentile for a score of 24.

$$P(x \leq 24) = 0.9082 \rightarrow \boxed{90.82\%}$$

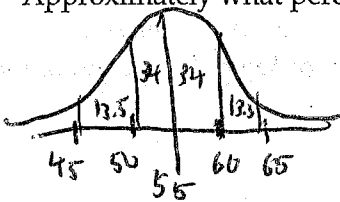
- 7) The Jackson triplets, Jenny, John, and James are in different math classes at City High. On their final exams, Jenny scored 82 on a test with a mean of 76 and a standard deviation of 7.5; John scored 77 on a test with a mean of 72 and a standard deviation of 10.5; and James scored 78 on a test with a mean of 66 and a standard deviation of 10.5. Who had the best z-score and what does this say about that triplet's test score in relation to their peers?

$$\text{Jenny: } z = \frac{82 - 76}{7.5} = 0.8 \quad \left| \quad \text{James: } z = \frac{78 - 66}{10.5} = 1.2$$

$$\text{John: } z = \frac{77 - 72}{10.5} = 0.48$$

James with the highest z-score means he has the highest percentile in relation to his class.

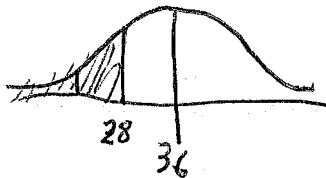
- 8) Some test scores were Normally distributed with a mean of 55 and a standard deviation of 5. Approximately what percentage of the scores lie between 45 and 65?



$\rightarrow 95\%$

(within 2 standard deviations from the mean)

- 9) The heights of a certain group of adult parrots were found to be Normally distributed. The mean height is 36 cm with a standard deviation of 8 cm. In a group of 1000 of these birds, how many would be at most 28 cm tall? (28 or less)



$$13.5 + 2.35 + 0.15$$

16%

$$0.16 (1000) = \boxed{160 \text{ birds}}$$

- 10) The life expectancy (in hours) of a fluorescent tube is normally distributed with a mean of 5000 and a standard deviation of 500. Find the probability that a tube lasts for at least 5650 hours.

$$z = \frac{5650 - 5000}{500} \rightarrow 1.3$$

$$\rightarrow 0.9032$$

$$P(x \geq 5650) = 1 - 0.9032$$

$$\boxed{P(x \geq 5650) = 0.0968}$$

- 11) A potato chip company sells a small snack bag of chips. The volume of the snack bag is Normally distributed with a mean of 1.75 ounces and a standard deviation of 0.15 ounces. What is the probability that a bag contains between 1.63 and 1.84 ounces?

$$z_{1.84} = \frac{1.84 - 1.75}{0.15} = 0.6$$

$$P(x \leq 1.84) = 0.7257$$

$$0.7257$$

$$- 0.2119$$

$$z_{1.63} = \frac{1.63 - 1.75}{0.15} = -0.8$$

$$P(x \leq 1.63) = 0.2119$$

$$\boxed{0.5138}$$