

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.

$\bar{x} = 22 \text{ yrs}$
 $n = 16 \text{ students}$
 $\sigma = 6 \text{ yrs}$

$CI = \bar{x} \pm z \frac{\sigma}{\sqrt{n}} = 22 \pm 1.96 \frac{6}{\sqrt{16}} = \boxed{(19.06, 24.94)}$

- 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.

$\sigma = 31 \text{ hrs}$
 $n = 16 \text{ bulbs}$
 $\bar{x} = 645 \text{ hrs}$

$CI = 645 \pm 2.58 \frac{31}{\sqrt{16}} = \boxed{(625.005, 664.995)}$

- 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.

$n = 100 \text{ bean cans}$
 $\bar{x} = 13 \text{ oz}$
 $\sigma = 0.8 \text{ oz}$

$CI = 13 \pm 1.44 \frac{0.8}{\sqrt{100}} = \boxed{(12.885 \text{ oz}, 13.115 \text{ oz})}$

- 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: Proportion of all residents in favor of paying 2¢ increase, p

Statistic: $\hat{p} = \frac{278}{900} = .309$
 proportion of sample willing to pay 2¢ increase.

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

$CI = \hat{p} \pm z \sqrt{\frac{\hat{p}(1-\hat{p})}{n}} = .309 \pm 1.28 \sqrt{\frac{.309(1-.309)}{900}}$

$= \boxed{(0.289, 0.329)}$

- 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.

$\bar{x} = 64.5$ is a statistic because it came from a sample of female college students

$\mu = 63$ is a parameter because it describes all American women.

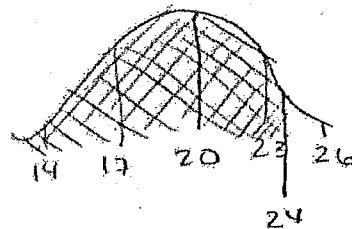
- 6) In a certain Normal distribution of scores, the mean is 20 and the standard deviation is 3. $N(20, 3)$

a. Find the z-score corresponding to a score of 24.

$$z = \frac{24 - 20}{3} = \frac{4}{3} = 1.33$$

b. Find the percentile for a score of 24.

$$P(X \leq 24) = P(Z \leq 1.33) = .9082$$



90.82%ile

- 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 in relation to their test score in relation to their peers?

$$Jenny = \frac{82 - 76}{7.5} = \frac{6}{7.5} = 0.8 \text{ stdev above class avg.}$$

$$John = \frac{77 - 72}{10.5} = \frac{5}{10.5} = 0.476 \text{ stdev above class avg.}$$

$$James = \frac{78 - 66}{10.5} = \frac{12}{10.5} = 1.143 \text{ stdev above class avg.}$$

James has the highest z-score meaning he did better than his class peers.

- 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?

$N(55, 5)$



According to the empirical rule, about 95%.

.9544 so 95.44% according to z chart.

- 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 more than 28 cm tall?

$$N(36, 8) \quad P(X > 28) = 50\% + 34\% = 84\%$$

$n = 1000$



$$84\% \text{ of } 1000 = \boxed{840 \text{ birds}}$$

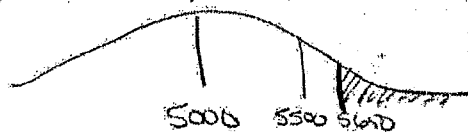
- 10) The life expectancy (in hours) of a fluorescent tube is normally distributed with a mean of 5000 and a standard deviation of 500. Find the probability that a tube lasts for at least 5650 hours.

$N(5000, 500)$

$$P(X \geq 5650) = P(Z \geq 1.30) = 1 - P(Z \leq 1.30)$$

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

$$= 1 - .9032 = \boxed{.0968}$$



- 11) A potato chip company sells a small bag of chips that has a mean volume of 1.75 ounces with a standard deviation of 0.15 ounces. What is the probability that a bag contains at most 1.84 ounces?

Normal

$N(1.75, 0.15)$

$$P(X \leq 1.84 \text{ oz}) = P(Z \leq 0.60) = \boxed{0.7257}$$

$$z = \frac{1.84 - 1.75}{0.15} = 0.60$$

