

# Test 6 Review

Name: Key Date: \_\_\_\_\_

## Vocabulary—Know your vocab!

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Confidence Interval	Point Estimate	Degrees of Freedom	Table A	$\hat{q}$	$\alpha$
Confidence Level	Critical Value	Error of Estimate	t-Table	$p$	$\hat{p}$

## Work Problems—answer each question fully.

### C.I. when $n > 30$ : (Use the table A.)

1. Find the critical values ( $z_{\alpha/2}$ ) for:  $\pm 1.75$   
 (a) a 92% confidence interval:  $\pm 1.75$   
 $\alpha = 1 - .92 = .08$   
 $\frac{\alpha}{2} = \frac{.08}{2} = .04 \rightarrow$  area .0400

- (b) a 97% confidence interval:  $\pm 2.17$   
 $\alpha = 1 - .97 = .03$   
 $\frac{\alpha}{2} = \frac{.03}{2} = .015 \rightarrow$  area .0150

**Formula:**  $\bar{X} - z_{\alpha/2} \left( \frac{\sigma}{\sqrt{n}} \right) < \mu < \bar{X} + z_{\alpha/2} \left( \frac{\sigma}{\sqrt{n}} \right)$  **(ROUND TO TWO DECIMAL PLACES!)**

2. In a recent study of 35 ninth-grade students, the mean number of hours per week that they watched television was 22.6. The standard deviation is known to be 2.8. Find the 98% confidence interval of the mean.  
 $\bar{x} = 22.6$   $z_{\frac{\alpha}{2}} = 2.33$   $22.6 - 2.33 \cdot \left( \frac{2.8}{\sqrt{35}} \right) < \mu < 22.6 + 2.33 \cdot \left( \frac{2.8}{\sqrt{35}} \right)$   
 $\sigma = 2.8$   
 $n = 35$   
 $21.50 < \mu < 23.70$

3. The average weight of 40 randomly selected school buses was 4150 pounds. The standard deviation was 480 pounds. Find the 99% confidence interval of the true mean weight of the buses.  
 $\bar{x} = 4150$   $z_{\frac{\alpha}{2}} = 2.58$   $4150 - 2.58 \left( \frac{480}{\sqrt{40}} \right) < \mu < 4150 + 2.58 \left( \frac{480}{\sqrt{40}} \right)$   
 $n = 40$   
 $\sigma = 480$   
 $3954.19 < \mu < 4345.81$

4. ~~\_\_\_\_\_~~  
 $n = 100$   $z_{\frac{\alpha}{2}} = 1.96$   $52 - 1.96 \left( \frac{6.8}{\sqrt{100}} \right) < \mu < 52 + 1.96 \left( \frac{6.8}{\sqrt{100}} \right)$   
 $\bar{x} = 52$   
 $\sigma = 6.8$   
 $50.67 < \mu < 53.33$

### C.I. when $n < 30$ : (Use the t-table.)

5. Find the critical values ( $t_{\alpha/2}$ ) for:  
 (a) a 95% confidence interval for a sample of 18: 2.110  
 $n = 18$   
 $df = 18 - 1 = 17$   
 $C = 95\%$   
 (b) a 99% confidence interval for a sample of 6: 4.032  
 $n = 6$   
 $df = 6 - 1 = 5$   
 $C = 99\%$

**C.I. when  $n < 30$ :** (Use the t-table.) (ROUND TO THREE DECIMAL PLACES!!!)

$$\text{Formula: } \bar{X} - t_{\alpha/2} \left( \frac{s}{\sqrt{n}} \right) < \mu < \bar{X} + t_{\alpha/2} \left( \frac{s}{\sqrt{n}} \right) \quad * \text{Degrees of freedom} = n - 1$$

6. An irate patient complained that the cost of a doctor's visit was too high. She randomly surveyed 20 other patients and found that the mean amount of money they spent on each doctor's visit was \$44.80. The standard deviation of the sample was \$3.53. Find the 98% confidence interval of the population mean.

$$n = 20$$

$$\bar{x} = 44.80$$

$$s = \$3.53$$

$$t_{\alpha/2} = 2.539$$

$$44.80 - 2.539 \left( \frac{3.53}{\sqrt{20}} \right) < \mu < 44.80 + 2.539 \left( \frac{3.53}{\sqrt{20}} \right)$$

$$42.796 < \mu < 46.804$$

7. In a study of 10 insurance sales reps from a certain large city, the average of the group was 48.6 years old, and the standard deviation was 4.1 years. Find the 95% confidence interval of the population mean of all insurance sales reps in that city.

$$n = 10$$

$$\bar{x} = 48.6$$

$$s = 4.1$$

$$t_{\alpha/2} = 2.262$$

$$48.6 - 2.262 \left( \frac{4.1}{\sqrt{10}} \right) < \mu < 48.6 + 2.262 \left( \frac{4.1}{\sqrt{10}} \right)$$

$$45.667 < \mu < 51.533$$

8. ~~A previous study found that 2.5% of 275 people surveyed said that...~~

$$n = 25$$

$$\bar{x} = 2.5$$

$$s = .5$$

$$t_{\alpha/2} = 2.172$$

$$2.5 - 2.172 \left( \frac{.5}{\sqrt{25}} \right) < \mu < 2.5 + 2.172 \left( \frac{.5}{\sqrt{25}} \right)$$

$$2.282 < \mu < 2.717$$

**C.I. for Proportions:** (Use the z-table.) (ROUND TO THREE DECIMAL PLACES!!!)

$$\text{Formula: } \hat{p} - Z_{\alpha/2} \sqrt{\frac{\hat{p}\hat{q}}{n}} < \mu < \hat{p} + Z_{\alpha/2} \sqrt{\frac{\hat{p}\hat{q}}{n}}$$

9. A political analyst found that 60% of 300 Republican voters believe that the federal government has too much power. Find the 95% confidence interval of the population proportion of Republican voters who feel this way.

$$n = 300$$

$$Z_{\alpha/2} = 1.96$$

$$\hat{p} = .6$$

$$\hat{q} = .4$$

$$.6 - 1.96 \sqrt{\frac{(.6 \cdot .4)}{300}} < p < .6 + 1.96 \sqrt{\frac{(.6 \cdot .4)}{300}}$$

$$.545 < p < .655$$

10. A recent study of 75 workers found that 53 people rode the bus to work each day. Find the 98% confidence interval of the proportion of all workers who rode the bus to work.

$$n = 75$$

$$Z_{\alpha/2} = 2.33$$

$$\hat{p} = \frac{53}{75} = .707$$

$$\hat{q} = 1 - .707 = .293$$

$$.707 - 2.33 \sqrt{\frac{(.707 \cdot .293)}{75}} < p < .707 + 2.33 \sqrt{\frac{(.707 \cdot .293)}{75}}$$

$$.585 < p < .829$$

11. A researcher collected data from 520 counties across the state and found that 210 of the counties spend more than \$300 on road repairs each year. If a researcher wants to be 99% confident what is the confidence interval of the true proportion?

$$n = 520$$

$$Z_{\alpha/2} = 2.58$$

$$\hat{p} = \frac{210}{520} = .404$$

$$\hat{q} = 1 - .404 = .596$$

$$.404 - 2.58 \sqrt{\frac{(.404 \cdot .596)}{520}} < p < .404 + 2.58 \sqrt{\frac{(.404 \cdot .596)}{520}}$$

$$.348 < p < .460$$