Chapter 6 Review #3 Worksheet **Prob/Stats** **Name** Key

Show All Work!!!!

1. Find the critical value z_c that corresponds to an 88% confidence level.

$\frac{1-.88}{2} = \frac{.12}{2} = .06$ $z_c = 1.555$

2. Find the critical value, t_c, for $c = 0.90$ and $n = 22$.

$t_c = 1.721$

3. Find the margin of error for the given information:

a. $c = 0.90$, $\sigma = 5.8$, $n = 52$ (one decimal place) $\frac{1-.9}{2} = \frac{.1}{2} = .0500$ $z_c = 1.645$

$E = 1.645 \cdot \frac{5.8}{\sqrt{52}} = \boxed{1.3}$

b. $c = 0.95$, $s = 3.6$, $n = 45$ (one decimal place) $t_c = 2.021$

$E = 2.021 \cdot \frac{3.6}{\sqrt{45}} = \boxed{0.8}$

c. $c = 0.90$, $\hat{p} = 0.36$, $n = 40$ (three decimal places) $z_c = 1.645$

$\hat{q} = .64$

$E = 1.645\sqrt{\frac{.36 \cdot .64}{40}} = \boxed{.125}$

4. Use the given confidence interval to find the sample mean and the margin of error: (42.8, 57.6).

$\bar{x} = \frac{42.8+57.6}{2} = 50.2$

$E = 50.2 - 42.8 = 7.4$

$\boxed{\bar{x} = 50.2 \quad E = 7.4}$

5. We start with a simple random sample of 25 of a particular species of newts and measure their tails. The mean tail length of our sample is 5 cm. Assume the tail lengths are normally distributed.

a. If we know that 0.2 cm is the standard deviation of the tail lengths of all newts in the population, then what is a 90% confidence interval for the mean tail length of all newts in the population? (one decimal place)

$n = 25$ $\sigma = .2$ $E = 1.645 \cdot \frac{.2}{\sqrt{25}} = 0.1$ $5 \pm .1 < \begin{matrix} 4.9 \\ 5.1 \end{matrix}$

$\bar{x} = 5$ $z_c = 1.645$

With 90% confidence, we can say that the mean tail length of all Newts is between 4.9 cm and 5.1 cm.

b. If we find that that 0.2 cm is the standard deviation of the tail lengths of the newts in our sample population, then what is a 90% confidence interval for the mean tail length of all newts in the population? (one decimal place)

$s = .2$ $E = 1.711 \cdot \frac{.2}{\sqrt{25}} = .1$ CI + interpretation is same as above

$t_c = 1.711$

6. In a survey of 1000 U.S. teens, 372 said they own a smart phone. Construct a 95% confidence interval for the proportion of teens who say they own a smart phone. Interpret the results. (three decimal places)

$\hat{p} = \frac{372}{1000} = .372$ $\quad \frac{1-.95}{2} = \frac{.05}{2} = .0250$ $\quad z_c = 1.96$ $\quad E = 1.96\sqrt{\frac{.372 \cdot .628}{1000}}$

$\hat{q} = 1 - .372 = .628$ $\quad .372 + .030 < p < .372 + .030$ $\quad = .030$

$.342 < p < .402$

With 95% confidence, we can say that 34.2% to 40.2% of all teens own a smartphone.

7. A researcher at a major hospital wishes to estimate the proportion of the adult population of the U.S. that has high blood pressure.

a. How large a sample is needed in order to be 99% confident that the sample proportion will not differ from the true proportion by more than 8%?

$\hat{p}$ is unknown so use .5 $\quad E = .08$ $\quad \frac{1-.99}{2} = \frac{.01}{2} = .0050$

$z_c = 2.575$

$n = .5 \cdot .5 \left(\frac{2.575}{.08}\right)^2 = 259.0\ldots$ $\quad \boxed{n = 260}$

b. What if a previous study indicates that the proportion of U.S. adults with high blood pressure is 23%? What is the minimum sample size now?

$\hat{p} = .23$ $\quad \hat{q} = .77$ $\quad z_c = 2.575$ $\quad E = .08$

$n = .23 \cdot .77 \left(\frac{2.575}{.08}\right)^2 = 183.4\ldots$ $\quad \boxed{n = 184}$

8. The standard IQ test has a mean of 97 and a population standard deviation of 18. We want to be 90% certain that we are within 5 IQ points of the true mean. What is the minimum sample size required?

$\bar{x} = 97$ $\quad \sigma = 18$ $\quad c = .90$ $\quad z_c = 1.645$ $\quad E = 5$

$n = \left(\frac{1.645 \cdot 18}{5}\right)^2 = 35.07\ldots$ $\quad \boxed{n = 36}$

9. In a random sample of 12 senior-level chemical engineers, the mean annual earnings was $133,326 and the standard deviation was $36,729. Assume the annual earnings are normally distributed and construct a 95% confidence interval for the population mean annual earnings for senior-level chemical engineers. Interpret the results. (nearest dollar)

$n = 12$ $\quad \bar{x} = 133{,}326$ $\quad s = 36{,}729$ $\quad c = .95$ $\quad t_c = 2.201$

$E = 2.201 \cdot \frac{36729}{\sqrt{12}} = \$23{,}337 \longrightarrow 133326 - 23337 < \mu < 133326 + 23337$

$109989 < \mu < 156663$

With 95% confidence, we can say the pop mean annual earnings for all senior-level chemical engineers is between $109989 to $156663.