Sample Size Practice **Name:** Key

Date: _____

How To Determine The Sample Size

Example: You wish to estimate with 90% confidence, the proportion of adults' age 18 – 29 that have high blood pressure. In a previous survey, 4% of adults in this age group had high blood pressure. What is the minimum sample size needed if you are to be accurate within 5% of the population proportion?

Step 1: Identify $\hat{p}$ → .04 (Write as a decimal)

Step 2: Identify the proper z^* value → 1.645

Step 3: Identify the ± error → .05 (Write as a decimal)

Step 4: Which formula will you use margin of error (E) or sample size (n)? → margin of Error

Step 5: Insert the values into the equation and use algebra to ***solve for n*** →

$E \geq z^* \cdot \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$ $\frac{.05}{1.645} \geq \frac{1.645}{1.645}\sqrt{\frac{.04(1-.04)}{n}}$ $(.030395)^2 \geq \left(\sqrt{\frac{(.04)(.96)}{n}}\right)^2$

$9.2385 \times 10^{-4} \geq \frac{(.04)(.96)}{n}$

Note: How can these steps be adjusted for a "means" question?

use $\frac{\sigma}{\sqrt{n}}$ instead of $\sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$

$n \geq 41.56$

$n \approx 42$

1. You are a travel agent and wish to estimate, with 95% confidence, the proportion of vacationers who plan to travel outside the United States in the next 12 months. Find the minimum sample size needed using a prior study that found that 26% of the respondents said they planned to travel outside the United States in the next 12 months. Your estimate must be accurate within 3 % of the true proportion.

$.03 \geq 1.96 \cdot \sqrt{\frac{.26(.74)}{n}}$

$n \geq 821.2$ $n \approx 822$

2. You are a travel agent and wish to estimate, with 99% confidence, the proportion of vacationers who use an online service or the Internet to make reservations for lodging. Find the minimum sample size needed, using a prior study that found that 10% of the respondents said they used an online service or the Internet to make reservations for lodging. Your estimate must be accurate within 4% of the true proportion.

$.04 \geq 2.575 \cdot \sqrt{\frac{.10(1-.10)}{n}}$

$n \geq 372.97$ $n \approx 373$

3. You wish to estimate, with 90 % confidence, the proportion of camcorders that need repairs or have problems by the time the product is five years old. Find the minimum sample size needed, using a prior study that found that 25% of camcorders needed repairs or had problems by the time the product was five years old. Your estimate must be accurate within 2.5 % of the true proportion.

$.025 \geq 1.645 \cdot \sqrt{\frac{.25(.75)}{n}}$

$n \geq 811.8$ $n \approx 812$

4. You wish to estimate, with 80 % confidence, the proportion of computers that need repairs or have problems by the time the product is five years old. Find the minimum sample size needed, using a prior study that found that 19% of computers needed repairs or had problems by the time the product was five years old. Your estimate must be accurate within 3.5 % of the true proportion.

$.035 \geq 1.28 \cdot \sqrt{\frac{.19(.79)}{n}}$

$n \geq 200.75$ $n \approx 201$

5. The college professor asks the statistics teacher to estimate the average age of the students at their college. How large of a sample is necessary? The statistics teacher would like to be 99% confident that the estimate should be accurate within one year. From a previous study the standard deviation of ages is known to be 3 years. ***(Be careful here. Is this a proportion question or a mean question?)***

$1 \geq 2.575 \cdot \frac{3}{\sqrt{n}}$

$n \geq 59.675$ $n \approx 60$

6. You want to estimate the mean number of sentences in a magazine advertisement. How many magazine advertisements must be included in the sample if you want to be 90% confident that the sample mean is within 2 sentences of the population mean? (a random sample of 54 magazines ads produces mean of 12.4 and standard deviation of 5) ***(Be careful here. Is this a proportion question or a mean question?)***

$2 \geq 1.645 \cdot \frac{5}{\sqrt{n}}$

$n \geq 16.9$ $n \approx 17$

7. An airline's maintenance manager desires to estimate the average time (in hours) required to replace a jet engine in a Boeing 767. How large of a sample is necessary if he wishes to be 95% confident the mean is within ¼ of an hour (error = 0.25). Assume preliminary sample size n = 30 has an average replacement time of 16.7 hrs. with a standard deviation of 4.3 hrs. ***(Be careful here. Is this a proportion question or a mean question?)***

$.25 \geq 1.96 \cdot \frac{4.3}{\sqrt{n}}$

$n \geq 1136.49$ $n \approx 1137$