



**AP Statistics**

**Chapter 8:  
Estimating with Confidence**

**Day 3**

**HW: Lesson 3 Practice Worksheet  
Study for Quiz**

Chapter 8  
Lesson 2 Practice Worksheet

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Date:

Period:

1. What proportion of students are willing to report cheating by other students? A student project put this question to an SRS of 172 undergraduates at a large university: "You witness two students cheating on a quiz. Do you go to the professor?" Only 19 answered yes. Construct a 99% confidence interval for  $p$ .

$$n = 172 \quad \hat{p} = \frac{19}{172} = .1105 \quad SE_{\hat{p}} = \sqrt{\frac{.1105(.8895)}{172}} = .0239$$

conditions

- ① As stated, this is an SRS.  
②  $172 \leq \frac{1}{10} N \rightarrow 1720$   
We can assume that there are at least 1720 students at this large university  
③  $np \geq 10$        $n(1-p) \geq 10$   
 $172(.1105) \geq 10$      $172(.8895) \geq 10$   
 $19.006 \geq 10$      $152.994 \geq 10$

$$CI = .1105 \pm 2.576(.0239) \\ (.0489, .1721)$$

We are 99% confident that the true proportion population of students who would go to the professor is between 4.89% and 17.21%.

2. In January 2010, a Gallup Poll asked a random sample of adults, "In general, are you satisfied or dissatisfied with the way things are going in the United States at this time?" In all, 256 said that they were satisfied and the remaining 729 said they were not. Construct a 90% confidence interval for  $p$ .

$$n = 985 \quad \hat{p} = \frac{256}{985} = .2599$$

$$SE_{\hat{p}} = \sqrt{\frac{.2599(.7401)}{985}} = .0140$$

the proportion of adults that are satisfied w/ the way things are going in the US at this time.

$$CI = .2599 \pm 1.645(.0140) \\ (.2369, .2829)$$

### Conditions

① As stated, this is an SRS.

②  $985 \leq \frac{1}{10} N \rightarrow 9850$   
We can assume that there are at least 9850 adults in the US

③  $np \geq 10$        $n(1-p) \geq 10$   
 $985(.2599) \geq 10$      $985(.7401) \geq 10$   
 $256 \geq 10$        $729 \geq 10$

We are 90% confident that the true proportion of adults that are satisfied w/ the way things are going in the US at this time is between 23.69% and 28.29%.



## Choosing a Sample Size

What if we want to choose a sample size that allows us to estimate a population proportion within a given margin of error?

**Remember:**

"z\*"

$$\sqrt{\frac{p(1-p)}{n}}$$

$$CI = \hat{p} \pm \text{critical value} \cdot SE$$

**So:**

$$\text{critical value} \cdot SE \leq ME$$

## Example

PTC is a substance that has a strong bitter taste for some people and is tasteless for others. The ability to taste PTC is inherited. About 75% of Italians can taste PTC. You want to estimate the proportion of Americans who have at least one Italian grandparent who can taste PTC. How large a sample must you test to estimate the proportion of PTC tasters within 0.04 with 90% confidence?

$$5.905 \times 10^{-4}$$
$$.0005905$$

$$z^* \cdot SE \leq ME$$

$$1.645 \cdot \sqrt{\frac{.75(.25)}{n}} \leq .04$$

$$.1875 \leq .0005905n \quad \left( \sqrt{\frac{.75(.25)}{n}} \right)^2 \leq .0243^2$$

$$317.5275 \leq n$$

$$n \cdot \frac{.1875}{n} \leq .0005905 \cdot n$$

Our sample size must be at least 318 people



## Example

Suppose you wanted to estimate the true proportion of students at your school who have a tattoo with 95% confidence and a margin of error of no more than 0.10. Determine how many students should be surveyed.

$$z^* \cdot SE \leq ME$$

$$\frac{.25}{n} \leq .0026$$

$$1.96 \sqrt{\frac{.5(.5)}{n}} \leq .10$$

$$\frac{.25}{.0026} \leq n$$

$$96.169 \leq n$$

We would have to sample at least 97 people.