CIS MCTC Statistics **9.1 Four-Step Process for Hypothesis Tests Classwork** KEY

For each situation below, carry out the four steps of a hypothesis test to determine if there is significant evidence to reject the null hypothesis.

1. In the United States, the average car is driven about 12,000 miles each year. The owner of a large rental car company suspects that for his fleet, the mean distance is greater than 12,000 miles each year. He selects a random sample of n = 225 cars from his fleet and finds that the mean annual mileage for this sample is $\bar{x} = 12{,}375$ miles. The P-value for the situation is calculated to be 0.01.

1. μ = mean annual mileage for all cars of this rental company
$H_0: \mu = 12{,}000$ Right-tailed
$H_a: \mu > 12{,}000$

2. $n = 225$, $\bar{x} = 12{,}375$

3. P-value = .01

4. Based on the P-value, there is strong evidence to reject the null hypothesis since it is significant at the 0.01 level.
Therefore there is strong evidence that the mean annual mileage for the rental car fleet is greater than 12,000 miles.

2. Assume that we want to test the claim that the mean IQ score of professional comedians is greater than 110. A random sample of 50 professional comedians was obtained and it is found that the mean IQ in the sample is $\bar{x} = 116$. The P-value for the situation is calculated to be 0.097.

1. μ = mean IQ score for all professional comedians
$H_0: \mu = 110$ Right-tailed
$H_a: \mu > 110$

2. $n = 50$, $\bar{x} = 116$

3. P-value = .097

4. Based on the P-value, there is not evidence to reject H_0 since it is not significant at either the 0.01 or the 0.05 level.
Therefore there is not evidence that the mean IQ score of all professional comedians is greater than 110.

3. For a number of years, the proportion of entering students who survived the first year in engineering school was about 65% nationwide. Engineering schools then instituted various measures to improve the situation, including more diligent screening of admissions and more counseling help. After the change, in a random sample of 800 students who were beginning their first year at engineering school, 560 (or 70%) of the students survived the year. The P-value for the situation is calculated to be 0.0015.

1. p = proportion of <u>all</u> engineering students who survive their first year after the new changes.
   $H_0: p = .65$ Right-tailed
   $H_a: p > .65$
2. $n = 800$, $\hat{p} = .70$
3. P-value = .0015
4. Based on the P-value, there <u>is</u> strong evidence to reject H_0 since it <u>is</u> significant at the 0.01 level.
   Therefore there <u>is</u> strong evidence that the changes were effective in raising the proportion of first year students who survive their first year at engineering school.

4. *Challenge: Make a decision about this test without a P-value.*

Lay's has just received a truckload of potatoes from its main supplier. They will assume that the truck is full of good potatoes, but if they find convincing evidence that more than 8% of the potatoes in the shipment have blemishes, the truck will be sent away to get another load from the supplier. A supervisor selects a random sample of 500 potatoes from the truck. An inspection reveals that 33 of the sampled potatoes have blemishes.

1. p = proportion of <u>all</u> potatoes in the truckload that have blemishes
   $H_0: p = .08$ Right-tailed
   $H_a: p > .08$
2. $n = 500$, $\hat{p} = \frac{33}{500} = .066$
3. P-value = ?
4. Since $\hat{p}$ is less than .08, there is <u>not</u> strong evidence to reject H_0.
   There is <u>not</u> evidence to suggest that more than 8% of all potatoes in the truckload have blemishes.