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Math 171-05

Hypothesis Testing and Confidence Intervals (HW Set 2)

1a.) **Population:** Unleaded Gasoline in Illinois

**Pop. Mean:** Price of Regular Unleaded Gasoline in Illinois

**Standard deviation of pop.:** unknown

* **Sample:**
	+ **SRS:** not stated
	+ n=10
	+ **Sample Mean:** 3.975
	+ **Standard deviation of sample:** 0.227
* **H>** Null: the average price for a gallon of regular unleaded gasoline in Illinois is equal to the national average price for a gallon of regular unleaded gasoline ($3.63).
* **H>** Alt: the average price for a gallon of regular unleaded gasoline in Illinois is greater than the national average price for a gallon of regular unleaded gasoline ($3.63).
* **A>** SRS? Unknown; Sample size <40, checked for outliers; No outliers present; Not normally distributed, skewed left because you can’t have a negative price.
* **N>** One-sample T Procedure for pop. mean Mu
* **T>** Test statistic t= 3.9703
* **O>** P-value= 0.0016
* **M>** Reject the null in favor of Ha. P-value is significant at alpha=0.05 level.
* **S>** We have statistically significant evidence that the average price for a gallon of regular unleaded gasoline in Illinois is greater than the national average price for a gallon of regular unleaded gasoline ($3.63).

1b.) Type II error, rejected the null when the null was correct.

2a.) “We are 92.5% confident that the mean number of hours (per week) female students at Big State University spend exercising is between 7.3913 hours ad 8.8287 hours.”

2b.) **Population:** Students at Big State University

**Pop. Mean 1:** mean number of hours (per week) that female students exercise

* **Sample:**
	+ **SRS:** yes
	+ n=168
	+ **Sample Mean:** 8.110
	+ **Standard deviation of sample:** 5.119

**Pop. Mean 2:** mean number of hours (per week) that male students exercise

* **Sample:**
	+ **SRS:** yes
	+ n=193
	+ **Sample Mean:** 9.876
	+ **Standard deviation of sample:** 6.069
* **H>** Null: The mean number of hours (per week) that male students exercise is equal to the mean number of hours (per week) that female students exercise.
* **H>** Alt: The mean number of hours (per week) that male students exercise is greater than the mean number of hours (per week) that female students exercise.
* **A>** SRS? yes; Sample size = 361; Not normally distributed, skewed left because you can’t have negative minutes.
* **N>** Two-sample T Procedure for pop. mean Mu
* **T>** Test statistic t= -2.9777
* **O>** P-value= 0.0016
* **M>** Reject the null. P-value is significant at alpha=0.05 level.
* **S>** We find statistically significant evidence that the mean number of hours (per week) that male students exercise is greater than the mean number of hours (per week) that female students exercise.

2c.) “We are 90% confident that the diﬀerence between the mean number of hours (per week) that female students at Big State University spend exercising and the mean number of hours (per week) that male students at Big State University spend exercising is between -2.774 and -0.788.”

3a.) By purchasing boxes from all over the country, it allows for the sample to be more accurate than if you chose boxes from just one location.

3b.)**Population:** All Bags of Chips Ahoy! Cookies in the world

**Pop. Mean:** Average number of chocolate chips in each bag

**Standard deviation of pop.:** unknown

* **Sample:**
	+ **SRS:** not stated
	+ n=42
	+ **Sample Mean:** 1261.6
	+ **Standard deviation of sample:** 117.6
* **H>** Null: The average number of chocolate chips per bag of Chips Ahoy! Cookies is equal to 1000.
* **H>** Alt: The average number of chocolate chips per bag of Chips Ahoy! Cookies is greater than 1000.
* **A>** SRS? Unknown; Sample size >40; Not normally distributed, skewed left because you can’t have a negative number of chocolate chips.
* **N>** One-sample T Procedure for pop. mean Mu
* **T>** Test statistic t= 14.4163
* **O>** P-value= 0
* **M>** Reject the null in favor of Ha. P-value is significant at alpha=0.05 level.
* **S>** We have statistically significant evidence that the average number of chocolate chips per bag of Chips Ahoy! Cookies is greater than 1000.

3c.) Based off of the hypothesis test, we are 95% confident that the number of chips per bag is greater than 1000 (since its a 5% alpha level). Since the p-value was low, we had to reject the null in favor of the alternative.