IC [CH 12] 3/31/16

AP STATISTICS **5 PTS** **NAME**____________________________

SHOW ALL WORK!!! **PER**____

1] Mr. McCreary goes to an open try-out with the Cleveland Indians. He wants to be a pitcher, so he tells the Cleveland Indians scouts that he can throw 95mph. To test Mr. McCreary's claim, they have him throw 8 baseballs while using a radar gun to get the speed in miles per hour of each throw.

86mp	94mph	96mph	93mph	89mph	95mph	91mph	92mph

$$t = \frac{\bar{x} - \mu_0}{s/\sqrt{n}} \qquad df = n-1$$

These 8 throws had an average speed of 92 mph and a standard deviation of 3.295 mph.

a] Carry out a significance test to determine if this is good evidence that Mr. McCreary throws an average speed that is less than he claims. [PHANTOMS]

b] Calculate and interpret a 98% Confidence Interval. Then use this interval to make a decision about Mr. McCreary's claim. [PANIC]

$$CI = \bar{x} \pm t^* \frac{s}{\sqrt{n}} \qquad df = n-1$$

AP STATISTICS **5 PTS** **NAME** MCCREARY
IC [12.1] **SHOW ALL WORK!!!** **PER**____

1] Mr. McCreary goes to an open try-out with the Cleveland Indians. He wants to be a pitcher, so he tells the Cleveland Indians scouts that he can throw 95 mph. To test Mr. McCreary's claim, they have him throw 8 baseballs while using a radar gun to get the speed in miles per hour of each throw.

μ

86mp	94mph	96mph	93mph	89mph	95mph	91mph	92mph

These 8 throws had an average speed of 92 mph and a standard deviation of 3.295 mph.

n $\bar{x}$ s

a] Carry out a significance test to determine if this is good evidence that Mr. McCreary throws an average speed that is less than he claims. [PHANTOMS]

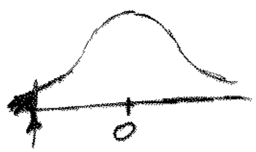
H $\boxed{H_0: \mu = 95 \quad H_a: \mu < 95}$ ✓

T $t = \dfrac{\bar{x} - \mu_0}{s/\sqrt{n}} = \dfrac{92-95}{3.295/\sqrt{8}}$

$\boxed{t = -2.575}$ ✓

O $\boxed{df = 7}$ ✓

TABLE $\boxed{\text{P-VALUE} = \text{BETWEEN } .01 \ \& \ .02}$ ✓



$t = -2.575$

CALCULATOR $\boxed{\text{P-VALUE} = .0184}$

M $\boxed{\text{REJECT } H_0 \text{ B/C } .01 \text{ TO } .02 \leq .05}$ ✓ $\boxed{.0184 \leq .05}$

b] Calculate and interpret a 98% Confidence Interval. Then use this interval to make a decision about Mr. McCreary's claim. [PANIC]

I $CI = \bar{x} \pm t^* \dfrac{s}{\sqrt{n}}$

$= 92 \pm (2.998)\dfrac{3.295}{\sqrt{8}}$

$= 92 \pm 3.5$

$\boxed{df = 7}$ ✓ 98% CONF

$t^* = 2.998$

$\boxed{CI = (88.5, 95.5)}$ ✓

C WE ARE 98% CONFIDENT THAT MCCREARY'S TRUE AVERAGE THROWING SPEED IS BETWEEN 88.5 & 95.5 mph ✓

PHANTOMS ✓

P μ → MCCREARY'S TRUE AVE THROWING SPEED

A SRS → ASSUME 8 THROWS ACT AS A SIMPLE RANDOM SAMPLE

NORMALITY → GRAPH OF SAMPLE DATA

HISTOGRAM CLOSE TO NORMAL

NORMAL PROBABILITY PLOT IS CLOSE TO LINEAR

B/C HISTOGRAM IS CLOSE TO NORMAL, OK TO HAVE A SMALL SAMPLE SIZE
$n = 8 < 15$

→ THUS SAMPLING DISTR OF $\bar{x}$ APPROX NORMAL

INDEP
→ ASSUME SPEED OF EACH THROW IS NOT AFFECTED BY SPEED OF PREVIOUS THROW

N ONE-SAMPLE t-TEST

S THUS, WE HAVE GOOD EVIDENCE TO CONCLUDE THAT MCCREARY'S TRUE AVE THROWING SPEED IS LESS THAN THE 95 mph HE CLAIMS

PANIC ✓ **P** **A** **N** → SAME AS ABOVE

Quiz 12.2C — AP Statistics — Name:

Eleven percent of the products produced by an industrial process over the past several months fail to conform to the specifications. The company modifies the process in an attempt to reduce the rate of nonconformities. In a trial run, the modified process produces 16 nonconforming items out of a total of 300 produced.

1. Do these results demonstrate that the modification is effective? Support your conclusion with a test of significance.

2. Construct and interpret a 95% confidence interval for the proportion of nonconforming items for the modified process.

Quiz 12.2D — AP Statistics — Name:

We often judge other people by their faces. It appears that some people judge candidates for elected office by their faces. Psychologists showed head-and-shoulders photos of the two main candidates in 32 races for the U.S. Senate to many subjects (dropping subjects who recognized one or both of the candidates) to see which candidate was rated "more competent" based on nothing but the photos. On election day, the candidate whose face looked more competent won 22 of the 32 contests. If faces don't influence voting, half of all races in the long run should be won by the candidate with the better face.

1. Is there evidence that the candidate with the better face wins more than half the time? Carry out an appropriate test to help answer this question.

2. Construct and interpret a 90% confidence interval for the unknown population proportion p.

Quiz 12.2C — AP Statistics — Name:

Eleven percent of the products produced by an industrial process over the past several months fail to conform to the specifications. The company modifies the process in an attempt to reduce the rate of nonconformities. In a trial run, the modified process produces 16 nonconforming items out of a total of 300 produced.

$n = 300 \quad \hat{p} = 16/300 \approx .053$

1. Do these results demonstrate that the modification is effective? Support your conclusion with a test of significance.

$\boxed{H_0: p = .11 \quad H_a: p < .11}$

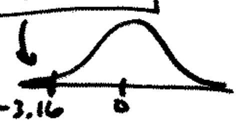
$p \rightarrow$ TRUE PROPORTION OF ALL NONCONFORMING ITEMS PRODUCED BY MODIFIED PROCESS

NORMALITY → CHECK EXPECTED # OF SUCCESSES AND FAILURES ARE AT LEAST 10

$np_0 = (300)(.11) = \boxed{33 \geq 10}$ ✓ $\quad n(1-p_0) = (300)(.89) = \boxed{267 \geq 10}$ ✓

$z = \dfrac{\hat{p} - p_0}{\sqrt{\dfrac{p_0(1-p_0)}{n}}} = \dfrac{.053 - .11}{\sqrt{\dfrac{(.11)(.89)}{300}}}$ $\quad \boxed{z = -3.16}$ ✓ ✓

$\boxed{p\text{-VALUE} = .0008}$



$\boxed{\text{WE REJECT } H_0 \text{ B/C } .0008 \leq .05}$

THUS WE CONCLUDE MODIFIED PROCESS REDUCES THE PROPORTION OF NONCONFORMING ITEMS

2. Construct and interpret a 95% confidence interval for the proportion of nonconforming items for the modified process.

$CI = \hat{p} \pm z^* \sqrt{\dfrac{\hat{p}(1-\hat{p})}{n}}$

SUCCESSES $\boxed{16 \geq 10}$ ✓
FAILURES $\boxed{284 \geq 10}$ ✓

$\boxed{\text{NORMALITY}}$ ★

$= .053 \pm 1.96\sqrt{\dfrac{(.053)(.947)}{300}}$

$= .053 \pm .025$

$\boxed{= (.028, .078)}$

$n\hat{p} = (300)(.0533) = 15.99 \geq 10$ ✓
$n(1-\hat{p}) = (300)(.9467) = 284.01 \geq 10$ ✓

WE ARE 95% CONFIDENT THAT THE TRUE PROPORTION OF NONCONFORMING ITEMS PRODUCED BY THE MODIFIED PROCESS IS BETWEEN 2.8% & 7.8%

Quiz 12.2D — AP Statistics — Name:

We often judge other people by their faces. It appears that some people judge candidates for elected office by their faces. Psychologists showed head-and-shoulders photos of the two main candidates in 32 races for the U.S. Senate to many subjects (dropping subjects who recognized one or both of the candidates) to see which candidate was rated "more competent" based on nothing but the photos. On election day, the candidate whose face looked more competent won 22 of the 32 contests. If faces don't influence voting, half of all races in the long run should be won by the candidate with the better face.

$n = 32 \quad \hat{p} = 22/32 = .6875$

1. Is there evidence that the candidate with the better face wins more than half the time? Carry out an appropriate test to help answer this question.

$\boxed{H_0: p = .5 \quad H_a: p > .5}$

$p \rightarrow$ TRUE PROPORTION OF ALL RACES WON BY THE CANDIDATE WITH THE BETTER FACE ✓

NORMALITY $\quad np_0 = n(1-p_0) = (32)(.5) = \boxed{16 \geq 10}$

$z = \dfrac{\hat{p} - p_0}{\sqrt{\dfrac{p_0(1-p_0)}{n}}} = \dfrac{.6875 - .5}{\sqrt{\dfrac{(.5)(.5)}{32}}}$ $\quad \boxed{z = 2.12}$ ✓

$\boxed{p\text{-VALUE}} = 1 - .9830 = \boxed{.0170}$

$\boxed{\text{WE REJECT } H_0 \text{ B/C } .0170 \leq .05}$

THUS WE CONCLUDE CANDIDATE WITH THE BETTER FACE WINS MORE THAN HALF THE TIME

2. Construct and interpret a 90% confidence interval for the unknown population proportion p.

$CI = \hat{p} \pm z^* \sqrt{\dfrac{\hat{p}(1-\hat{p})}{n}}$

SUCCESSES $\boxed{22 \geq 10}$ ✓
FAILURES $\boxed{10 \geq 10}$ ✓

$\boxed{\text{NORMALITY}}$ ★

$= .6875 \pm 1.645\sqrt{\dfrac{(.6875)(.3125)}{32}}$

$= .6875 \pm .1348$

$\boxed{= (.5527, .8223)}$ ✓

$n\hat{p} = (32)(.6875) = 22 \geq 10$ ✓
$n(1-\hat{p}) = (32)(.3125) = 10 \geq 10$ ✓

WE ARE 90% CONFIDENT THAT THE CANDIDATE WITH THE BETTER FACE WILL WIN BETWEEN 55% & 82% OF THE TIME