MA207 One Sample Population Mean Test Name: Key

Ex 1 A travel agency claims that the average cost of a hotel room in Florence is \$89.21. A member of the Florence Chamber of Commerce believes the cost is actually less, so he hires a researcher to see if this figure is correct. The researcher selects a random sample of 30 hotels rooms and finds the average cost to be \$87.13 with standard deviation \$3.72. What does the researcher conclude?

$\bar{x} = 87.13$ $s = 3.72$ $n = 30$ $\mu_0 = 89.21$

a. State the null hypothesis, using correct notation.

$H_0: \mu = 89.21$ dollars

b. State the alternative hypothesis, using correct notation.

$H_a: \mu < 89.21$ dollars

c. Is the alternative hypothesis one-sided or two-sided? left-tailed

d. Explicitly check any assumptions needed to perform the significance test.

* Randomization - yes; "random sample of size 30"
* $n = 30$ is large enough

e. Compute the appropriate test statistic.

$$t = \frac{87.13 - 89.21}{3.72/\sqrt{30}} \approx -3.06$$

f. Determine the P-Value. Draw a labeled curve and shade the appropriate region.

df	$t_{.005}$		$t_{.001}$
29	2.462	2.756	(3.06) 3.396

$.001 < P < .005$

g. Interpret the P-value in the context of this problem. (Note that here you need to give the meaning of the P-value, not an assessment of the evidence it provides against the null.)

The probability of obtaining a sample mean of \$87.13 or even lower is between .001 and .005, assuming the null hypothesis is actually true.

h. Assume the $\alpha = 0.01$ level of significance. $.001 < P < .005$ $\alpha = .010$ $P < \alpha$

(a) Are the results statistically significant or not statistically significant?

(b) Do we therefore reject the null hypothesis or not reject the null hypothesis?

(c) Explain in a complete sentences what this means in the context of this problem.
(Because P is less than alpha, the results are statistically significant. Reject the null hypothesis.)

There is sufficient evidence that the average of all hotel room prices in Florence is less than \$89.21.

Ex 2 *USA Today* reported that the state with the longest mean life span is Hawaii, where the population mean life span is 77 years. A random sample of 20 obituary notices for Honolulu residents in the *Honolulu Advertizer* resulted in a mean life span of 71.4 years with standard deviation 20.65 years. Does this information indicate that the population mean life span for Honolulu residents is not 77 years? $\mu_0 = 77$ $n = 20$ $\bar{x} = 71.4$ $s = 20.6$

a. State the null hypothesis, using correct notation.

$H_0: \mu = 77$ years

b. State the alternative hypothesis, using correct notation.

$H_a: \mu \neq 77$ years

c. Is the alternative hypothesis one-sided or two-sided?

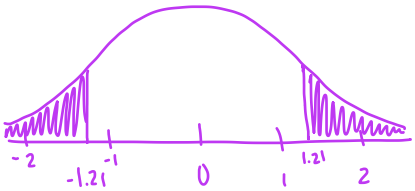
d. Explicitly check any assumptions needed to perform the significance test.

- Data obtained randomly- "random sample" from Honolulu, so results only tell us about Honolulu, not all Hawaiian residents.
- Ages in obituary notices are not necessarily normally distributed. Also, n=20 which is not at least 30. However the two tailed test is robust even when those requirements aren't met.

e. Compute the appropriate test statistic.

$$t = \frac{\bar{x} - \mu_0}{s/\sqrt{n}} = \frac{71.4 - 77}{\left(\frac{20.65}{\sqrt{20}}\right)} \approx -1.21$$

f. Determine the P-Value. Draw a labeled curve and shade the appropriate region.



df	$t_\square$	$t_{.100}$	$t_{.050}$	$t_{.025}$	$t_{.010}$
19	1.21	1.328	1.729	2.093	2.539

the right tail is even more than .100

$P > .200$

g. Interpret the P-value in the context of this problem. (Note that here you need to give the meaning of the P-value, not an assessment of the evidence it provides against the null.)

The probability of selecting a sample with mean age 71.4 years or even more extreme (below 71.4 or above 82.6) is above 0.200, assuming the null hypothesis is actually true.

h. Assume the $\alpha = 0.05$ level of significance. $P > .200$ $\alpha = .05$ $P > \alpha$

(a) Are the results statistically significant or not statistically significant?

(b) Do we therefore reject the null hypothesis or not reject the null hypothesis?

(c) Explain in a complete sentences what this means in the context of this problem.

(Because the P-value of .200 is more than alpha, the results are not statistically significant. Do not reject the null hypothesis.)

It is plausible that the mean lifespan of Honoluluans reported in obituaries is 77 years.