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Homework 3:

Pg 369-370 : 6.17, 6.27, 6.28

6.17: 340 Millenials (18-33 year olds) indicate stress levels (avg) on a 10 point scale during last month Mean = 5.4 Sd = 2.3

a) give Margin of error & find 95% confidence interval.

Margin of Error: $2\sigma_{\bar{x}} = 2(\sigma/\sqrt{n}) = 2(2.3/\sqrt{340}) = \boxed{0.2495}$

Confidence Interval: $[\bar{x} - 2\sigma_{\bar{x}}, \bar{x} + 2\sigma_{\bar{x}}]$

$= [5.4 - 2(.1247), 5.4 + 2(.1247)] = \boxed{[5.15, 5.65]}$

b) repeat for 99% confidence interval

Margin of Error: $3\sigma_{\bar{x}} = 3(\sigma/\sqrt{n}) = \boxed{0.3742}$

Confidence interval: $[\bar{x} - 3\sigma_{\bar{x}}, \bar{x} + 3\sigma_{\bar{x}}]$

$= [5.4 - 3(0.1247), 5.4 + 3(0.1247)] = \boxed{[5.03, 5.77]}$

6.27: 1200 students surveyed on radio habits: 83% said listened to radio.

Mean = 11.5 hours per week, Sd = 8.3 hours

a. give 95% confidence Interval for mean time spent per week listening to radio.

$[\bar{x} - 2\sigma_{\bar{x}}, \bar{x} + 3\sigma_{\bar{x}}] \Rightarrow \sigma_{\bar{x}} = \sigma/\sqrt{n}$

C.I. $= [11.5 - 2(8.3/\sqrt{1200}), 11.5 + 2(8.3/\sqrt{1200})]$

$= \boxed{[11.02, 11.98]}$

b. Is it true that 95% of 1200 students responses lie in interval from a?

No, because this is for the average time spent, not individual time

c. Population is skewed to the right, why is this still a good approximation?

This is still a good approximation because the sample size is large ($n = 1200$)

6.28: Avg Minutes per week (refer to 6.27

a. give mean & sd in minutes: mean: 690, sd: 498

b. calc. 95% C.I: $[690 - 2(\frac{498}{\sqrt{1200}}), 690 + 2(\frac{498}{\sqrt{1200}})] = \boxed{[661.25, 718.75]}$

c. Since 6.27 is in hours, the C.I. is also in hours, therefore you can just convert the C.I. by multiplying by 60.

Pg 391-393 6.58, 6.59, 6.71, 6.73

6.58: Computing P-value: A test of null hypothesis $H_0: \mu = \mu_0$ gives test statistic $Z = 1.77$.

a) what is p-value if alt. is $H_a: \mu > \mu_0$?

$P(Z > 1.77) = 0.5 - 0.4616 = \boxed{0.0384}$

b) what is p-value if alt is $H_a: \mu < \mu_0$?

$P(Z < 1.77) = 1 - P(Z > 1.77) = 1 - 0.0384 = \boxed{0.9616}$

c. what is pvalue if $H_a: \mu \neq \mu_0$?

$P(Z > 1.77 \text{ and } Z < 1.77) = 2(P(Z > 1.77)) = \boxed{0.0768}$

6.59: A test of null Hypothesis $H_0: \mu = \mu_0$ gives test Statistic $Z = -1.69$.

a. what is p-value if $H_a: \mu > \mu_0$?

$P(Z > -1.69) = 1 - P(Z < -1.69) = 1 - (.5 - .4545) = \boxed{0.9545}$

b. what is p-value if $H_a: \mu < \mu_0$?

$P(Z < -1.69) = .5 - .4545 = \boxed{0.0455}$

c. what is p-value if $H_a: \mu \neq \mu_0$?

$P(Z > -1.69, Z < -1.69) = 2(P(Z < -1.69)) = \boxed{0.091}$

6.71: Survey given to 25 students 30+, $\bar{X} = 127.8$, $\mu = 115$, $\sigma = 30$

a. Assuming $\sigma = 30$ for older students, test $H_0: \mu = 115$, $H_a: \mu > 115$; report p-value & state conclusion

$$Z = \frac{(\bar{X} - \mu)}{\sigma/\sqrt{n}} = \frac{(127.8 - 115)}{30/\sqrt{25}} = 2.13$$

$P(Z > 115) = .5 - .4834 = \boxed{0.0166}$

b. what 2 assumptions did you make, which is most important to validity of conclusion?

- This is an SRS, (most important) & that it has a normal distribution [no outliers, little skewness]

6.73: 5.0, 6.5, -0.6, 1.7, 3.7, 4.5, 8.0, 2.2, 4.9, 3.0, 4.4, 0.1, 3.0, 1.1, 1.1, 5.0, 2.1, 3.7, -0.6, -4.2 $\bar{X} = 2.73$ $\sigma = 3.0$

a) State H_0 & H_a to test: $H_0: \mu = 0$ mpg $H_a: \mu \neq 0$ mpg

b) carry out test: $Z = \frac{(\bar{X} - \mu_0)}{\sigma/\sqrt{n}} = \frac{2.73 - 0}{3/\sqrt{20}} = 4.07 \rightarrow$ p-value really small

Pg 401: 6.99

6.99: Practical significance & sample size: Calculate p-value for test: $H_0: \mu = 2403.7$, $H_a: \mu > 2403.7$ & Sd = 880 for:

a) Sample of 100 athletes → $\bar{x} = 2453.7$

$$z = \frac{\bar{x} - \mu_0}{\sigma/\sqrt{n}} = \frac{50}{880/10} = .57 \rightarrow P: .5 - .2157$$

$$\boxed{P = 0.2843}$$

b) Sample of 500 athletes → $\bar{x} = 2453.7$

$$z = \frac{50}{880/\sqrt{500}} = 1.27 \rightarrow P: .5 - .3980$$

$$\boxed{P = 0.1020}$$

c) Sample of 2500 athletes → $\bar{x} = 2453.7$

$$z = \frac{50}{880/\sqrt{2500}} = 2.84 \rightarrow P: .5 - .4977$$

$$\boxed{P = 0.0023}$$

Pg 412: 6.120:

6.120: Choose appropriate distribution.

x	0	1	2	3	4	5	6
P_0	0.1	0.1	0.2	0.1	0.1	0.1	0.3
P_1	0.2	0.2	0.2	0.1	0.1	0.1	0.1

test:
H_0: P_0 is correct
H_a: P_1 is correct

1-β

one decision procedure is: reject H_0 iff $X \le 2 \rightarrow X = 0, 1, 2$

a) Find probability of Type I error (α)

$P(X=0 \text{ OR } X=1 \text{ OR } X=2) = .1 + .1 + .2 = .4$

$\boxed{P(\text{type I error}) = 0.4}$

b) Find probability of Type II error ($1-\beta$)

$P(X=3 \text{ OR } X=4 \text{ OR } X=5 \text{ OR } X=6) = 1 - P(X=0 \text{ OR } X=1 \text{ OR } X=2)$

$= 1 - (.2 + .2 + .2) = 1 - .6 = .4$

$\boxed{P(\text{type II error}) = 0.4}$

Pg 442: 7.22, 7.23

7.22: A one-sample t-test: $H_0: \mu = 8$, $H_a: \mu > 8$ from sample of $n = 16$, $t = 2.15$

a) what are degrees of freedom? $\boxed{15}$

b) give 2 critical values t^* from table D that braket t.

$\boxed{2.131 < t < 2.249}$

c) between what p values? $\boxed{0.02 < p < 0.025}$

d) Significant at 5%, but not 1%.

e) $\boxed{P = 0.0483}$

7.23: One-sample t-test:

$H_0: \mu = 40$, $H_a: \mu \neq 40$ $n = 27$, $t = 2.01$

a) degree of freedom = $\boxed{26}$

b) 2 critical values of $t^* =$ $\boxed{1.706 < t < 2.056}$

c) 2 values of p: $\boxed{0.025 < p < 0.05}$

d) Not significant at either 5% or 1% levels.

e) $\boxed{p = 0.0549}$

I pledge my honor that I have abided by the Stevens Honor System.

[signature]