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Math 130 (Statistics)
Project 4

Date: 11/20/2015

Project 4 Math 130

1. **Number of faculty**: The numbers of faculty at 32 randomly selected state-controlled colleges and universities with enrollment under 12,000 students are shown below. Use these data to estimate the mean number of faculty at all state-controlled colleges and universities with enrollment under 12,000 with 92% confidence. Assume σ =165.1. <--- Population Std.Deviation

Note: Duplicates:

n = 32 Confidence Interval (CI) = 92% $\bar{x}$ = 11080/32 = 346.25

Samples Std.Dev. S_x

211	384	396	211	$\boxed{224}$	337	395	121	356	621	367
408	515	280	289	180	431	176	318	836	203	374
$\boxed{224}$	121	412	134	539	471	638	425	159	324	

$\sum^{32}$ = 11080

100%-92% = 8/2 = 4 + 92 = 96 InvNorm(.96,0,1)=1.750686071 = Z*= 1.75

Formula: $\bar{x} \pm \dfrac{(Z^*)(\sigma)}{\sqrt{n}}$

$$\left(346.25-\frac{(1.75)(165.1)}{\sqrt{32}},\ 346.25+\frac{(1.75)(165.1)}{\sqrt{32}}\right)$$

ME = 288.925/√32 = 51.07520669
LL = 346.25-51.07520669 = 295.1747933
HL = 346.25+51.07520669 = 397.3252067

Stat: Edit: Enter Data into L1,L2 2nd key quit. Formula Answer:(295.175,397.325)
~~Stat:Tests: 7.Z-Interval: Data = (419.77,425.26)~~<---Note: Both are above the mean. (Duplicates)
Stat:Tests: 7.Z-Interval: Data = (295.15,397.35)<---Note:Using Frequency List in L2 (Correct).
We are 92% confident that the mean number of faculty at all state controlled colleges and universities with an enrollment under 12000, is between 295.175 and 397.325.

2. **Playing Video Games**: In a recent study of 35 ninth-grade students, the mean number of hours per week that they played video games was 16.6. The standard deviation of the population was 2.8. σ = 2.8, n = 35, $\bar{x}$ = 16.6
   a) Find the 95% confidence interval of the mean time playing video games. Z* = 1.96
   b) Find the 99% confidence interval of the mean time playing video games. Z* = 2.58

Critical Value

Margin of Error ME

100%-95% = 5/2 = 2.5 + 95 = 97.5 Stat: Distr: InvNorm(.975,0,1)=1.96
100%-99% = 1/2 = 0.5 + 99 = 99.5 Stat: Distr: InvNorm(.995,0,1)=2.58

Formula: $\bar{x} \pm \dfrac{(Z^*)(\sigma)}{\sqrt{n}}$

a) $$\left(16.6-\frac{(1.96)(2.8)}{\sqrt{35}},\ 16.6+\frac{(1.96)(2.8)}{\sqrt{35}}\right)$$

ME=0.92764131
LL = 16.6-0.9276431=15.6723569
HL = 16.6+0.9276431=17.5276431

Stat:Tests: 7.Z-interval: Stats = (15.672,17.528) Formula Answer: (15.672,17.528)

b) $$\left(16.6-\frac{(2.58)(2.8)}{\sqrt{35}},\ 16.6+\frac{(2.58)(2.8)}{\sqrt{35}}\right)$$

ME = 1.221078867
LL = 16.6-1.221078867 = 15.37892113
HL = 16.6+1.221078867 = 17.82107887

Stat:Tests: 7.Z-interval: Stats = (15.381,17.819) Formula Answer: (15.379,17.821)

3. **Birth weights of infants :** A health care professional wishes to estimate the birth Weights of infants. How large a sample must be obtained if she desires to be 90% confidence that the true mean is within 2 ounces of the sample mean? Assume the population standard deviation to be 8 ounces. CI = 90%, σ = 8

Formula: $n = \left(\dfrac{(Z^*)(\sigma)}{ME}\right)^2$

Z* = InvNorm(.95,0,1)=1.644853626 Z* = 1.645 (Margin of Error)ME = 2

$$\left(\frac{(1.645)(8)}{2}\right)^2 = 43.2964 \approx 44$$ Answer: n ≈ 44

We need a sample of at least 44 estimate birth weights of infants in order to be 90% confident within 2 percent of the sample mean.

4. A sample of 10 networking sites for a specific month has a mean number of visits of 26.1 and a standard deviation of 4.2. Find a 99% confidence interval of the true mean. n = 10, σ is not given. $\bar{x}$ = 26.1 S_x = 4.2

Margin of Error

Degree of Freedom (DF) = 10-1 = 9, t* = 3.25
$((t^*)(S_x)/\sqrt{n})$ = ME
$((3.25)(4.2)/\sqrt{10})$ = 4.316509006 Margin of Error (ME) = 4.316509006
LL = 26.1 - 4.316509006 = 21.78349099 = 21.7835
HL = 26.1 + 4.316509006 = 30.41650901 = 30.4165

Formula: $\bar{x} \pm \dfrac{(t^*)(S_x)}{\sqrt{n}}$

$$\left(26.1-\frac{(3.25)(4.2)}{\sqrt{10}},\ 26.1+\frac{(3.25)(4.2)}{\sqrt{10}}\right)$$

Formula Answer:(21.7835,30.4165)
Stat:Tests: 8.T-interval: Stats = (21.784,30.416)
We are 99% confident that the true mean number of visits for a specific month is between 21.7835 and 30.4165.

(t^*)
From Table C

Formula: $\bar{x} \pm t_{\frac{a}{2}} \left(\frac{S_x}{\sqrt{n}} \right)$

5. The number of students who belong to the dance company at each of several randomly selected small universities is shown below. Estimate the true population mean size of university dance company with 99% confidence.

σ is not given. n = 19, CI = 99% Total sum of elements = $\sum^{19}$ = 567

21	25	32	22	28	30	29	30	47	26
$\boxed{35}$	26	$\boxed{35}$	26	28	28	32	27	40	

Stat:Calc: 1-Var Stats to get S_x. Stat:Calc:Edit: enter data,2nd,quit.

$\bar{x}$ = 567/19 = 29.84210526 = 29.842 S_x= 6.17578747

Degrees of Freedom (DF) = 19-1 = 18 Table C (T): T-distribution Critical Value = 2.878

LL=6.17578747/√19=1.416822815*2.878= 4.077616061 29.842-4.077616061 = $\boxed{25.76438394}$

HL=29.842+4.077616061 = $\boxed{33.91961606}$

Answer: (25.764,33.920)

We are 99% confident that the population true mean is between 25.764 and 33.920.

6. A U.S travel data center survey conducted for better homes and gardens of 1500 adults found that 39% said that they would take more vacations this year than last year. Find a 95% confidence interval for the true proportion of adults who said that they will travel more this year. Z* @ 95% Confidence Level = 1.96

σ = not given.
S = not given.
n = 1500

Standard Error

Formula: $\hat{p} \pm Z^* \sqrt{(\hat{p})(1-\hat{p})/n}$

(ME)
Margin of Error

$\hat{p}$= 0.39 Note: P-hat is the number of proportion success over n.

√((0.39)(1-0.39)/1500) = 0.0125936492 Standard Error(SE) = 0.0125936492

1.96√(0.39)(1-0.39)/1500 = 0.0246835524 ME = 0.0246835524

LL = 0.39 - 0.0246835524 = 0.3653164476 = 0.3653

LH 0.39 + 0.0246835524 = 0.4146835524 = 0.4147

Answer: (0.3653, 0.4147)

We are 95% confident that the true proportion of adults who said they will travel more this year is between 0.3653 and 0.4147.

7. A random sample of 205 college students were asked if they believed that places could be haunted and 65 responded yes. Estimate the true proportion of college students who believe in the possibility of haunted places with 99% confidence.

Missing data--> According to time magazine, 37% of americans believe that places can be haunted.

Formula: $\hat{p} \pm Z^* \sqrt{(\hat{p})(1-\hat{p})/n}$

Note: Percentage of population who believe is P hat. $\hat{p}$ = 0.37 σ = is not given.

2.576√(0.37)(1-0.37)/205 = 0.0868640481

LL = 0.37 - 0.0868640481 = 0.2831359519 = 0.2831
HL = 0.37 + 0.0868640481 = 0.4568640481 = 0.4569

Answer:(0.2831,0.4569)

X = 65, n = 205, Z* @ 99% Confidence Level = 2.576

We are 99% confident that the true proportion of college students who believe in the possibility of haunted places is between 0.2831 and 0.4569).

8. A federal report indicated that 27% of children ages 2 or 5 years had a good diet - an increase over previous years . How large a sample is needed to estimate the true proportion of children with good diets within 2% with 95% confidence.

σ = is not given.
Sample n = ?

100%-95% = 2.5% + 95% = 97.5%

2nd key: Vars: InvNorm(.975,0,1) = 1.959963986 = 1.96

$\hat{p}$ = 0.27, Z* @ 95% Confidence Level = 1.96

Margin of Error(ME) = 2% = 0.02

Formula: $(\hat{p})(1-\hat{p})\left(\frac{Z^*}{ME}\right)^2 = n$

$(0.27)(1-0.27)(1.96/0.02)^2$ = 1892.9484 ≈ 1893

Answer: n ≈ 1893