STAT 145 Week Six Homework Solutions

Section 8.2 #108, 109, 110

108.

Suppose that 14 children, who were learning to ride two-wheel bikes, were surveyed to determine how long they had to use training wheels. It was revealed that they used them an average of six months with a sample standard deviation of three months. Assume that the underlying population distribution is normal.

a.
   i. $\bar{x} = 6\ months$
   ii. sx = 3 months
   iii. n = 14
   iv. n – 1 = 13 = df

b. Define the random variable X in words (optional).

   ANSWER: The length of time, in months, that children need to use training wheels.

c. Define the random variable x-bar in words (optional).

   ANSWER: The mean length of time that children need to use training wheels for this sample of 14 children.

d. Which distribution should you use for this problem? Explain your choice. (optional)

   The t-distribution since we are working with numerical data.

e. Construct a 99% confidence interval for the population mean length of time using training wheels.
   i. State the confidence interval.

StatHelper Output

Now we can combine the LB and UB to get the 99% confidence interval:

$\mu \in (3.585, 8.415)$

Minitab 19 Output

Descriptive Statistics

N	Mean	StDev	SE Mean	99% CI for μ
14	6.000	3.000	0.802	(3.585, 8.415)

μ: population mean of Sample

INTERPRETATION: We are 99% confident that the population mean length of time using training wheels for children is between 3.585 months and 8.415 months.

ii. Sketch the graph.

iii. Calculate the error bound.

The error bound is the textbook's way of saying the Margin of Error.

ME = (8.415 – 3.585) divided by 2 = 2.415

Or

Find the difference between the upper bound and the sample mean: 8.415 – 6 = 2.415

f. Why would the error bound change if the confidence level were lowered to 90%?

The margin of error (error bound) would change because when you lower the confidence to 90%, the corresponding t critical value will also go down. If t decreases, then the margin of error decreases.

109.

The Federal Election Commission (FEC) collects information about campaign contributions and disbursements for candidates and political committees each election cycle. A political action committee (PAC) is a committee formed to raise money for candidates and campaigns. A Leadership PAC is a PAC formed by a federal politician (senator or representative) to raise money to help other candidates' campaigns.

The FEC has reported financial information for 556 Leadership PACs that operating during the 2011–2012 election cycle. The following table shows the total receipts during this cycle for a random selection of 30 Leadership PACs.

x-bar = $251,854.23

s= $521,130.41

Use this sample data to construct a 96% confidence interval for the mean amount of money raised by all Leadership PACs during the 2011–2012 election cycle. Use the Student's t-distribution.

Now we can combine the LB and UB to get the 96% confidence interval:

$\mu \in (47261.64, 456446.82)$

Descriptive Statistics

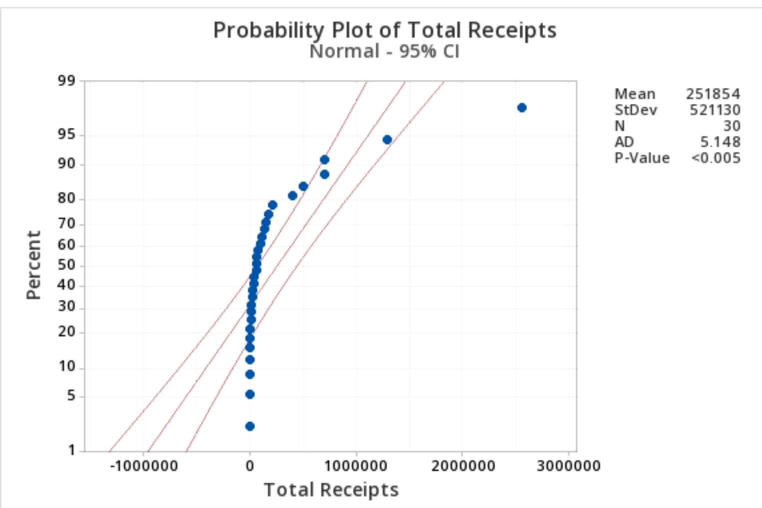
N	Mean	StDev	SE Mean	96% CI for μ
30	251854	521130	95145	(47262, 456447)

μ: population mean of Total Receipts

INTERPRETATION: We are 96% confident that the true mean amount of money raised by all Leadership PACs during the 2011-012 election cycle is between $47, 262 and $456,447.

ASSUMPTION: Since the sample size is 30 (and considered large enough), we will assume a normal sampling distribution.

NOTE: In case you are curious, an NPP on these data does not indicate that the data come from a normal population. We allow the CLT and the large enough sample size to trump the NPP. If the sample size is large enough, you do not have to even check the NPP>



110.

Forbes magazine published data on the best small firms in 2012. These were firms that had been publicly traded for at least a year, have a stock price of at least \$5 per share, and have reported annual revenue between \$5 million and \$1 billion. The **Table 8.13** shows the ages of the corporate CEOs for a random sample of these firms.

Use this sample data to construct a 90% confidence interval for the mean age of CEO's for these top small firms. Use the Student's t-distribution.

Now we can combine the LB and UB to get the 90% confidence interval:

$\mu \in (54.424, 58.71)$

Descriptive Statistics

N	Mean	StDev	SE Mean	90% CI for μ
30	56.57	6.91	1.26	(54.42, 58.71)

μ: population mean of Ages

INTERPRETATION: We are 90% confident that the true mean age of CEOs for these top small firms is between \$54.42 years and 58.71 years.

ASSUMPTION: Since the sample size is 30 (and considered large enough), we will assume a normal sampling distribution.