Tuesday, March 19, 2019

Warm-up

An engineer measured the Brinell hardness of 25 ductile iron that were subcritically annealed. The resulting data were:

170	**167**	**174**	**179**	**170**	**156**	**163**	**156**	**187**
156	**183**	**179**	**174**	**179**	**170**	**156**	**187**	**179**
183	**174**	**187**	**167**	**159**	**170**	**179**		

Test the hypothesis of the engineer that the mean Brinell hardness of all such ductile iron pieces is greater than 170.

Check Homework

Computer Output

Sample Size

Objectives

Content Objective: I will read computer output and use that information to create confidence intervals and/or perform a hypothesis test.
Social Objective: I will participate with my partner and try to have fun with the activity.
Language Objective: I will write clearly in my scenario so that others can understand.

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183	**179**	**174**	**179**	**170**	**156**	**187**	**179**	**183**	**174**
187	**167**	**159**	**170**	**179**					

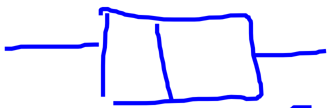
Test the hypothesis of the engineer that the mean Brinell hardness of all such ductile iron pieces is greater than 170.

$H_0: \mu = 170 \leftarrow$

$H_A: \mu > 170$

Assume representative sample

25 < 10% of all pieces



box plot is fairly symmetric w/no outliers

Nearly Normal

1 sample t-test

$t_{24} = 1.055$

p-value = 0.15

$\alpha = 0.05$

Due to p-value of 0.15 which is higher than my α of 0.05, we fail to reject the null. There is not sufficient evidence that the mean Brinell hardness is greater than 170.

Warm-up

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183	179	174	179	170	156	187	179	183	174
187	167	159	170	179					

Test the hypothesis of the engineer that the mean Brinell hardness of all such ductile iron pieces is greater than 170.

$\frac{10.31}{\sqrt{25}}$

One-Sample T: Brinell

Test of mu = 170 vs mu > 170

Variable	N	Mean	StDev	SE Mean	T	P
Brinell	25	172.52	10.31	2.06	1.22	0.117

An exercise physiologist is interested in the effect of exercise on heart rate.

She has subjects walk slowly for 5 minutes and records their heart rates. Then she has the subjects run vigorously for 5 minutes and records their heart rates again.

The differences are recorded (heart rate after running - heart rate before running), with results below:

$H_0: \mu = 0$

$H_A: \mu > 0$

$t_{11} = 16.35$

p-value = approx zero

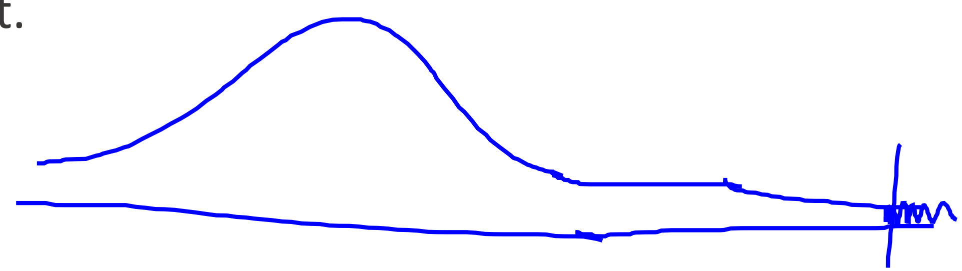
One-Sample T: Differences

Test of mu = 0 vs. > = 0

Variable	*N*	*Mean*	*StDev*	*SE Mean*	*95% CI*	*T*	*P*
Differences	*12*	*59.88*	*10.36*	*3.66*	*(51.22, 68.53)*	*16.35*	*0.000*

Complete a hypothesis test for this physiologist.

Due to a very low p-value of nearly zero, we would reject the null.



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One-Sample T: Differences

Test of mu = 0 vs. > = 0

Variable	*N*	*Mean*	*StDev*	*SE Mean*	*95% CI*	*T*	*P*
Differences	*12*	*59.88*	*10.36*	*3.66*	*(51.22, 68.53)*	*16.35*	*0.000*

Write a valid interpretation of the confidence interval.

Sample Size

- To find the sample size needed for a particular confidence level with a particular margin of error (*ME*), solve this equation for *n* :

$$ME = t^*_{n-1}\frac{s}{\sqrt{n}}$$

- The problem with using the equation above is that we don't know most of the values. We can overcome this:
  - We can use *s* from a small pilot study.
  - We can use z^* in place of the necessary *t* value.

We would like to estimate the mean teacher's salary in the Chapel Hill school district, with 99% confidence, to an accuracy within $2,000. In this case we have no idea what s would be. But in previous studies there we deduced that among four possible values that were given, the likeliest was $6,000. So in the absence of anything better, let's use that as our guess for s. How many teachers will we need to sample to get a good estimate within our parameters?

$$ME = t^*_{n-1}\frac{s}{\sqrt{n}}$$

use z^*

$$\sqrt{n}\,\frac{2000}{2000} = \frac{2.576\,\frac{6000}{\sqrt{n}}}{2000}\cdot\sqrt{n}$$

$$\left(\sqrt{n}\right)^2 = \left(\frac{2.576\cdot 6000}{2000}\right)^2$$

$$n = 59.722$$

at least 60 teachers

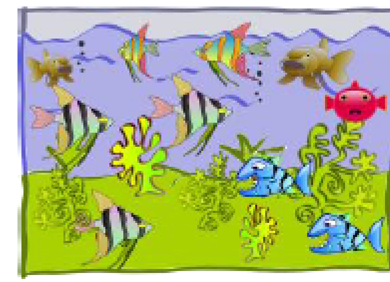
Day 72

The mean GPA at a large high school is 3.32, and the principal wonders if classroom aquariums improve student achievement. The principal selects a simple random sample of 20 students. These students are required to attend a one hour daily study period held in a room with an aquarium. At the end of the semester, the students' GPS's are as follows:

3.92	3.38	3.24	3.55	3.53	3.48	3.38	3.31	3.41	3.36
3.41	3.58	3.28	3.39	3.52	3.52	3.61	3.26	3.32	3.65

The principal performs a significance test for the hypotheses: H_O: $\mu = 3.32$

H_A: $\mu > 3.32$



where μ is the true mean GPA of students who spend an hour with an aquarium.

a) The P-value from a one-sided t test is lower than any reasonable α value. Can the principal conclude that spending time with the aquarium improves GPA?

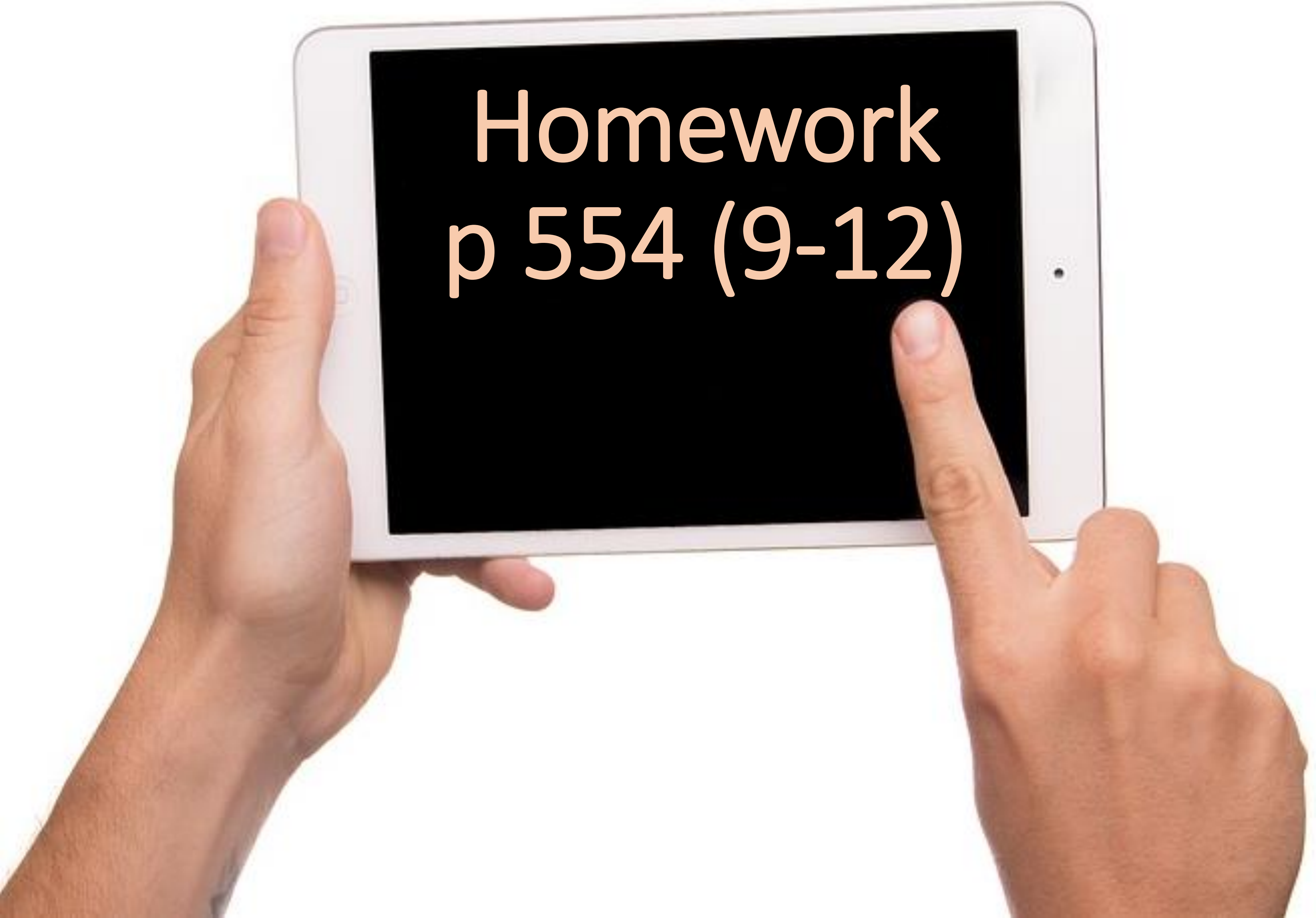
b) Are the conditions to perform a t test met? If not, how might the violation(s) affect the results?

Day 73

The annual survival rate (proportion that will survive the year) of adult male brown bears in North America is reported to be 0.85. To determine if this rate was different for adult male brown bears on Kodiak Island, biologists radio collared 33 bears. The biologists concluded, with 95% confidence that the true survival rate of adult male brown bears on Kodiak Island was between 0.61 and 0.81.

a) Assume the conditions for inference were met for the biologist's confidence interval. At the $\alpha = 0.05$ significance level, is there significant evidence that the annual survival rate of adult male brown bears on Kodiak Island is different than 0.85?

b) Another sample, using 108 adult male brown bears on Kodiak Island, estimated with 95% confidence the true annual survival rate to be between 0.75 and 0.85. Should we conclude from *this* confidence interval that the rate is not different than 0.85?


Homework
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