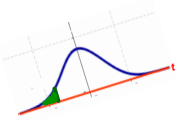
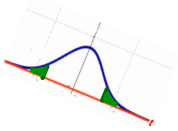


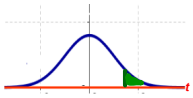
STUDY SESSIONS, 2023



Problems for the Following Topics

One Sample t-Test

Two Sample t-Tests:
Pooled and Nonpooled



Linear Regression,
Correlation Coefficient, and
Coefficient of Determination

Class Notes: Prof. G. Battaly, Westchester Community College, NY

Statistics Home Page Class Notes Homework

4. A car company claims that their Super Sport Sedan averages 32 mpg. You randomly select 8 Super Sports from local car dealerships and test their gas mileage under similar conditions.

You get the following mpg scores: 30 28 32 26 33 25 28 30

At the 1% significance level, do the Sedans actually get lower mileage than advertised?

Yes. The sedans get lower milage than advertized.

Class Notes: Prof. G. Battaly, Westchester Community College, NY

Statistics Home Page Homework

4. A car company claims that their Super Sport Sedan averages 32 mpg. You randomly select 8 Super Sports from local car dealerships and test their gas mileage under similar conditions.

You get the following MPG scores: 30 28 32 26 33 25 28 30

At the 1% significance level, do the Sedans actually get lower mileage than advertised? → hyp test

G: $\mu = 32$ mpg. $n = 8$ $\alpha = 0.01$

F: at $a = 0.01$, do sedans get lower mileage.

A: srs ✓ $\boxed{nd^2}$ ✓ N.P.P. σ not know → $\boxed{t\text{-test}}$

$H_0: \mu = 32$
$H_a: \mu < 32$

$df = n-1 = 7$

$$t_T = \frac{\bar{x} - \mu}{s/\sqrt{n}} = \frac{29 - 32}{2.78/\sqrt{8}}$$

$= -3.055$

$p = 0.009 \overset{?}{<} 0.010 = \alpha$ ∴ rej. H_0.

Yes. The data suggests that sedans get lower mileage than advertised.

Class Notes: Prof. G. Battaly, Westchester Community College, NY

Statistics Home Page Homework

TV Viewing. According to Communications Industry Forecast & Report, published by Veronis Suhler Stevenson, the average person watched 4.55 hours of television per day in 2005. A random sample of 20 people gave the following number of hours of television watched per day for last year.

1.0	4.6	5.4	3.7	5.2
1.7	6.1	1.9	7.6	9.1
6.9	5.5	9.0	3.9	2.5
2.4	4.7	4.1	3.7	6.2

At the 10% significance level, do the data provide sufficient evidence to conclude that the amount of television watched per day last year by the average person differed from that in 2005? (Note: $\bar{x}$ = 4.760 hours and s = 2.297 hours.)

Class Notes: Prof. G. Battaly, Westchester Community College, NY

Statistics Home Page Homework

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1.7 6.1 1.9 7.6 9.1
6.9 5.5 9.0 3.9 2.5
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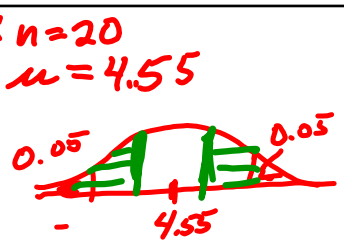
At the 10% significance level, do the data provide sufficient evidence to conclude that the amount of television watched per day last year by the average person differed from that in 2005? (Note: $\bar{x} = 4.760$ hours and $s = 2.297$ hours.)



$H_0: \mu = 4.55$
$H_a: \mu \neq 4.55$

$$t = \frac{\bar{x} - \mu}{s/\sqrt{n}} = \frac{4.760 - 4.55}{2.297/\sqrt{20}} = 0.409$$

$p = 0.687 > \alpha = 0.10$ Do not rej. H_0.

Conclude that time watching TV has not changed.

The ankle brachial index (ABI) compares blood pressure in the arm to blood pressure in the leg. A healthy ABI is 0.9 or greater. Researchers obtained the ABI of 93 randomly selected women with peripheral arterial disease. The mean ABI for these women was 0.78, with a standard deviation of 0.15. At the 1% significance level do the data provide sufficient evidence to conclude that, on average, women with peripheral arterial disease have an unhealthy ABI?

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① SRS ✓ ② ✓

$n = 93 > 30 \therefore$ ABI ~ n.d.

$\bar{x} = 0.78, s = 0.15$

$n \geq 5 \Rightarrow$ t-test

$H_0: \mu = 0.9$

$H_a: \mu < 0.9$

0.01

$$t = \frac{\bar{x} - \mu_0}{s/\sqrt{n}} = \frac{0.78 - 0.9}{0.15/\sqrt{93}} = -7.715$$

$p \approx 7.02(10^{-13}) = 0.0000 < 0.01 = \alpha$ rej. H_0

Concl: Women with PAD have an unhealthy ABI.

A lab tested golf clubs by using a robot to hit six balls of the same model with a head velocity of 80 miles per hour (mph). A golfer wants to be able to hit the ball more than 200 yards at that speed. The total yards each of the 6 balls traveled were:

204 206 200 208 203 201

At the 1% significance level, do the data provide sufficient evidence to conclude that the golf club hits the balls more than 200 yards?

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A lab tested golf clubs by using a robot to hit six randomly selected balls of the same model with a head velocity of 80 miles per hour (mph). A golfer wants to be able to hit the ball more than 200 yards at that speed. The total yards each of the 6 balls traveled were:

204 206 200 208 203 201

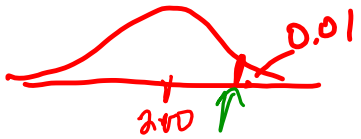
$n=6$ $df=5$ Assump ① srs ② n.d NPP

At the 1% significance level, do the data provide sufficient evidence to conclude that the golf club hits the balls more than 200 yards?

hyp test, 1 sample. t-test ← ③ no σ

$H_0: \mu = 200$ yd.

$H_a: \mu > 200$ yd.



$t = \frac{\bar{x}-\mu_0}{s/\sqrt{n}} = \frac{203.7-200}{3.01/\sqrt{6}} = 2.983$

$p = 0.015 > 0.01 = \alpha$ Do NOT rej.

No. The golf club does not hit the balls more than 200 yds.

FE May 2020

6. Independent random samples of nests of corn snakes provided data on the litter size of snakes in Georgia compared with those in North Carolina. Assume that litter size is normally distributed.

a) Find the standard deviation for each sample (use calculator), and decide which procedure to use for part (b). Clearly state the procedure as part of your answer.

b) At the 1% significance level, do the data provide sufficient evidence to conclude that the litter size in Georgia is less than that in North Carolina?

Georgia	4	7	4	6	6	5	6	5			
N. Carolina	5	4	12	13	10	7	8	5	3	9	7

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FE May 2020

6. Independent random samples of nests of corn snakes provided data on the litter sizes of snakes in Georgia compared with those in North Carolina. Assume that litter size is normally distributed.

$s_1 = 1.06 \quad s_2 = 3.24$

a) Find the standard deviation for each sample (use calculator), and decide which procedure to use for part (b). Clearly state the procedure as part of your answer.

a) ✓s not = non-pooled t-test

b) At the 1% significance level, do the data provide sufficient evidence to conclude that the litter size in Georgia is less than that in North Carolina?

Georgia	4	7	4	6	6	5	6	5			
N. Carolina	5	4	12	13	10	7	8	5	3	9	7

$df = 12.77 = 12$

$H_0: \mu_1 = \mu_2$

$H_a: \mu_1 < \mu_2$

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}} = \frac{5.375 - 7.545}{\sqrt{\frac{1.06^2}{8} + \frac{3.236^2}{11}}} = -2.076$$

$p = 0.029 > 0.01 = \alpha$. ∴ DO NOT REJECT H_0.

Concl: Litter size of corn snakes in GA and NC are the same.

Class Notes: Prof. G. Battaly, Westchester Community College, NY

Statistics Home Page Homework

A random sample of 10 universities results in the above data on Student/Faculty ratios and Graduation rate (%).

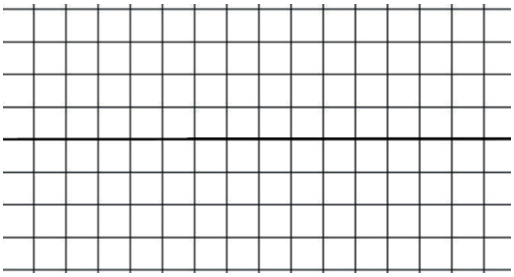
University	1	2	3	4	5	6	7	8	9	10
S/F Ratio, x	16	20	17	19	22	17	17	17	10	18
Grad Rate, y	55	55	70	50	47	46	50	66	70	60

a) Sketch the data points and the "best fit least squares" line.

b) Find the correlation coefficient. Are Graduation Rate and Student/ Faculty ratio linearly correlated?

c) What percent of the Graduation Rate can be explained by the Student/Faculty ratio?

d) Predict the Graduation Rate for a university with a Student/ Faculty ratio of 21.



Class Notes: Prof. G. Battaly, Westchester Community College, NY

Statistics Home Page Homework

A random sample of 10 universities results in the above data on Student/Faculty ratios and Graduation rate (%). (x, y)

eg: (16, 55)

University	1	2	3	4	5	6	7	8	9	10
S/F Ratio, x	16	20	17	19	22	17	17	17	10	18
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a) Sketch the data points and the "best fit least squares" line.

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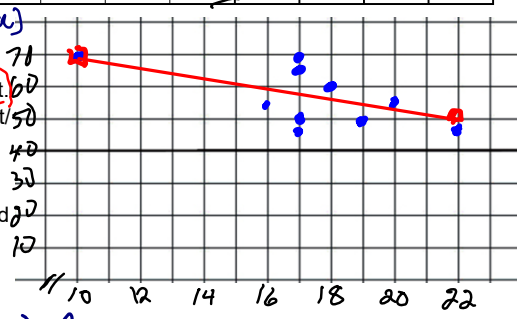
d) Predict the Graduation Rate for a university with a Student/Faculty ratio of 21.

a)



a) $\hat{y} = ax + b$

$\hat{y} = -1.77x + 87.47$

To sketch the best fit regr line, use calculator Stat/Calc function to find the slope and intercept.

b) $r = -0.604$

yes.

Yes. Graduation Rate and S/F are linearly correlated because - 0.6 is closer to a -1 than to 0.

c) $r^2 = 0.365$

36.5% of variation in grad. rate is attributed to the S/F.

d) $\hat{y} = -1.77x + 87.47$

$\hat{y} = -1.77(21) + 87.47 = 50.36\%$ grad. when S/F = 21.

7 Regression Line and Coef of Determination 14.3 $\hat{y} = -87.474 - 1.767x$ r=-0.604, rsq=0.3645. 36.45% of grad rate attributed to student/faculty ratio. Predict 50.36 for x=21

Class Notes: Prof. G. Battaly, Westchester Community College, NY

Statistics Home Page Homework

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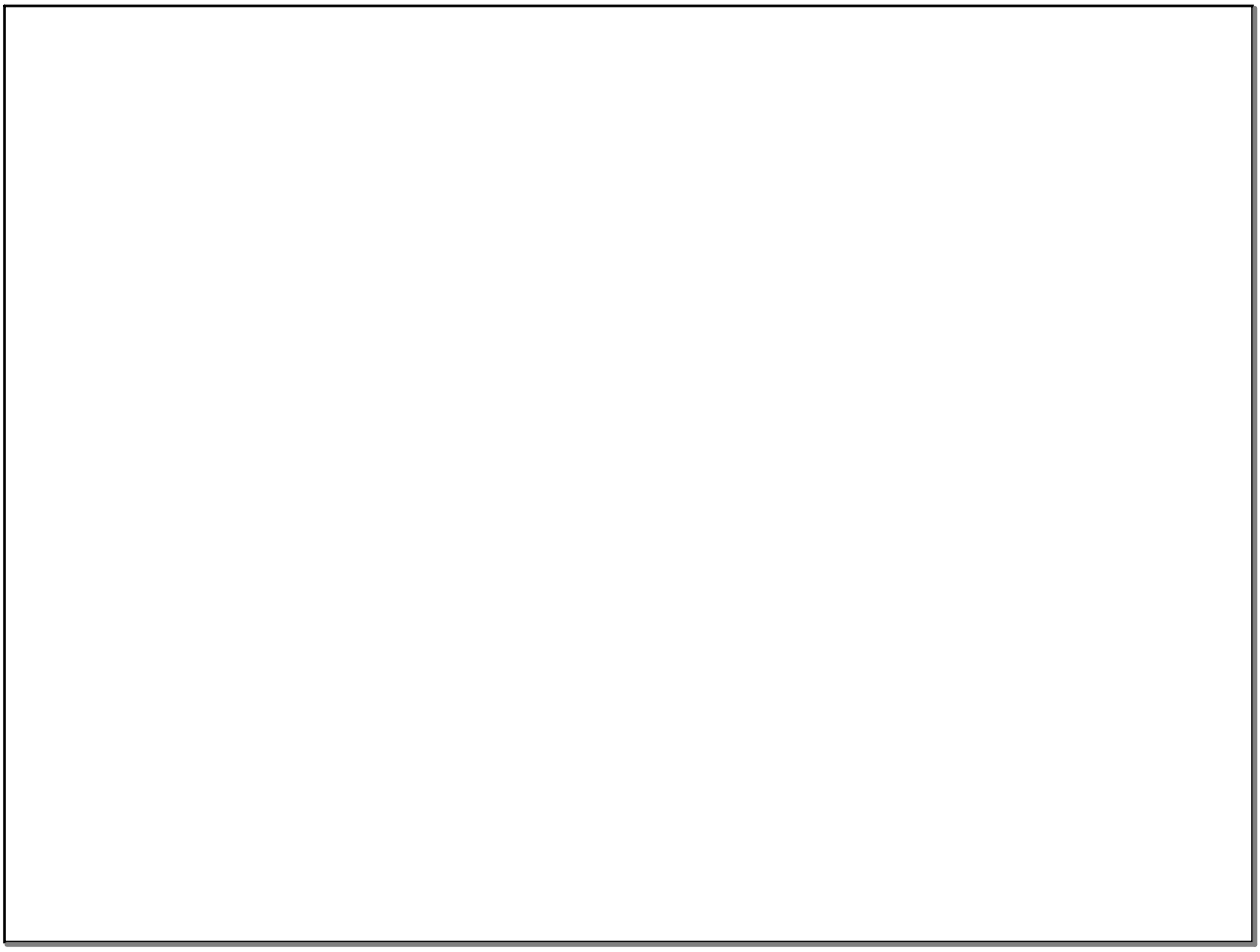
Statistics Home Page Homework