Statistics

Lecture 26

Feb 19-8:47 AM

Dependent Samples
Matched Pairs

Keywords: Before & After

Before	After	Difference
18	15	3
12	10	2
10	10	0
8	10	-2
12	9	3

Clear all lists

Before → L1

After → L2

→ Go to L3 and ↑ L3

2nd 1 − 2nd 2 Enter

STAT → CALC

2nd 3

1: 1-Var Stats

List: L3

Freq List: clear

Calculate

$\bar{x}_d = 1.2$ $\quad \bar{x} = 1.2$

$s_d = 2.168$ $\quad s = 2.168$

$s_d^2 = \frac{47}{10}$ $\quad s^2 = \frac{47}{10}$

May 18-6:54 PM

Does Calc help improving Qz scores?

Before	After	difference
8	10	-2
10	9	1
9	9	0
8	7	1
6	8	-2

Clear all list
Before → L1
After → L2
→ to go to L3 ↑ L3
2nd 1 – 2nd 2 Enter

Find 1) $\bar{x}_d = \bar{d}$ $= -.4$ 2) $S_d = 1.517$ 3) $S_d^2 = \frac{23}{10}$

Find 95% Conf. interval for the differences

σ unknown → TInterval
inpt: Stats
$\bar{x} = -.4$
$S = 1.517$
$n = 5$
C-level: .95
Calculate

$-2.2 < \mu_d < 1.5$

$E = \frac{1.5 - (-2.2)}{2} = \frac{3.7}{2} = 1.85$

May 18-7:06 PM

Does a certain diet help losing weight?

Before	After	L3
150	140	10
175	185	-10
190	160	30
180	180	0
200	180	20

Clear all lists
Before → L1
After → L2
→ to go to L3 ↑ L3
2nd 1 ▭ 2nd 2 Enter

Use 1-Var Stats with L3 only to find

1) $\bar{d} = 10$ ($\bar{x}_d$) 2) $S_d = 15.8$ 3) $S_d^2 = 250$

4) Find 99% Conf. int for mean of all differences μ_d

σ unknown
TInterval
inpt: Stats
$\bar{x} = \bar{d} = 10$
$S = 15.8$
$n = 5$
C-level: .99

$-23 < \mu_d < 43$

$E = \frac{43 - (-23)}{2} = 33$

May 18-7:18 PM

Does this diet work?

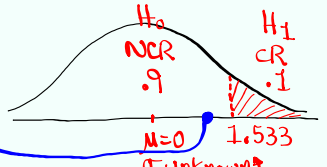
H_0: $\mu_d \leq 0$

H_1: $\mu_d > 0$ claim, RTT

Test using $\alpha = .1$

CV t RTT $\alpha = .1$

$df = n - 1 = 5 - 1 = 4$



CTS $t = 1.415$

P-Value $P = 0.115$

T-Test

Stats

Input:

$\mu_0 : 0$

$\bar{x} = \bar{d} = 10$

$S = 15.8$

$n = 5$

$\mu > \mu_0$

σ Unknown

$df = 4$

$t = invT(.9, 4)$

CTS is in NCR $\Rightarrow$ H_0 valid

P-Value $> \alpha$ H_1 invalid

Invalid claim

Reject the claim.

If we change α such that P-Value $\leq \alpha$, we fail-to-Reject the claim

$.115 \leq \alpha \rightarrow \alpha = .12, .13, .14, .15, \ldots$

May 18-7:29 PM

LADWP recommends watching a certain video to help improving water usage per house hold.

Before	After	L3
120	130	-10
100	80	20
80	80	0
130	100	30
140	150	-10
150	140	10

Before $\rightarrow$ L1

After $\rightarrow$ L2

$\rightarrow$ $\uparrow$ L3

2nd 1 $-$ 2nd 2 Enter

use L3 with 1-Var Stats

$\bar{d} = \bar{x} = 6.666 \approx 7$

$S_d = S_x = 16.330$

Find Conf. interval for μ_d

No C-level

.95

TInterval

$-10 < \mu_d < 24$

$E = \frac{24 - (-10)}{2} = 17$

May 18-7:41 PM

Test the claim that watching the video helps improving water usage. (No $\alpha \rightarrow .05$)

$H_0: \mu_d \geq 0$ claim

$H_1: \mu_d < 0$ LTT

Use T-Test

CTS $t = 1.050$

P-Value $P = .829$

P-value $> \alpha$

H_0 valid → Valid claim

H_1 invalid

FTR the claim.

May 18-7:51 PM

Same exam was given to both males & females.

Females: $n = 20$, $\bar{x} = 88$, $S = 10$

Males: $n = 15$, $\bar{x} = 84$, $S = 12$

Assume σ_1 & σ_2 unknown but equal.

Pooled: Yes

$df = n_1 + n_2 - 2 = 20 + 15 - 2 = 33$

Find 98% conf. interval for the difference of two Pop. Means.

2-SampTInt

$-5 < \mu_F - \mu_M < 13$

$E = \frac{13 - (-5)}{2} = 9$

May 18-7:56 PM

Test the claim that there is no difference ($=$) between two Pop. means. No $\alpha \rightarrow .05$

$H_0: \mu_F = \mu_M$ claim

$H_1: \mu_F \neq \mu_M$ TTT

2-SampT Test

CTS $t = 1.075$

P-Value $P = .290$

P-Value $> \alpha$ H_0 valid $\rightarrow$ Valid claim

H_1 invalid

FTR the claim

May 18-8:02 PM

Use the chart below to test the claim $\sigma_1 \neq \sigma_2$.

Group 1	Group 2
$n_1 = 12$	$n_2 = 10$
ndf = 11	Ddf = 9
$S_1 = 8$	$S_2 = 5$

Always verify $S_1 > S_2$. → No α → .05

Use 2-SampF Test

CTS $F = 2.56$

P-Value $P = .169$ ✓

P-Value $> \alpha$

H_0 valid & H_1 invalid

Invalid claim

Reject it.

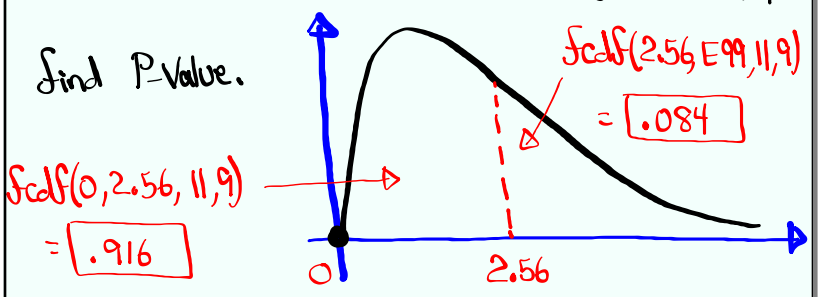
$H_0: \sigma_1 = \sigma_2$

$H_1: \sigma_1 \neq \sigma_2$ claim, TTT

May 18-8:07 PM

Given CTS F=2.56 Ndf=11 Ddf=9 TTT

Find P-Value.



P-Value = 2 · Smaller area

= 2 (.084) = .168

Last day of lecture: Monday June 1, 2026

Final exam: June 5–6 Sunday - Tuesday

Final exam Q & A right after that

May 18-8:14 PM