

(NOTE: in all problems where you are comparing two means, compute the 95% confidence interval around the mean difference): 1, 4, 6, 8, 13, 14, 16

1

a)

M	52
S	19
n	20
μ	50
est σ^2	380
est σ	19.49358869
df	19
est σ_M	4.358898944

find t-crit from back of book p 611

	one tail $\alpha=.05$	two-tail $\alpha=.05$	one tail $\alpha=.01$	two-tail $\alpha=.01$
t-obtained	0.458831468	0.458831468	0.458831468	0.458831468
t-crit	1.729	2.093	2.539	2.861
conclusion	fail to reject	fail to reject	fail to reject	fail to reject

CI's	M	\pm	(tcrit)(est σ_M)
95%	52	\pm	9.123175489
99%	52	\pm	12.47080988

b)

M	182
S	16
n	12
μ	170
est σ^2	279.2727273
est σ	16.71145497
df	11
est σ_M	4.824181513

find t-crit from back of book p 611

	one tail $\alpha=.05$	two-tail $\alpha=.05$	one tail $\alpha=.01$	two-tail $\alpha=.01$
t-obtained	2.487468593	2.487468593	2.487468593	2.487468593
t-crit	1.796	2.201	2.718	3.106
conclusion	reject	reject	fail to reject	fail to reject

CI's	M	\pm	(tcrit)(est σ_M)
95%	182	\pm	10.61802351
99%	182	\pm	14.98390778

c)

M	69	inches
S	3	inches
n	64	
μ	66	inches

est σ^2	9.142857143
est σ	3.023715784
df	63
est σ_M	0.377964473

find t-crit from back of book p 611

	one tail $\alpha=.05$	two-tail $\alpha=.05$	one tail $\alpha=.01$	two-tail $\alpha=.01$
t-obtained	7.937253933	7.937253933	7.937253933	7.937253933
t-crit	1.671	2	2.39	2.66
conclusion	reject	reject	reject	reject

CI's	M	\pm	(tcrit)(est σ_M)
95%	69	\pm	0.755928946
99%	69	\pm	1.005385498

4

a)

M1	78
n1	16
S1	6
df1	15
est₁ σ^2	38.4
M2	84
n2	16
S2	6
df2	15
est₂ σ^2	38.4

est σ^2	38.4
est σ_{M1}^2	2.4
est σ_{M2}^2	2.4
est σ_{M1-M2}^2	4.8
est σ_{M1-M2}	2.19089023
df total	30

	one tail $\alpha=.05$	two-tail $\alpha=.05$	one tail $\alpha=.01$	two-tail $\alpha=.01$
t-obtained	2.738612788	2.738612788	2.738612788	2.738612788
t-crit	1.697	2.042	2.457	2.75
result	reject	reject	reject	fail to reject

CI's	M	\pm	(tcrit)(est σ_M)
M1	95%	78 \pm	3.163452797
M2	95%	84 \pm	3.163452797
M2-M1	95%	6 \pm	4.47379785

b)

M1	69
n1	81
S1	3
df1	80
est₁ σ^2	9.1125
M2	64

n2	11
S2	4.5
df2	10
est₂ σ²	22.275

est σ²	10.575
est σ_{M1}²	0.130555556
est σ_{M2}²	0.961363636
est σ_{M1-M2}²	1.091919192
est σ_{M1-M2}	1.044949373
df total	90

	one tail α=.05	two-tail α=.05	one tail α=.01	two-tail α=.01
t-obtained	4.78492081	4.78492081	4.78492081	4.78492081
t-crit	1.662	1.987	2.368	2.632
result	reject	reject	reject	reject

	CI's	M	±	(tcrit)(est σ_M)
M1	95%	69	±	0.717952225
M2	95%	64	±	1.948236666
M2-M1	95%	5	±	2.076314404

c)

M1	170
n1	16
S1	15
df1	15
est₁ σ²	240
M2	185
n2	10
S2	12
df2	9
est₂ σ²	160

est σ²	210
est σ_{M1}²	13.125
est σ_{M2}²	21
est σ_{M1-M2}²	34.125
est σ_{M1-M2}	5.841660723
df total	24

	one tail α=.05	two-tail α=.05	one tail α=.01	two-tail α=.01
t-obtained	2.567762955	2.567762955	2.567762955	2.567762955
t-crit	1.711	2.064	2.492	2.797
result	reject	reject	reject	reject

	CI's	M	±	(tcrit)(est σ_M)
M1	95%	170	±	7.477550401
M2	95%	185	±	9.458436234
M2-M1	95%	15	±	12.05718773

subject	cond1	cond2	xi=xi1-xi2	xi ²
1	9	7	2	4
2	2	2	0	0
3	7	4	3	9
4	12	13	-1	1
5	14	13	1	1
6	10	7	3	9
7	6	4	2	4
8	7	6	1	1
9	12	8	4	16
10	10	9	1	1

M= 1.6 Σxi²= 46

SS =	20.4
df=	9
est σ ² =	2.266666667
est σ _M =	0.476095229

a) see column xi=xi1-xi2

b) mean diff = 1.6
 95% CI 1.6 ± 1.076927407

c) t-obt= 3.360672202
 t-crit= 1.833 directional (one-tail) H1: cond1>cond2
 result reject

d) sign test
 we have 9 "successes" where a success is if the subj did better in cond1 than cond2

one-tailed	r	p(<=r)
	1	0.010742188
crit value	2	0.0546875
	3	0.171875
	4	0.376953125
	5	0.623046875
	6	0.828125
	7	0.9453125
	8	0.989257813
	9	0.999023438
	10	1

9>2
 therefore we reject

8

group 1 (photti's)	xi1 ²		Group 2 (Ivan's)	xi2 ²
6	36		3	9
8	64		5	25
7	49		4	16
7	49			
Σ	28	198	12	50

M1 7

n1	4
SS1	2
df1	3
est₁ σ²	0.666666667
M2	4
n2	3
SS2	2
df2	2
est₂ σ²	1

est σ²	0.8
est σ_{M1}²	0.2
est σ_{M2}²	0.266666667
est σ_{M1-M2}²	0.466666667
est σ_{M1-M2}	0.683130051
df total	5

	one tail α=.05
t-obtained	4.391550328
t-crit	2.015
result	reject

	CI's	M	±	(tcrit)(est σ _M)
M1	95%		7 ±	1.149786154
M2	95%		4 ±	1.327658691
M2-M1	95%		-3 ±	1.756327361

13

	Liberian Tankers	xi1 ²		American Tankers	xi2 ²
	125	15625		112	12544
	120	14400			
	131	17161			
	132	17424			
	119	14161			
	126	15876			
Σ	753	94647		112	12544

M1	125.5
n1	6
SS1	145.5
df1	5
est₁ σ²	29.1
M2	112
n2	1
SS2	0
df2	0
est₂ σ²	n/a

est σ^2	29.1
est σ_{M1}^2	4.85
est σ_{M2}^2	29.1
est σ_{M1-M2}^2	33.95
est σ_{M1-M2}	5.826662853
df total	5

	one tail $\alpha=.05$
t-obtained	2.316935155
t-crit	2.015
result	reject H0

	CI's	M	±	(tcrit)(est σ_M)
M1	98%	125.5	±	7.410643781
M2	98%	112	±	18.15229593
M2-M1	95%	-13.5	±	14.98035019

H0: $\mu_{\text{Liberian}} = \mu_{\text{American}}$

H1: $\mu_{\text{Liberian}} > \mu_{\text{American}}$

14

experimental group	xi1²		Control Group	xi2²
-2	4		-1	1
0	0			
-4	16			
Σ	-6		-1	1

M1	-2
n1	3
SS1	8
df1	2
est₁ σ^2	4
M2	-1
n2	1
SS2	0
df2	0
est₂ σ^2	#DIV/0!

est σ^2	4
est σ_{M1}^2	1.333333333
est σ_{M2}^2	4
est σ_{M1-M2}^2	5.333333333
est σ_{M1-M2}	2.309401077
df total	2

	one tail $\alpha=.05$
t-obtained	0.433012702
t-crit	2.92
result	fail to reject H0

	CI's	M	±	(tcrit)(est σ_M)
M2-M1	95%		1 ±	9.937352833

b) no. We have no reason to think that HOV is violated. The groups were randomly assigned, and the difference in participants makes the groups look like they have differences in variance, but if the samples were larger, this might not be the case.

c) if we know $\sigma^2 = 1$
we can do a z-test

M1	-2
n1	3
M2	-1
n2	1

σ^2	1
est σ_{M1}^2	0.333333333
est σ_{M2}^2	1
est σ_{M1-M2}^2	1.333333333
est σ_{M1-M2}	1.154700538

	one tail $\alpha = .05$
z-obtained	0.866025404
z-crit	1.64
result	fail to reject H0

16 with-in

sister	exam 1 (no gum)	exam 2 (gum)	$xi = xi1 - xi2$	xi^2
Betty	91	92	1	1
Connie	73	80	7	49
Carrie	41	41	0	0
Rosie	80	90	10	100

$$M = 4.5 \quad \Sigma xi^2 = 150$$

SS =	117.6
df =	3
est $\sigma^2 =$	39.2
est $\sigma_M =$	3.130495168

b)

mean diff =	4.5		
95% CI	4.5	±	9.961235626

a)

t-obt=	1.437472271
t-crit=	2.353
result	fail to reject H0

c)

differences between the exam scores might not be due to gum chewing. It could be due to easier material, more studying, etc. They should have had half of the sisters chew gum the first exam, and the other half chew during the second exam.