

STA 261: Introduction to Statistics

Answers to homework problems relevant to Exam III

- 6.23 [a] $n=16$ [b] $n=64$. The req'd sample size does not double, rather, it is quadrupled.
- 6.26 The fact that the mean is less than the SD casts doubt on the condition that the pop'n is normal, for the following reason: In a normal population, about 15% of the observations fall more than one SD below the mean, whereas this sample cannot have any observations that small since $(\bar{Y} - SD) < 0$ and the observed variable (serum SGOT) cannot be negative.
- 6.27 [a] There were 36 cells but only 7 guinea pigs, so there is a hierarchical structure suggesting the data are not independent. [b] The distribution has two or perhaps three modes, which may reflect the hierarchical structure.
- 6.30 [a] CI is (4.73, 6.63) [b] We are 90% confident that the average square root of the diameters of all American Sycamore trees in the population is between 4.73 and 6.63.
- 6.31 [a] $SE=0.053$ [b] $SE=0.026$
- 6.34 CI is (0.033, 0.069)
- 6.35 CI is (0.164, 0.250)
- 6.37 CI is (0.120, 0.306)
- 6.40 $n \sim 2096$
- 6.41 $n \sim 2496$
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- 7.1 $SE_1=1.755$ $SE_2=1.645$ $SE(1-2)=2.41$
- 7.2 $SE_1=13.977$ $SE_2=9.076$ $SE(1-2)=16.7$
- 7.4 $SE_1=2.907$ $SE_2=3.175$ $SE(1-2)=4.30$
- 7.5 $SE_1=2.055$ $SE_2=2.245$ $SE(1-2)=3.04$
- 7.10 [a] CI is (-45.5, -0.5) when $df=6$ [b] CI is (-40.9, -5.1) when $df=6$
- 7.11 [a] CI is (6.1, 13.5) when $df=140$ [b] We are 95% confident that the population mean reduction in systolic blood pressure for those who receive training for eight weeks is larger than that for others by an amount that might be as small as 6.1 mm Hg or as large as 13.5 mm Hg.
- 7.12 No. The CI found in 7.11 is valid even if the populations are not normal, because the sample sizes are large.
- 7.15 [a] CI is (-0.12, +0.24) when $df=40$ [b] We cannot be 95% confident that there is a difference in the true mean head width of females who mate successfully and females that are rejected, because 0 is inside the CI.
- 7.19 [a] $t=-1.16$, $.20 < p\text{-value} < .40$ [b] $t=2.89$, $.01 < p\text{-value} < .02$ [c] $t=4.83$, $p\text{-value} < .001$
- 7.21 [a] Because $p\text{-value} > \alpha$, we do not reject H_0 . [b] Because $p\text{-value} < \alpha$, we reject H_0 . [c] $t=2.191$, $.06 < p\text{-value} < .08$. Because $p\text{-value} < \alpha$, we reject H_0 . [d] $t=1.869$, $.06 < p\text{-value} < .08$. Because $p\text{-value} > \alpha$, we do not reject H_0 .
- 7.22 Two-tailed (non-directional) alternative. $t=1.07$. Using $df=32$, $.20 < p\text{-value} < .40$. Do not reject H_0 .
- 7.23 [a] $t=1.74$, $.10 < p\text{-value} < .20$ [b] $t=2.46$, $.02 < p\text{-value} < .04$ [c] $t=3.01$, $.001 < p\text{-value} < .01$.
- 7.25 [a] Two-tailed (non-directional) alternative. $t=-3.26$. Using $df=100$, $.001 < p\text{-value} < .01$. Reject H_0 . [b] There is sufficient evidence to conclude that mean tibia length is larger in females than in males. [c] Judging from the means and SDs, the two distributions overlap substantially, so tibia length would be a poor predictor of sex.
- 7.27 [a] Two-tailed (non-directional) alternative. $t=-3.92$. Using $df=6$, $.001 < p\text{-value} < .01$. Reject H_0 . [b] There is sufficient evidence to conclude that flooding tends to lower ATP in birch seedlings.
- 7.29 Two-tailed (non-directional) alternative. $t=-0.14$. Using $df=18$, $p\text{-value} > .40$. Do not reject H_0 . There is insufficient evidence to conclude that the two diets differ in their effects on cholesterol.
- 7.37 [a] $t=-.39$, $p\text{-value} > .20$ [b] $t=1.33$, $.10 < p\text{-value} < .20$ [c] $t=-2.14$, $p\text{-value} > .50$
- 7.38 [a] Yes, $.0005 < p\text{-value} < .005$ [b] Yes, $.02 < p\text{-value} < .025$ [c] Yes, $.03 < p\text{-value} < .04$ [d] No, $.05 < p\text{-value} < .10$

- 7.41 [a] $t=2.76$. Using $df=14$, $.01 < p\text{-value} < .02$. Reject H_0 . There is sufficient evidence to conclude that mean ventilation is higher in the “to-be-hypnotized” condition than in the control condition.
 [b] $t=2.76$. Using $df=14$, $.005 < p\text{-value} < .01$. Reject H_0 . There is sufficient evidence to conclude that mean ventilation is higher in the “to-be-hypnotized” condition than in the control condition.
 [c] The non-directional alternative (part [a]) is more appropriate. According to the narrative, the researchers formulated the directional alternative in part [b] after they had seen the data; thus, it would not be legitimate for them (or us) to use any directional alternative.
- 7.45 The proponents are confused. They are speaking as if they know that $MU1-MU2 = 4$ lb/acre, whereas the field trial only indicates that $YBAR1-YBAR2 = 4$ lb/acre. That statistician’s data analysis indicates that the trial gives only weak information about $MU1-MU2$; in fact, the results do not even show whether $MU1-MU2$ is positive, let alone that it is equal to 4 lb/acre.
- 7.46 The lack of a statistically significant difference in therapeutic responses does not show that the two medications are equally effective.
- 7.49 95% CI: (0.0841 mmol/l, 0.0979 mmol/l). All values in the CI are greater than 0.08 mmol/l; therefore, according to the CI the data indicate that the difference is “clinically important”.

- 8.1 No, this does not mean that living in Arizona exacerbates breathing problems. To determine this, we would need to know whether breathing problems got better or worse for people in Arizona. In fact, people with respiratory problems often move to Arizona because the dry air is good for them. This would explain the association between living in Arizona and having breathing problems.
- 8.2 In this observational study, the effect of implants on illness is confounded with the effects on illness of smoking, drinking heavily, using hair dye, and having an abortion.
- 8.3 [a] The explanatory variable is whether or not a woman has had breast implants. [b] The response variable is illness (whether or not one is ill). [c] The observational units are individual women. [d] The extraneous variables are smoking, drinking heavily, using hair dye, and having had an abortion.
- 8.9 There is no single correct answer to this exercise because it involves randomization.
- 8.11 There is no single correct answer to this exercise because it involves randomization; however, here is one possible assignment: number the pens 01, 02, ..., 18. Do random number generation to assign the pens to “groups”. One typical answer:
 Group 1: Pens 03, 09, 02, 10, 18, 15
 Group 2: Pens 13, 01, 11, 05, 08, 14
 Group 3: Pens 04, 06, 07, 12, 16, 17
- 8.12 The acupuncturist expects acupuncture to work better than aspirin, so he or she is apt to “see” more improvement in someone given acupuncture than in someone given aspirin – even if the two groups are truly equivalent to each other in their response to treatment.
- 8.13 [a] Arrangement II is better, because it will make each block as homogeneous as possible. Under arrangement II, each treatment is observed at each temperature. In contrast, arrangement I confounds the effects of the treatments with the effect of temperature.
 [b] Label the pots within each block as 1, 2, ..., 6. One possible allocation is as follows:

	Block 1	Block 2	Block 3	Block 4	Block 5	Block 6
Trt 1	2	4	5	1	2	5
Trt 2	6	6	3	5	6	4
Trt 3	1	5	2	3	1	6
Trt 4	4	3	4	6	3	3
Trt 5	5	1	6	4	5	1
Trt 6	3	2	1	2	4	2

- 8.14 There is no single correct answer to this exercise because it involves randomization. Within in litter (block), one animal will be allocated to each treatment. The random allocation is carried out separately for each litter.
- 8.17 Plan II is better. We want units within a block to be similar to each other; plan II achieves this. Under plan I, the effect of rain would be confounded with the effect of a variety.