STA 113 Solutions

Chapter 9.5

a: H_α says that the average calories output for suffers is more than 1 $cal/cm^2/min$ below that for nonsuffers.$\sqrt{\frac{\sigma_1^2}{m}+\frac{\sigma_2^2}{n}} = 0.1414$, so $z = \frac{(.64-2.05)+1}{0.1414} = -2.90$.At level .01,$H_0$ is rejected if $z \leq -2.33$, so we reject H_0

b: $P = \Phi(-2.90) = 0.0019$

Chapter 9.41

We test $H_0 : \mu_d = 0$ vs $H_\alpha : \mu_d > 0$. With $\bar{d} = 7.6$, and $s_d = 4.178$, $t = \frac{7.6-5}{4.178\sqrt{9}} = 1.87$. With $df = 8$, the corresponding p-value is $P(t > 1.87) = 0.047$. We would like to reject H_0 at any α greater than 0.047. So, at the typical significance level of 0.05, we would like (barely) reject H_0 and conclude that the data indicates that the higher level of illumination yields a decrease of more than 5 seconds in true average task completion time.

Chapter 14.16

The null hypothesis is $H_0 : p_{ij} = p_i p_j$

	1	2	3
Estimated	195	73	100
Expected	207	69	92

The test is based on $df = (3-1)(2-1) = 2$
$\chi^2 = 1.62314$, $\chi^2_{0.05,2} = 5.992 > 1.623$
Thus, we can not reject H_0.

Chapter 14.41

The null hypothesis $H_0 : p_{ij} = p_i p_j$ states that level of parental use and level of student use are independent in the population of interest. The test is based on $df = (3-1)(3-1) = 4$

	Estimated	Expected	
119.3	57.6	58.1	235
82.5	33.9	40.3	163
23.9	11.5	11.6	47
226	109	110	445

The calculated value of $\chi^2 = 22.4$. Since $22.4 > \chi^2_{0.005,4} = 14.86$, p-value < 0.005, so H_0 should be rejected at any significance level greater than 0.005. Parental and student use level do not appear to be independent.

Chapter 15.13

$H_0 : \mu_1 - \mu_2 = 0$ will be rejected at level .01 in favor of $H_\alpha : \mu_1 - \mu_2 \neq 0$ if $z \geq 2.58$ or $z \leq -2.58$. Identifying X with orange juice, the X ranks are 7, 8,9,10,11,16,17,18,19,and 20, so $w = 135$. With $\frac{m(m+n+1)}{2} = 105$ and $\sqrt{\frac{mn(m+n+1)}{12}} = \sqrt{175} = 13.22$,$z = \frac{135-105}{13.22} = 2.27$.So H_0 is rejected.
p-value $\doteq 2(1 - \Phi(2.27)) = 0.0232$