STAT 2220 - Fall 2007
Solution to Assignment 6

5-30. a) $\text{Mean}_{\text{Diff}}$ = 74-2430 – 73.4797 = 0.7633

$$T = \frac{\bar{D} - \Delta_0}{S_D/\sqrt{n}} = \frac{0.7633 - 0}{2.905560/\sqrt{12}} = 0.91$$

P-value = 2*P(t > |0.91|): for df = 11 we obtain 2*(0.1 < P-value < 0.25) = 0.2 < P-value < 0.5

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Paired T-Test and CI: X1, X2

Paired T for X1 - X2

               N      Mean     StDev   SE Mean
X1            12   74.2430    1.8603    0.5370
X2            12   73.4797    1.9040    0.5496
Difference    12    0.7633    2.905560  0.838763


95% CI for mean difference: (-1.082805, 2.609404)
T-Test of mean difference = 0 (vs not = 0): T-Value = 0.91  P-Value =
(0.2, 0.5)
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Since p-value is bigger than 0.05, the null hypothesis cannot be rejected at the 0.05 level.

b) It is a two-sided test

c) 99%CI on the difference in means

$$\bar{d} - t_{\alpha/2,n-1}\left(\frac{s_d}{\sqrt{n}}\right) \le \mu_d \le \bar{d} + t_{\alpha/2,n-1}\left(\frac{s_d}{\sqrt{n}}\right)$$

$$0.7633 - 3.106\left(\frac{2.90556}{\sqrt{12}}\right) \le \mu_d \le 0.7633 + 3.106\left(\frac{2.90556}{\sqrt{12}}\right)$$

$$-1.842 \le \mu_d \le 3.368$$

d) From the 95%CI for mean difference, since zero (0) is included in the interval, we cannot reject the null hypothesis

5-82. b) From Minitab, the test statistic is found to be $T_0 = 4.22$, The p-value is 0.001

c) From Minitab, the p-value is found to be 0.001

d) $\bar{x}_1 = 16.36$ $\quad \bar{x}_2 = 11.48$

$s_1 = 2.07$ $\quad s_2 = 2.37$

$n_1 = 9$ $\quad n_2 = 6$

99% confidence interval: $t_{\alpha/2,n_1+n_2-2} = t_{0.005,13}$ where $t_{0.005,13} = 3.012$

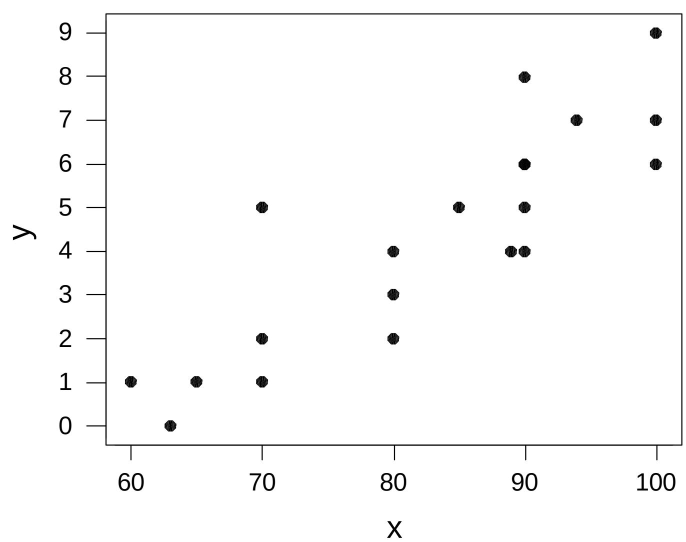
$$s_p = \sqrt{\frac{8(2.07)^2 + 5(2.37)^2}{13}} = 2.19$$

$$(\bar{x}_1 - \bar{x}_2) - t_{\alpha/2,n_1+n_2-2}(s_p)\sqrt{\frac{1}{n_1} + \frac{1}{n_2}} \le \mu_1 - \mu_2 \le (\bar{x}_1 - \bar{x}_2) + t_{\alpha/2,n_1+n_2-2}(s_p)\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}$$

$$(16.36 - 11.48) - 3.012(2.19)\sqrt{\frac{1}{9} + \frac{1}{6}} \le \mu_1 - \mu_2 \le (16.36 - 11.48) + 3.012(2.19)\sqrt{\frac{1}{9} + \frac{1}{6}}$$

$$1.40 \le \mu_1 - \mu_2 \le 8.36$$

6-6. a) The plot below implies that a simple linear regression seems reasonable in this situation.



b) The regression equation is
y = - 10.1 + 0.174 x

Predictor	Coef	StDev	T	P
Constant	-10.132	1.995	-5.08	0.000
x	0.17429	0.02383	7.31	0.000

S = 1.318   R-Sq = 74.8%   R-Sq(adj) = 73.4%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	92.934	92.934	53.50	0.000
Residual Error	18	31.266	1.737		
Total	19	124.200			

An estimate of $\hat{\sigma}^2 = 1.737$

c) $\hat{y} = -10.1 + 0.174(85) = 4.69.$ The predicted mean rise in blood pressure level associated with a sound pressure level of 85 decibels is 4.69 millimeters of mercury.

6-10. a) 4.683

b) (4.055, 5.312)

c) (1.844, 7.523)

d) The prediction interval is wider than the confidence interval.

6-12. a) The regression equation is
BOD = 0.658 + 0.178 Time

Predictor	Coef	SE Coef	T	P
Constant	0.6578	0.1657	3.97	0.003
Time	0.17806	0.01400	12.72	0.000

S = 0.287281   R-Sq = 94.7%   R-Sq(adj) = 94.1%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	13.344	13.344	161.69	0.000
Residual Error	9	0.743	0.083		
Total	10	14.087			

$\hat{y} = 0.658 + 0.178x$

$\hat{\sigma}^2 = 0.083$

b) $\hat{y} = 0.658 + 0.178(15) = 3.328$

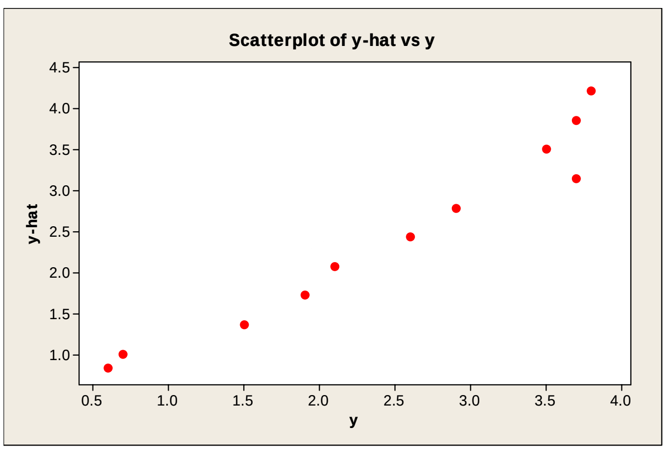
c) 0.178(3) = 0.534

d) $\hat{y} = 0.658 + 0.178(6) = 1.726$

$e = y - \hat{y} = 1.9 - 1.726 = 0.174$

e) Fitted $\hat{y}_i$:

0.83585
1.01391
1.37002
1.72613
2.08225
2.43836
2.79447
3.15058
3.50670
3.86281
4.21892



All the points would lie along the 45 degree line $y = \hat{y}$. That is, the regression model would estimate the values exactly. At this point, the graph of observed vs. predicted indicates that the simple linear regression model provides a reasonable fit to the data.