Elementary Statistics for Business
Test 4
Fall 2003

Name:…………………………………………………………………..

1 Measurements of the heat-producing capacity of coal from two mines yielded the following results.

| | | |
|---|---|---|
| $n_1 = 35$ | $\bar{x}_1 = 8060$ | $s_1 = 452$ |
| $n_2 = 45$ | $\bar{x}_2 = 7800$ | $s_2 = 407$ |

The measurements are in millions of calories per ton. Can we conclude that the mean heat-producing capacity of coal from two mines is not the same at 0.05 level of significance? Assume that the two populations are normal. Find the p-value.

2 Unfortunately, arsenic occurs naturally in some ground water. A mean arsenic level of 8 parts per billion (ppb) is considered safe for agricultural use. A well in Texas is tested on a regular basis for arsenic. A random sample of 36 gave a sample mean of 7.2 ppb with a standard deviation of 1.9 ppb. Does this information indicate that the mean level of arsenic in this well is less than 8 ppb? Use 0.01 level of significance.

3 An educator claims that the average salary of substitute teachers in school districts in Allegheny County, Pennsylvania, is less than $60 per day. A random sample of 8 school districts is selected, and the daily salaries are shown below.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| $60 | $56 | $60 | $55 | $70 | $55 | $60 | $55 |

Is there enough evidence to support the educators claim at 0.05 level of significance? Note that the sample mean is $58.88 and the sample standard deviation is $5.08. Assume that the average salary of substitute teachers is normally distributed.

4 Harpers index reported that 80% of all supermarket prices and in the digit 9 or 5. Suppose you check a random sample of 115 items in a supermarket and find that 88 have prices that end in 9 or 5. Does this indicate that less than 80% of the prices in the store end in the digits 9 and 5? Use 0.05 level of significance.

5 (a) Find the regression line.

(b) Find the correlation coefficient.

(c) Test $H_0 : b = 0$ against $H_a : b \neq 0$ using 0.05 level of significance.
p-value= ____________

Conclusion:______________________________________________

(d) Find a 95% confidence interval for the intercept.

| | |
|---|---|
| 2.1 | 10.2 |
| 3.5 | 10.8 |
| 3.7 | 8.9 |
| 4.2 | 8.5 |
| 5.8 | 5.1 |
| 6.5 | 5.3 |

SUMMARY OUTPUT

| *Regression Statistics* | |
|---|---|
| Multiple R | 0.921846 |
| R Square | 0.8498 |
| Adjusted R Square | 0.812251 |
| Standard Error | 1.049506 |
| Observations | 6 |

ANOVA

| | *df* | *SS* | *MS* | *F* | *Significance F* |
|---|---|---|---|---|---|
| Regression | 1 | 24.92748 | 24.92748 | 22.63124 | 0.008923 |
| Residual | 4 | 4.405853 | 1.101463 | | |
| Total | 5 | 29.33333 | | | |

| | *Coefficients* | *Standard Error* | *t Stat* | *P-value* | *Lower 95%* | *Upper 95%* |
|---|---|---|---|---|---|---|
| Intercept | 14.10149 | 1.325693 | 10.63708 | 0.000442 | 10.42077 | 17.78221 |
| X Variable | -1.38794 | 0.291755 | -4.75723 | 0.008923 | -2.19799 | -0.5779 |

6 True/False questions.

(a) $-1 \le r \le 1$ (True, False)

(b) $0 \le r^2 \le 1$ (True, False)

(c) If $b > 0$, then $r > 0$. (True, False)

(d) If $b < 0$, then $r < 0$. (True, False)

(e) Reject $H_0$ if p-value < $\alpha$. (True, False)

(f) In linear regression, we use a $t$-distribution with $n-1$ degrees of freedom to do hypotheses testing about slope and the intercept.
(True, False)

(g) $\alpha$ = P[Type II error] (True, False)

(h) $\beta$ = P[Type II error] (True, False)

(i) Keeping sample size constant if $\alpha$ is decreased then $\beta$ will be decreased.

(True, False)

(j) The only way to reduce both $\alpha$ and $\beta$ is to decrease the sample size.

(True, False)