Elementary Statistics for Life Sciences
Test 4
Fall 2003

Name:……..

1 Ecological researchers measured the concentration of red blood cells in the blood of 80 field-caught lizards. In addition, they examined each lizard for malarial parasites. Counts are given 10^{-3} cells per mm^3.

Infected Animals	$n_1 = 35$	$\overline{x}_1 = 972.1$	$s_1 = 245.1$
Non-infected Animals	$n_2 = 45$	$\overline{x}_2 = 843.4$	$s_2 = 251.2$

Test whether there is a significant difference in the concentration of red blood cells between the infected and non-infected lizards at 0.05 level of significance. Also find the p-value.

2 In a far away country the popular belief is that the number of kids in a family is odd or even is equally likely. A sample of randomly selected 300 families had 128 families with even number of children. Test the hypothesis that the popular belief is not true at 0.01 level of significance. If the level of significance is changed to 0.05, what will be your decision?

3 A particular drug company claims that its headache remedy stops the average headache in 14 minutes. Being skeptical, you randomly select 25 patients from the outpatient clinic, asking them to take one of these pills when they have a headache and record the length of time (in minutes) until it disappears. The results of your study are $\bar{x}$ = 18.1 minutes and s = 6.9 minutes. Do the results of your study reinforce or disagree with your skepticism? Use 0.05 level of significance.

4 A manufacturing process produces ball bearings with diameters having a normal distribution with mean 0.50cm and a standard deviation of 0.04 cm. Ball bearings that have diameters that are too small or too large are undesirable. Test an appropriate test to check whether the process is under control if a random sample of 50 ball bearings has a sample mean of 0.51 at 0.01 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.

X	Y
3	7
5	20
7	20
8	15
10	25
11	17
12	20
12	35

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.67306
R Square	0.45301
Adjusted R Square	0.361845
Standard Error	6.425444
Observations	8

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	205.1571	205.1571	4.969128	0.067344
Residual	6	247.7179	41.28632		
Total	7	452.875			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	6.089744	6.588139	0.92435	0.390964	-10.0309	22.21034	-10.0309	22.21034
X Variable 1	1.621795	0.727538	2.229154	0.067344	-0.15843	3.402017	-0.15843	3.402017

6 True/False questions.

(a) The ratio of bay boys to baby girls born is about 50/50. If twice as many girls were born in a hospital in one day, this hospital is more likely to be small.

(True, False)

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

(c) In statistical hypothesis testing, the p-value is the probability of obtaining a test statistic at least as extreme as the one that was actually observed, assuming that the null hypothesis is true.

(True, False)

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

(e) Reject H_0 if p-value < α. (True, False)

(f) In linear regression, we use a t-distribution with $n-2$ degrees of freedom to do hypotheses testing about slope and the intercept.

(True, False)

(g) α = P[Type II error] (True, False)

(h) If a null hypothesis is rejected at 0.05 level of significance, then it will also be rejected at 0.10 level.

(True, False)

(i) Keeping sample size constant if α is decreased then β will be decreased.

(True, False)

(j) The only way to reduce both α and β is to increase the sample size.

(True, False)