

Elementary Statistics, Test 4 Preparation (Modified on 11/28/2008)

- 1 When a poultry farmer uses her regular feed, the newborn chickens have normally distributed weights with a mean of 62.2 oz. In an experiment with an enriched feed mixture, nine chickens are born with the weights (in ounces) given below. Use 0.01 significance level to test the claim that the mean weight is higher with the enriched feed.

61.4	62.2	66.9
63.3	66.2	66.0
63.1	63.7	66.6

Find the p-value.

<i>Column1</i>	
Mean	64.37778
Standard Error	0.688351
Median	63.7
Mode	#N/A
Standard Deviation	2.065053
Sample Variance	4.264444
Kurtosis	-1.80008
Skewness	-0.05554
Range	5.5
Minimum	61.4
Maximum	66.9
Sum	579.4
Count	9

- 2 According to Management Accounting, salary figures for certified management accountants (CMAs) who are in the field less than one year are randomly distributed with a mean of \$31,129. A random sample of 35 first-year CMAs in Denver produces a mean salary of \$32,379, with a standard deviation of \$2,797. Test the hypothesis that the mean for all Denver first-year CMAs is more than \$31,129. Use 0.05 level of significance. Find the p-value.
- 3 According to norms established for a history test, eighth graders should average 81.9 with a standard deviation of 8.5. If 100 randomly selected eighth graders from a certain school district averaged 79.6 on this test, can we conclude at the 0.05 level of significance that eighth graders from this school district can be expected to average less than the norm 81.9 on this test? Find the p-value.
- 4 The average running time of a certain variety of rechargeable batteries is known to be 8.5 hours. A change in the production method has been proposed. A pilot study results show that the average life of 60 batteries is 8.62 hours with a standard deviation of 0.55 hours. Test at 0.05 level of significance whether the average life of the batteries from the new process is different from the old process.
- 5 A manufacturer guarantees a certain ball bearing to have a mean outside diameter of 0.7500 inch with a standard deviation of 0.0020. If a random sample of 10 such bearings has a mean outside diameter of 0.7520, can we reject the manufacturer's guarantee with regard to the mean outside diameter at the 0.01 level of significance?

6 Faculty member at the PSU nursing program claims that the starting salary for nursing students graduating in May 2007 will be \$20.00 per hour. A senior student thought that the professor's number is too high and collected the salary offers data from a random sample of 10 students out of the 60 students and found that the sample mean hourly salary for new nurses is \$17.95 with a standard deviation of \$1.45. Conduct an appropriate test at **0.005** level of significance.

7 Coke Verses Pepsi:
Use a 0.05 level of significance to test whether regular coke and regular Pepsi have the same weight. Find the p-value.

	Regular Coke	Regular Pepsi
Sample size	36	36
Sample mean	0.81682 lb.	0.82216 lb.
Sample s.d.	0.007507	0.005701

8 In a study of the effects of second-hand smoke, serum cotinine level of 47 nonsmokers who were not exposed to smoke (NOETS) and 50 nonsmokers who were exposed to smoke (ETS) were measured. Subjects were selected randomly and the summary results are given below. Test the hypothesis that mean serum cotinine level of NOETS is less than to that of ETS at 0.01 level of significance.

NOETS	$n_1 = 47$	Mean= 0.4050	S.D.= 1.2129
ETS	$n_2 = 50$	Mean= 4.0976	S.D.= 10.2117

9 A pain-killing drug was tested for efficacy in 30 women who were experiencing uterine cramping pain following childbirth. Fifteen of the women were randomly allocated to receive the drug, and the remaining 15 received a placebo (inert substance). Capsules of drugs or placebos were given before breakfast and again at noon. A pain relief score, based on hourly questioning throughout the day, was computed for each woman. The possible pain relief score ranged from 0 (no relief) to 56 (complete relief for 8 hours). Summary results are shown below.

Treatment	Sample size	Mean	SD
Drug	15	31.96	12.05
Placebo	15	25.32	13.78

10 **A survey indicates that 22% of the people in Fun City are illegally receiving some kind of public assistance. The mayor of Fun City believes that the figures are exaggerated. To test this claim, she carefully examines 75 cases and finds that 11 of these people are illegally receiving aid. Does this sample support the survey results? Use a 5% level of significance. Find the p-value.**

- 11 **A social scientist wants to find whether the proportion of babies with low birth weight is higher in place A than in place B. If respective random samples of sizes 900 and 700 yielded 135 and 77 babies with a low birth weight, what is your conclusion with 0.01 level of significance? Find the p-value.**
- 12 **Triglycerides are blood constituents that are thought to play a role in coronary artery disease. To determine whether regular exercise can reduce triglyceride levels, researchers measured the concentration of triglycerides in the blood serum of seven male volunteers, before and after participation of a 10-week exercise program. Test whether the exercise program reduces the triglyceride levels at 0.01 level of significance.**

Participant	Before	After
1	0.87	0.57
2	1.13	1.03
3	3.14	1.47
4	2.14	1.43
5	2.98	1.20
6	1.18	1.09
7	1.60	1.51

Explain why you selected this particular test.

t-Test: Paired Two Sample for Means

	Variable 1	Variable 2
Mean	0.677143	0
Variance	0.561324	0
Observations	7	7
Pearson Correlation	#DIV/0!	
Hypothesized Mean Difference	0	
df	6	
t Stat	2.391237	
P(T<=t) one-tail	0.026968	
t Critical one-tail	3.142668	
P(T<=t) two-tail	0.053935	
t Critical two-tail	3.707428	

t-Test: Paired Two Sample for Means

	<i>Variable 1</i>	<i>Variable 2</i>
Mean	1.862857	1.185714
Variance	0.83569	0.109729
Observations	7	7
Pearson Correlation	0.6342	
Hypothesized Mean Difference	0	
df	6	
t Stat	2.391237	
P(T<=t) one-tail	0.026968	
t Critical one-tail	3.142668	
P(T<=t) two-tail	0.053935	
t Critical two-tail	3.707428	

- 13 (a) Find the regression line.
 (b) Find the correlation coefficient.
 (c) Test $H_0 : a = 0$ against $H_a : a \neq 0$.
 (d) Test $H_0 : b = 0$ against $H_a : b \neq 0$.
 (e) Test $H_0 : b = 2$ against $H_a : b \neq 2$.
 (f) Find a 95% confidence interval for the intercept.
 (g) Find a 95% confidence interval for the slope.

x	y
2.1	12.7
3.5	10.8
3.7	8.9
4.2	8.5
5.8	5.1
6.5	3.7

SUMMARY
OUTPUT

<i>Regression Statistics</i>	
Multiple R	0.989891
R Square	0.979884
Adjusted R Square	0.974855
Standard Error	0.537314
Observations	6

ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	56.25351	56.25351	194.8469	0.000153
Residual	4	1.154825	0.288706		
Total	5	57.40833			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	17.24887	0.678713	25.4141	1.42E-05	15.36445	19.13328	15.36445	19.13328
x	-2.08501	0.149369	-13.9588	0.000153	-2.49972	-1.67029	-2.49972	-1.67029

True/False questions.

- (a) $-1 \leq r \leq 1$
- (b) $0 \leq r^2 \leq 1$
- (c) If $b > 0$, then $r > 0$.
- (d) If $b < 0$, then $r < 0$.
- (e) Reject H_0 if p-value $< \alpha$.
- (f) In linear regression, we use a t -distribution with $n - 2$ degrees of freedom to do hypotheses testing about slope and the intercept.
- (g) $\alpha = \text{P}[\text{Type I error}]$
- (h) $\beta = \text{P}[\text{Type II error}]$
- (i) Power of the test = $1 - \beta$.
- (j) Keeping sample size constant if α is decreased then β will be increased.
- (k) The only way to reduce both α and β is to increase the sample size.