**Statistics 300**
**Quiz #14** **Name:** ______________________________

(8 points : 15 minutes)

1. **Do carpool lanes save commute time? Use the results of the experiment below to test the claim that using the carpool lane causes the average commute time to be at least 5 minutes less per trip. For the experiment, 6 randomly selected routes from the suburbs to downtown were selected. For each route, the time required was tested using the regular lanes and using the carpool lane. The data are given below.** Use a Type I error rate of 0.05 for the test.

| | Time for Lane | |
|---|---|---|
| **Route** | **Regular** | **Carpool** |
| 1 | 50.3 | 46.6 |
| 2 | 28.2 | 28.2 |
| 3 | 19.9 | 18.5 |
| 4 | 24.7 | 16.3 |
| 5 | 60.1 | 55.7 |
| 6 | 58.2 | 57.3 |
| $\bar{x}$ = | 40.23 | 37.07 |
| s = | 17.99 | 18.44 |
| n = | 6 | 6 |

**Statistics 300**
**Quiz #14** **Name:** ______________________________

(8 points; 12 minutes)

2. **The data are from an experiment to compare the effect of natural vitamins to synthetic vitamins. Six patients participated in the test. Each patient used the natural vitamins for 6 months and the synthetic vitamins for 6 months. The data are measurements of "energy level." Use the data to construct a 98% confidence interval for ($m_1$ - $m_2$), the difference in mean energy level that would occur if all people participated in the experiment.**

| | Vitamin Treatment | |
|---|---|---|
| **Patient** | **1 = Natural** | **2 = Synthetic** |
| **1** | **8** | **6** |
| **2** | **6** | **5** |
| **3** | **6** | **5** |
| **4** | **9** | **6** |
| **5** | **7** | **8** |
| **6** | **8** | **5** |
| **Mean** | **7.3** | **5.8** |
| **St. Dev.** | **1.21** | **1.17** |
| **n** | **6** | **6** |

**Statistics 300**
**Quiz #15** **Name:** ______________________________

(9 points:12 minutes)

1. **Some people want to compare the proportion of high school boys that smoke cigarettes to the proportion of high school girls that smoke cigarettes. Use the data below to test the claim that the proportion of boys that smoke is 5% bigger than the proportion for girls.** (Use the classical approach to hypothesis testing with a 0.10 significance level.)

| smoke | Girls | Boys |
|---|---|---|
| Yes | 407 | 470 |
| No | 1451 | 1469 |

**Statistics 300**
**Quiz #15** **Name:** ______________________

(9 points:12 minutes)

2. **Some people want to compare the proportion of high school boys that smoke cigarettes to the proportion of high school girls that smoke cigarettes. Use the data below to test the claim that the proportion of boys that smoke is the same as the proportion for girls.** (Use the classical approach to hypothesis testing with a 0.10 significance level.)

| smoke | Girls | Boys |
|---|---|---|
| Yes | 407 | 470 |
| No | 1451 | 1469 |

**Statistics 300**
**Quiz #15** **Name:** ______________________________

(9 points:12 minutes)

3. **Some people want to compare the proportion of high school boys that are "overweight" to the proportion of high school girls that are "overweight". Use the data below to make an 80% confidence interval for the true difference between $p_g$ (the proportion of all girls that are overweight) and $p_b$ (the proportion of all boys that are overweight).**

| Overweight | Girls | Boys |
|---|---|---|
| Yes | 418 | 486 |
| No | 1451 | 1469 |

**Statistics 300**
**Quiz #16** **Name:** ______________________

(8 points : 12 minutes)

1. **A random sample of 13 Zoologists has an average weight of 106 kg with a standard deviation of 22 kg. A random sample of 17 Physicists has an average weight of 100 kg and a standard deviation of 24 kg. Use these results to construct a 95% confidence interval for the difference between the mean weight of all zoologists and the mean weight of all physicists.** (Assume that variation among weights is the same in both cases.)
(You must include the algebraic expression for the test statistic as part of your answer.)

| **sample data** | | |
|---|---|---|
| | **Zoologists** | **Physicists** |
| **n =** | **13** | **17** |
| $\bar{X}$ **=** | **106** | **100** |
| **s =** | **22** | **24** |

(8 points : 12 minutes)

2. **A random sample of 16 Zoologists has an average weight of 106 kg with a standard deviation of 28 kg. A random sample of 10 Physicists has an average weight of 100 kg and a standard deviation of 20 kg. Use these results to test the claim that the mean weight of all zoologists is more than 2 kg greater than the mean weight of all physicists.**
(Assume that variation among the weights in each population may not be the same.)
(You must include the algebraic expression for the test statistic as part of your answer.)

| **sample data** | | |
|---|---|---|
| | **Zoologists** | **Physicists** |
| **n =** | **16** | **10** |
| $\bar{X}$ **=** | **106** | **100** |
| **s =** | **28** | **20** |

**Statistics 300**
**Quiz #16** **Name:** ______________________________

(6 points : 10 minutes)

3. **Some lawyers argue that police radar units are too variable to give reliable speed values. Police laboratories test a new radar unit that is claimed to have lower variability, and they compare its performance with an old unit. Use the test data to test the claim that the variability of the new radar unit is less than the variability of the old one. The readings from both units are normally distributed.**
(Use a Type I error probability of 0.025.)

| sample data | | |
|---|---|---|
| | **New Unit** | **Old Unit** |
| **n =** | **10** | **8** |
| $\bar{x}$ **=** | **68.4** | **68.3** |
| **s =** | **0.22** | **0.27** |

**Claim:** ____________________

**$H_0$:** ____________________

**$H_1$:** ____________________

**Statistics 300**
**Quiz #16** **Name:** ______________________________

(8 points : 12 minutes)

4. **You run a company that produces cans of mixed nuts labled "400 grams". A requirement of the federal government is that the moisture content of the nuts (as a group) cannot be more than four percent (4 grams water per 100 grams of nuts). You have two different ways to measure the moisture content, called Method 1 and Method 2. Use the data below for 16 samples of nuts to make a 95% confidence interval for ($m_1$ - $m_2$), the difference between the mean for Method 1 and the mean for Method 2.**
(You must include the algebraic expression for the CI in your answer.)

| | **Moisture (grams)** | |
|---|---|---|
| **Sample** | **Method 1** | **Method 2** |
| **1** | **21.4** | **19.8** |
| **2** | **23.6** | **23.2** |
| **3** | **12.6** | **12.4** |
| **4** | **22.9** | **22.1** |
| **5** | **16.0** | **14.6** |
| **6** | **19.2** | **17.9** |
| **7** | **17.9** | **17.6** |
| **8** | **16.1** | **15.3** |
| $\bar{x}$ **=** | **18.71** | **17.86** |
| **s =** | **3.80** | **3.73** |

**Statistics 300**
**Quiz #16** **Name:** ______________________________

(8 points : 12 minutes)

5. **You run a company that produces cans of mixed nuts labled "400 grams". A requirement of the federal government is that the moisture content of the nuts (as a group) cannot be more than four percent (4 grams water per 100 grams of nuts). You have two different ways to measure the moisture content, called Method 1 and Method 2. Use the data below to test the claim that $\mu_2$ is at least 0.5 grams more than $\mu_1$.** (Let $\alpha$ = 0.10 and assume the variances for the methods are not the same. You must include the algebraic expression for the test statistic as part of your answer.)

| | Moisture (grams) | |
|---|---|---|
| | **Method 1** | **Method 2** |
| | 20.7 | 19.8 |
| | 23.8 | 23.2 |
| | 13.0 | 12.4 |
| | 24.2 | 22.1 |
| | 15.2 | 14.6 |
| | 19.6 | 17.9 |
| | 18.6 | 17.6 |
| | 15.4 | 15.3 |
| | | 18.6 |
| | | 19.3 |
| $\bar{x}$ = | 18.81 | 18.08 |
| s = | 4.08 | 3.32 |

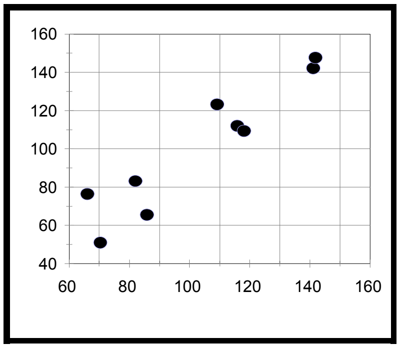
**Statistics 300**
**Quiz #17** **Name:** ______________________________

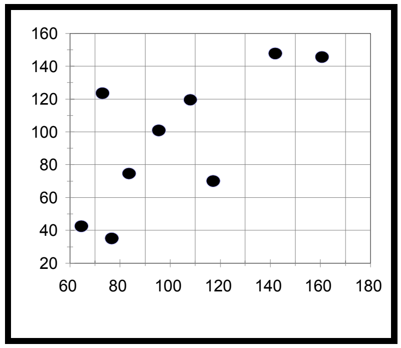
(3 points; 2 minutes)

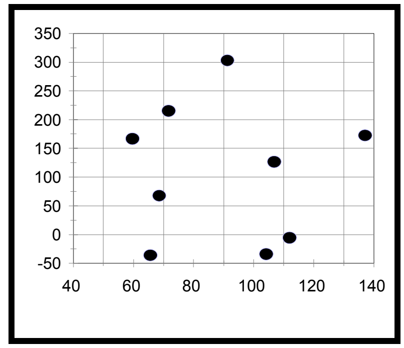
1. **Assign the three sample correlation coefficients to the three pictures. A correlation value may be used more than once or not at all. If a picture has no appropriate correlation available, write NONE [do not use the zero].**

**r = ________** **r = ________** **r = ________**

| **Values** |
|---|
| **0.00** |
| **0.80** |
| **0.90** |
| **NONE** |



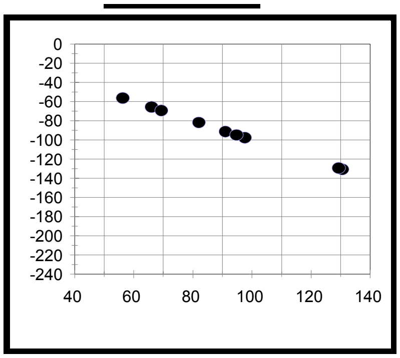



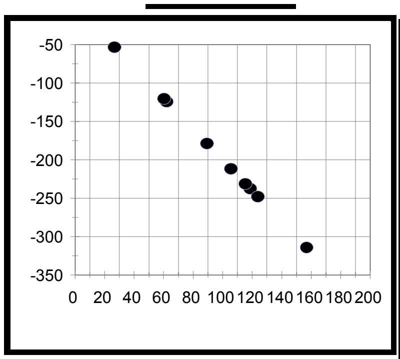

(3 points; 2 minutes)

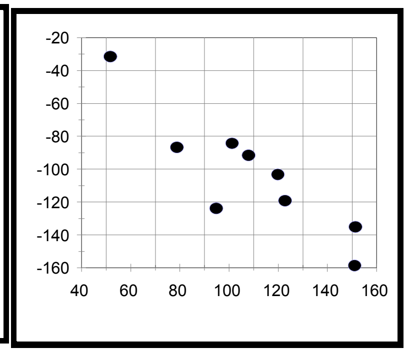
2. **Assign the three sample correlation coefficients to the three pictures. A correlation value may be used more than once or not at all. If a picture has no appropriate correlation available, write NONE [do not put zero].**

**r = ________** **r = ________** **r = ________**

| **Values** |
|---|
| **0.90** |
| **-1.00** |
| **-2.00** |
| **NONE** |



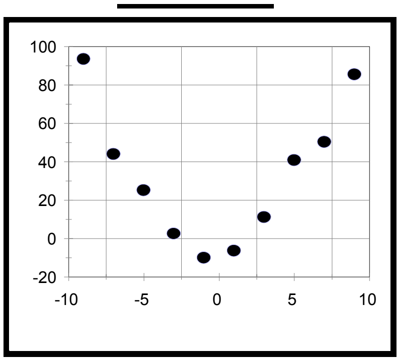



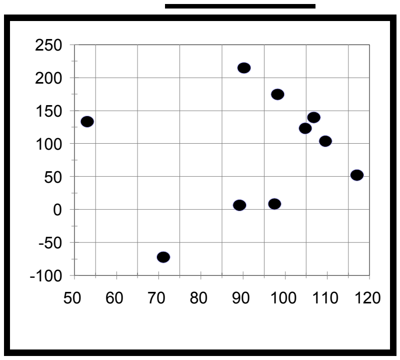

(3 points; 2 minutes)

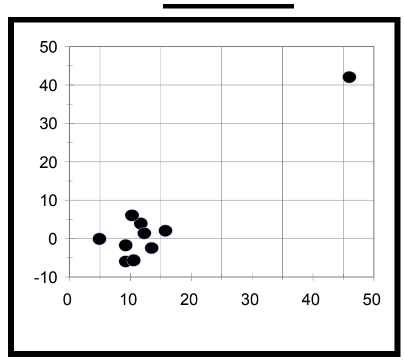
3. **Assign the three sample correlation coefficients to the three pictures. A correlation value may be used more than once or not at all. If a picture has no appropriate correlation available, write NONE [do not use the zero].**

**r = ________** **r = ________** **r = ________**

| **Values** |
|---|
| **0.00** |
| **-0.80** |
| **0.90** |
| **NONE** |



**Statistics 300**
**Quiz #17** **Name:** ______________________________

(7 points; 8 minutes)

2. **Market research concerning spending patterns found a sample correlation of 0.66 between X=purchase price of house and Y=purchase price of automobile for a sample of 6 families. Use these results to test the claim that the prices paid for houses and cars are positively correlated for the population of all families.**
   (Use a 0.05 significance level for this test.)

**Claim:** ______________________________

**$H_0$:** ______________________________

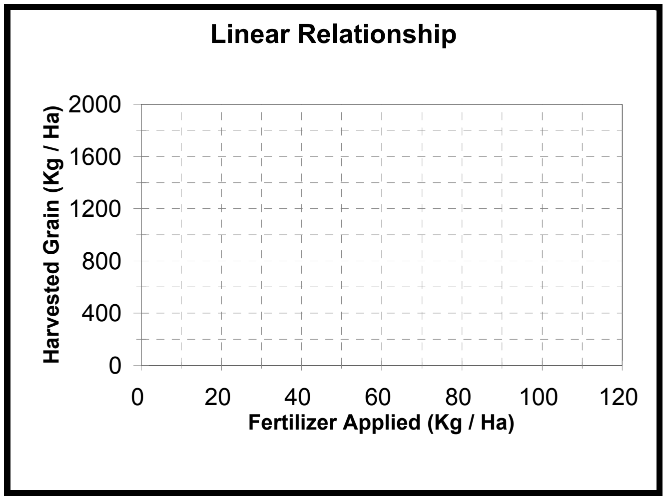
**$H_1$:** ______________________________

Statistics 300
Quiz #17 Name: ______________________

(15 points - 16 minutes)

**3. Use the data given below to answer questions (a) through (i).**

| Test Area | (X) Fertilizer Applied (Kg / Ha) | (Y) Harvested Grain (Kg / Ha) |
|---|---|---|
| 1 | 0 | 429 |
| 2 | 10 | 859 |
| 3 | 40 | 1572 |
| 4 | 80 | 1756 |
| 5 | 120 | 1256 |




**(a) Plot the data on the coordinate axes.**

**(b) What is the equation of the least squares regression line for these data :** ______________

**(c) Plot the line on the graph.**

**(d) If a farmer used 30 Kg of fertilizer per hectare, how much grain should be expected?** ______

**(e) What is the linear correlation between fertilizer applied and grain harvested?** ______________

**(f) What is the expression for "total variation in Y" (amounts of grain harvested)?** ______________

**(g) What is the value of the total variation in Y, the amounts of grain harvested?** ______________

**(h) What fraction of the total variation in Y is explained by the regression line?** ______________

**(i) What is the expression for "explained variation in Y ?"** ______________

**(j) What is the value of the explained variation in Y?** ______________

**(k) What is the expression for "unexplained variation in Y ?"** ______________

**(l) What is the value of the unexplained variation in Y?** ______________

**(m) What is the expression for standard error of estimate, $S_e$?** ______________

**(n) Determine the value of the standard error of estimate, $S_e$?** ______________

**Statistics 300**
**Quiz #18** **Name:** ______________________________

(8 points - 20 minutes : it's a big table)

1. **Use the data in the contingency table to test the claim that customers at coffee vendors A, B, C, and D choose types of coffee beverages in the same proportions.** (Use $\alpha$ = 0.025 for this test)

| Coffee Choice | Vendor | | | | |
|---|---|---|---|---|---|
| | A | B | C | D | Total |
| Plain | 115 | 123 | 138 | 128 | 504 |
| Latte | 55 | 53 | 73 | 58 | 239 |
| Mocha | 80 | 74 | 39 | 64 | 257 |
| Total | 250 | 250 | 250 | 250 | 1000 |

**Claim:** ______________________________

______________________________

**$H_0$:** ______________________________

______________________________

**$H_1$:** ______________________________

______________________________

**Statistics 300**
**Quiz #18** **Name:**________________________________

(8 points - 10 minutes)

2. **Use the data for a random sample of claims against auto insurance in Your City to test the claim that losses due to various causes occur in Your City in the same proportions that they occur in cities throughout the nation.** (Use a Type I error rate of 0.05 for this test)

| Type of Insurance Claim | Sample From Your City | National City Proportions |
|---|---|---|
| Theft | 142 | 10% |
| Vandalism | 78 | 9% |
| Fire | 31 | 3% |
| Flood/Storm | 10 | 2% |
| Collision | 739 | 76% |
| Total | 1000 | 100% |

**Claim:** ______________________________

**$H_0$:** ______________________________

**$H_1$:** ______________________________

**Statistics 300**
**Quiz #19** **Name:** ______________________________

(8 points : 10 minutes)

1. **Use the data below to complete the Analysis of Variance Table and test the claim that all of the 1998 Chevy Nova cars have the same gas mileage today.** (Use a 0.05 significance level for the test.)

| Car | Test 1 | 2 | 3 | 4 | Sample Size | Mean | Standard Deviation |
|---|---|---|---|---|---|---|---|
| **Car 1** | 20.33 | | 20.63 | 17.00 | 3 | 19.32 | 2.015 |
| **Car 2** | 19.93 | 20.06 | 17.52 | | 3 | 19.17 | 1.430 |
| **Car 3** | 17.53 | 18.50 | 17.10 | 20.87 | 4 | 18.50 | 1.685 |
| **Car 4** | 19.54 | 17.81 | 20.81 | 17.91 | 4 | 19.02 | 1.434 |
| **Car 5** | 20.39 | 20.33 | 18.56 | | 3 | 19.76 | 1.040 |
| **Car 6** | 19.14 | 17.29 | 17.01 | 20.04 | 4 | 18.37 | 1.460 |
| **Car 7** | 19.77 | 20.60 | 19.08 | 19.96 | 4 | 19.85 | 0.626 |
| **Car 8** | 17.85 | 17.72 | 18.45 | | 3 | 18.01 | 0.389 |
| **Car 9** | 19.10 | 17.09 | 17.45 | | 3 | 17.88 | 1.072 |

| | Overall | | Pooled |
|---|---|---|---|
| **Total N** | **Mean** | **St. Dev.** | **St. Dev.** |
| **31** | **18.88** | **1.331** | **1.335** |

**Analysis of Variance Table**

| Source | Deg. of Freedom | Sum of Squares | Mean Square | F |
|---|---|---|---|---|
| **Cars** | | | | |
| **Error** | | | | |
| **Total** | | | | |

**Statistics 300**
**Quiz #19** **Name:** ______________________________

(8 points : 10 minutes)

2. **Use the information below to test the claim that all of the 1998 Chevy Nova cars tested have the same gas mileage today.**
   (Use a 0.10 significance level for the test.)

| | **Test** | | |
|---|---|---|---|
| **Car** | **1** | **2** | **3** |
| **Car 1** | 20.33 | 17.00 | 20.63 |
| **Car 2** | 19.93 | 20.06 | 17.52 |
| **Car 3** | 17.53 | 18.50 | 17.10 |
| **Car 4** | 19.54 | 17.81 | 20.81 |
| **Car 5** | 20.39 | 20.33 | 18.56 |
| **Car 6** | 19.14 | 17.29 | 17.01 |
| **Car 7** | 19.77 | 20.60 | 19.08 |
| **Car 8** | 17.85 | 17.72 | 18.45 |
| **Car 9** | 19.10 | 17.09 | 17.45 |

**Analysis of Variance:One Way**

**Summary**

| ***Groups*** | ***Count*** | ***Sum*** | ***Average*** | ***Variance*** |
|---|---|---|---|---|
| Car 1 | 3 | 57.96 | 19.32 | 4.0593 |
| Car 2 | 3 | 57.51 | 19.17 | 2.0461 |
| Car 3 | 3 | 53.13 | 17.71 | 0.5143 |
| Car 4 | 3 | 58.16 | 19.387 | 2.267633 |
| Car 5 | 3 | 59.28 | 19.76 | 1.0809 |
| Car 6 | 3 | 53.44 | 17.813 | 1.339633 |
| Car 7 | 3 | 59.45 | 19.817 | 0.579233 |
| Car 8 | 3 | 54.02 | 18.007 | 0.151633 |
| Car 9 | 3 | 53.64 | 17.88 | 1.1487 |

**Analysis of Variance Table**

| ***Source of Variation*** | ***SS*** | ***df*** | ***MS*** | ***F*** | ***P-value*** |
|---|---|---|---|---|---|
| Between Groups | | | 2.3743 | | 0.187788 |
| Within Groups | | | | | |
| Total | 45.369 | | | | |