STAT303: Secs 102 and 103
Summer I 2000
Exam #4
Form A

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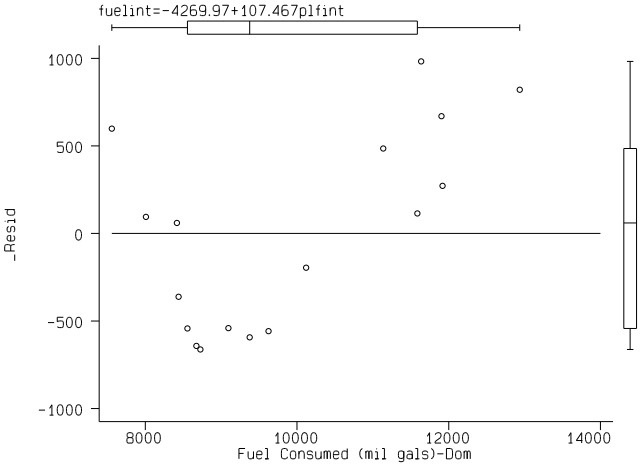
1. **Don't EVEN open this until you are told to do so.**
2. Be sure to mark your section number and your test form (A, B, C or D) on the scantron!
3. Sign your name where indicated on your scantron and write your section number, seat number and computer number beside it. You will get your scantrons back tomorrow in class. You may keep this exam.
4. There are 20 multiple-choice questions on this exam, each worth 5 points. There is partial credit. Please mark your answers **clearly** on the scantron. Multiple marks will be counted wrong.
5. You will have 60 minutes to finish this exam.
6. If you are caught cheating or helping someone to cheat on this exam, you both will receive a grade of **zero** on the exam. You must work alone.
7. This exam is worth 100 points, and will constitute 20% of your final grade.
8. Good luck!

1. Suppose we ask a large(so the necessary assumptions are met) random sample of people whether they would return the money if they found a wallet on the street. To find out if age makes any difference, we separated the sample into 5 age groups. What test procedure should we use to analyze the data?

   A. One way ANOVA on the multiple means.
   B. Case 9 since the sample is large and there are no other assumptions.
   C. Case 6 since the data is categorical and the sample is large.
   D. Case 11 since the data is categorical and the sample is large.
   E. Chi-squared test since the data is categorical, and we have more than 2 proportions.



2. What does the residual plot above tells us?

   A. The residuals are not linear, which is good.
   B. The linear relationship between *fuel* and *passenger load factor* is not valid.
   C. The variance of the residuals is not constant.
   D. The assumption of normality of the residuals may have been violated.
   E. The residual plot shows no problems.

3. What does 'statistical significance' mean for a Simple Regression t-test?

   A. It means that the true slope is significant, definitely not 0.
   B. It means that the true mean of the y's is significant, definitely not 0.
   C. It means that the true mean of the y's is 0.
   D. It means that the true slope is 0.
   E. None of the above are true.

1=No| Summary of No. of finger
caffeine;| taps per minute
2=100mg;|
3=200mg| Mean Std. Dev. Freq.

	Mean	Std. Dev.	Freq.
1	244.8	2.394438	10
2	246.4	2.0655911	10
3	248.3	2.2135944	10
Total	246.5	2.5964166	30

Analysis of Variance

Source	SS	df	MS	F	Pr > F
Between	61.40	2	30.70	6.18	0.0062
Within	134.10	27	4.97		
Total	195.50	29	6.74		

Bartlett's test for equal variances:
chi2(2) = 0.1877 Prob>chi2 = 0.910

4. What are the null and alternative hypotheses for the ANOVA test above?

   A. $H_0 : \mu_1 = \mu_2 = \mu_3$ vs. H_A: at least one mean is different
   B. $H_0 : \mu_1 = \mu_2 = \mu_3$ vs. $H_A : \mu_1 \neq \mu_2 \neq \mu_3$
   C. $H_0 : \mu_1 = \mu_2$ vs. $H_A : \mu_1 \neq \mu_2$
   D. $H_0 : \mu_1 = \mu_2$ vs. H_A: at least one mean is different
   E. $H_0 : \mu_1 = \mu_2 = \mu_3$ vs. H_A: the means are not all different

5. What conclusion may be made from the previous output?

   A. The variances are not all equal.
   B. Drinking coffee makes you jittery.
   C. The more caffeine you consume, the jitterier you get.
   D. There is a difference in the jitteriness, based on finger taps, due to caffeine.
   E. None of the above are correct.

6. What is the advantage of the *paired t test* over the other 2 sample t tests?

   A. It uses less data.
   B. It has less variability.
   C. It has more degresses of freedom.
   D. All of the above are true.
   E. Exactly two of the above are true.

7. Which of the following best describes the assumptions for the Chi-squared test in a contingency table?

   A. Each sample size must be at least 30.
   B. The variances must be equal.
   C. The means must be equal.
   D. The proportions must be equal.
   E. Each count must be at least 5.

8. An experiment was done with 15 students to see if manual dexterity was better for the dominant hand compared to the non-dominant hand. The experiment consisted of tossing beans into a paper cup and counting how many beans made it in 15 seconds. The order in which the two hand were measured was randomized to compensate for 'learning'. How should the data be analyzed?

   A. Assuming that the data is normal, we can use Case 2, the small sample t test.
   B. Assuming that the data is normal, we can use Case 9, the 2 sample t test.
   C. Assuming that the data is normal, we can use Case 8, the 2 sample t test since it's probable the variances are equal.
   D. Assuming that the data is normal, we can use Case 10, the paired t test.
   E. Assuming that the true proportion is around 0.5, we can use Case 11, the 2 sample z test.

9. Which of the following best describes what a p-value tells us for the Simple Regression t-test?

   A. The proportion of times we will get a sample slope of 0 when the true slope is not zero.
   B. The proportion of times we will get a sample slope of 0 when the true slope is zero.
   C. The proportion of times we will get a sample slope as different from 0 as we got when the true slope is not zero.
   D. The proportion of times we will get a sample slope that is not 0 when the true slope is zero.
   E. The proportion of times we will get a sample slope as different from 0 as we got when the true slope is zero.

10. Why are the assumptions so important in statistical inference, *i.e.*, hypothesis testing?

    A. They are the only rules we have to go by.
    B. They are what make the assumed distributions valid.
    C. They are what minimize the Type I and II errors.
    D. They are what help us decide our conclusions.
    E. They are what help us decide which procedure to use.

```
1=Yes, 0=No
    Whether| Whether baby was rocked
 baby cried|         0          1 |     Total
-----------+----------------------+----------
         0 |        78         15 |        93
         1 |        48          3 |        51
-----------+----------------------+----------
     Total|       126         18 |       144

          Pearson chi2(1) =   3.1618   Pr = 0.075
```

11. What is the best conclusion about the output above?

    A. The p-value is NOT greater than 10%, so we cannot assume that the variances are equal.
    B. At the 10% level, we can conclude that rocking and crying babies are related.
    C. At the 10% level, we can conclude that rocking causes babies to stop crying.
    D. Two of the above are true.
    E. None of the above are true.

12. Assuming rocking and crying are independent, how many babies should we expect to cry even though they were rocked?

    A. 3
    B. 3/144
    C. (18/144)*(51/144)*144
    D. (3/18)*(3/51)*3
    E. (3/18)*(3/51)*144

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13. If I test $H_0 : \mu_1 = \mu_2$ vs. $H_A : \mu_1 \neq \mu_2$, and get a p-value = 0.02, which of the following would be true?

    A. I would conclude the means are different at the 5 and 10% significance levels, but not at the 1%.
    B. 0 would be in a 99% confidence interval for the difference of the true means, but 0 would not be in either the 90 or 95% intervals.
    C. I must have both sample sizes greater than 30 if I don't know the data is normal.
    D. All of the above are true.
    E. Exactly two of the above are true.

14. Which of the following is NOT an assumption of Simple Linear Regression?

    A. The data, (x, y)'s, has a linear relationship.
    B. The residuals are normally distributed.
    C. The mean of the y's is zero.
    D. The variance of the residuals is constant.
    E. All of the above are valid assumptions.

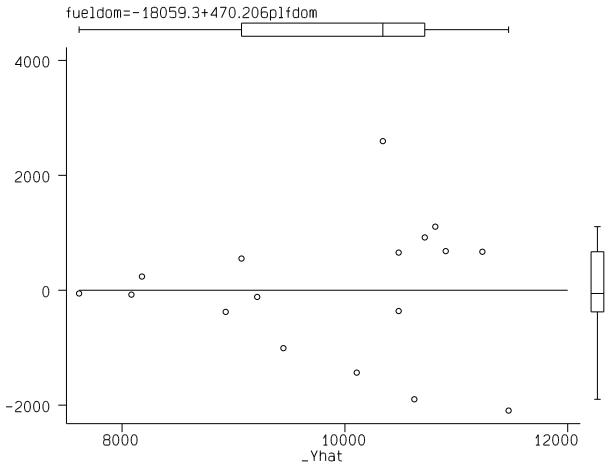
```
Production| Summary of Diameters of ball bearings
Line Drawn|
      From|        Mean   Std. Dev.       Freq.
----------+------------------------------------
         1 |        1.19        0.29          10
         2 |        1.41        0.43          10
----------+------------------------------------
     Total |        1.30        0.37          20
                Analysis of Variance
Source      SS   df      MS        F    Pr > F
------------------------------------------------
Between   .225    1   .224720026  1.68  0.2112
Within   2.406   18   .133682225
------------------------------------------------
Total    2.631   19   .138473688
Bartlett's test for equal variances:
          chi2(1) =   1.2720  Prob>chi2 = 0.259
```

15. Which of the following best describes the what the p-value above represents?

    A. 21.12% of the time, we will get a sample means that are equal when the true mean are different.
    B. 25.9% of the time, we will get a sample means that are equal when the true mean are different.
    C. 21.12% of the time, we will get a sample means that are at least this different when the true mean are equal.
    D. 25.9% of the time, we will get a sample means that are at least this different when the true mean are equal.
    E. 21.12% of the time, we will get a sample means that are not equal when the true mean are equal.

16. Which of the following is a valid conclusion about the previous output?

    A. The p-value for testing the assumption of equal variances is greater than 10%, so it is safe to assume the variances are equal.
    B. The p-value for testing equal means is NOT greater than 10%, so we cannot assume the means are equal.
    C. The p-value for testing the assumption of equal variances is greater than 10%, so we cannot assume the variances are equal.
    D. The p-value for testing equal means is less than the p-value for testing equal variances, so the test is invalid.
    E. Exactly two of the above are correct.



17. What does the residuals plot above tell us?

    A. The residuals are not linear, which is good.
    B. The linear relationship between *fuel* and *passenger load factor* is not valid.
    C. The variance of the residuals is not constant.
    D. The assumption of normality of the residuals may have been violated.
    E. The residual plot shows no problems.

```
  Source |       SS       df       MS
---------+------------------------------
   Model |  42231450.9     1  42231450.9
Residual |  1588509.29    15  105900.619
---------+------------------------------
   Total |  43819960.2    16  2738747.51

------------------------------------------------------------------------------
  fuel |  Coef.   Std. Err.      t    P>|t|     [95% CI]
-------+----------------------------------------------------------------------
 miles | 2.279647   .114156    19.970   0.000    2.036,2.523
 _cons | 3303.307   337.9538    9.774   0.000    2583.,4024.
------------------------------------------------------------------------------
```

18. What conclusion can we make about the output above?

    A. The p-value is 0, so *fuel* and *miles* have no linear relationship.
    B. The p-value is 0, so the true slope must also be zero.
    C. The p-value is 0, so *miles* is a good predictor for *fuel*.
    D. The p-value is 0, so *fuel* is a good predictor for *miles*.
    E. The p-value is 0, so we have 0 probability of making a Type II error.

19. Which of the following best describes why we use 10% significance level for Bartlett's test?

    A. A Type I error is more critical because it means we would be doing an invalid test procedure.
    B. A Type II error is more critical because it means we would be doing an invalid test procedure.
    C. A Type I error is more critical because it means we would not run the test even though it would be correct.
    D. A Type II error is more critical because it means we would not run the test even though it would be correct.
    E. A Type II error is more critical because it means we would conclude the is an effect even though there isn't one.

20. A 95% confidence interval for the true slope, β_1, from the previous output is $(2.036, 2.523)$. What is the probability that this interval contains the true slope?

    A. 0 or 1
    B. 0.05 or 0.95
    C. 0.95 only
    D. 0.05 only
    E. We cannot say since we don't know the true slope.

1E,2B,3A,4A,5D,6B,7E,8D,9E,10B,11B
12C,13D,14C,15C,16A,17C,18C,19B,20A