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Lab #4

12-8-2015

1. The mean number of hours undergraduates sleep is 6.186667. The mean number of hours graduates sleep is 6.42.
2. The test statistic is -1.23042 and the p-value is .110632. Because our p-value is greater than our alpha, .05, we accept the null hypothesis and conclude that the mean number of hours of sleep for undergraduate students does not differ from the mean number of hours of sleep for graduate students.
3. The standard deviations are similar enough to use an ANOVA on the data because the standard deviation of the smallest population (green) divided by the standard deviation of the largest population (brown) is 1.349933, which is less than 2. By the Rule of Thumb, then the standard deviations are similar enough.

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| Anova: Single Factor | |  |  |  |  |  |
|  |  |  |  |  |  |  |
| SUMMARY |  |  |  |  |  |  |
| Groups | Count | Sum | Average | Variance |  |  |
| Blue | 6 | 169 | 28.16667 | 2.334667 |  |  |
| Brown | 8 | 204.7 | 25.5875 | 1.864107 |  |  |
| Green | 5 | 134.6 | 26.92 | 3.397 |  |  |
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|  |  |  |  |  |  |  |
| ANOVA |  |  |  |  |  |  |
| Source of Variation | SS | df | MS | F | P-value | F crit |
| Between Groups | 22.99729 | 2 | 11.49864 | 4.802346 | 0.023249 | 3.633723 |
| Within Groups | 38.31008 | 16 | 2.39438 |  |  |  |
|  |  |  |  |  |  |  |
| Total | 61.30737 | 18 |  |  |  |  |
|  |  |  |  |  |  |  |

The test statistic is F=4.802346 and the p-value is 0.023249. Thus, because the p-value is smaller than our alpha, .05, we reject the null hypothesis and conclude that the mean CFF’s in the three eye-color populations are not all the same. CFF is related to eye color.

1. Out of the first 10 students in the data file, 6 turned in the extra credit.
2. Out of the first 10 students in the data file, 5 did better on the first midterm than the second midterm.
3. The final score of the first junior in the data file who did not turn in the extra credit was 82.
4. H0: µ1-µ2=0, meaning that the students who did not do the extra credit assignment performed the same as the students who did the extra credit assignment

Ha: µ1-µ2<0, meaning that the students who did not do the extra credit assignment performed worse than the students who did the extra credit assignment

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| t-Test: Two-Sample Assuming Unequal Variances | | | | |
|  |  |  |  |  |
|  | 0 | 1 |  |  |
| Mean | 73.86363636 | 84.07692 |  |  |
| Variance | 23.1041958 | 39.07287 |  |  |
| Observations | 66 | 39 |  |  |
| Hypothesized Mean Difference | 0 |  |  |  |
| df | 65 |  |  |  |
| t Stat | -8.783914016 |  |  |  |
| P(T<=t) one-tail | 5.95493E-13 |  |  |  |
| t Critical one-tail | 1.668635976 |  |  |  |
| P(T<=t) two-tail | 1.19099E-12 |  |  |  |
| t Critical two-tail | 1.997137908 |  |  |  |
|  |  |  |  |  |

The test statistic is -8.783914016 and the p-value is 5.9543 \* 10-13. Our alpha is .05. Thus, since our p-value is less than our alpha we will reject the null hypothesis and conclude that the students who did not do the extra credit did significantly worse than the students who did the extra credit.

1. H0: µD=0, meaning that there is no difference in the material of the first and second midterms.

Ha: µD >0, meaning that the second midterm is harder than the first midterm based on the students grades are worse for the second midterm.

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| t-Test: Paired Two Sample for Means | | |
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|  | Midterm1 | Midterm2 |
| Mean | 78.22857143 | 77.81905 |
| Variance | 68.19725275 | 95.53425 |
| Observations | 105 | 105 |
| Pearson Correlation | 0.858099719 |  |
| Hypothesized Mean Difference | 0 |  |
| df | 104 |  |
| t Stat | 0.835842822 |  |
| P(T<=t) one-tail | 0.202579788 |  |
| t Critical one-tail | 1.659637437 |  |
| P(T<=t) two-tail | 0.405159575 |  |
| t Critical two-tail | 1.983037526 |  |
|  |  |  |

The test statistic is 0.835842822 and the p-value 0.202579788. Our alpha is .05. Since our p-value is greater than our alpha, we do not reject the null hypothesis and conclude that the second midterm is not more difficult than the first midterm, according to the students’ grades.

1. H0: µ1=µ2= µ3=µ4, meaning that the average final score for all four classes are the same

Ha: at least two of the classes have different averages for the final score

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| Anova: Single Factor |  |  |  |  |  |  |
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| SUMMARY |  |  |  |  |  |  |
| Groups | Count | Sum | Average | Variance |  |  |
| Freshmen | 48 | 3709 | 77.27083 | 47.77615 |  |  |
| Sophomores | 26 | 2048 | 78.76923 | 61.54462 |  |  |
| Juniors | 17 | 1369 | 80.52941 | 54.76471 |  |  |
| Seniors | 14 | 1028 | 73.42857 | 34.87912 |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| ANOVA |  |  |  |  |  |  |
| Source of Variation | SS | df | MS | F | P-value | F crit |
| Between Groups | 429.898726 | 3 | 143.2996 | 2.830258 | 0.042194 | 2.694618 |
| Within Groups | 5113.758417 | 101 | 50.63127 |  |  |  |
|  |  |  |  |  |  |  |
| Total | 5543.657143 | 104 |  |  |  |  |

The test statistic is 2.830258 and the p-value is 0.042194. Our alpha is .05. Since our p-value is less than our alpha, we reject the null hypothesis and conclude that there are at least two classes for which the average of the final exam scores are not equal.