# Math 663-102, Spring 2011 <br> Final Exam 

Name:
Student ID: $\qquad$
May, 9 Must show all work to get full credit!
I pledge I have not violated the NJIT Honor Code

1. a. - d. The following displays the results of a standardized neuropsychological test administered to a sample of high school seniors. Test measures analytic skills and is scored on a scale of 0 to 100 , with higher scores indicative of stronger analytic skills. Note that $1 \mid 5$ $=51$ for males and also $6 \mid 3=63$ for females.


Compute:
a) The median scores for females.
b) The first, second and third quartiles for males and then the interquartile range. (9 points)
c) Are there any outliers among the male scores using quartiles? Why or Why not?(4 points)
d) Would the mean or median provide a better estimate for central location of male scores?

Would the standard deviation or the interquartile range divide by two, provide a better estimate for spread of male scores? Give reason for your answers.
(5 points)
2. a. - c. A dispensing machine is set to produce 1-pound lots of a particular compound. The machine is fairly accurate, producing mean weights of lots equal to 1.0 pounds with a standard deviation of 0.11 pounds. Thirty six lots are randomly selected.
b. What is the expected sample mean weight?
c. What is the standard error in the weights $\sigma_{\bar{X}}$ ?
d. Find the probability that the sample mean weight lies between 0.95 pounds and 1 pound.
(7 points)
3. We wish to estimate, using a $95 \%$ confidence interval, the mean age at which patients with hypertension are diagnosed. We randomly select 12 subjects with diagnosed hypertension and record the age at which they were diagnosed. The following data are observed in years:
$32.8, \quad 40, \quad 41, \quad 42,45.5, \quad 47, \quad 48.5, \quad 50, \quad 51, \quad 52,54,59.2$. We assume that age at diagnosis is approximately normally distributed (please see page 180 of the textbook).
4. We wish to test the hypothesis that the mean weight for females who are $5^{\prime} 7^{\prime \prime}$ is 134 pounds against the alternative that the true mean is greater than 134 pounds. Assuming $\sigma$ $=15$ using $5 \%$ level of significance and with $n=40$, find the power of the test if $\mu=$ 140.
5. a. - c. A randomized trial is run to compare two competing medications for peripheral vascular disease. One of the outcomes is self-reported physical functioning. After taking the assigned medication for six weeks, patients provide data on their abilities to perform various physical activities, and a score is computed for each individual. The physical functioning score range from 0 to 100 , with higher score indicative of better functioning. The data are:

| Medication | n | $\bar{X}$ | s |
| :---: | :---: | :---: | :---: |
| 1 | 20 | 69.5 | 24.1 |
| 2 | 20 | 77.1 | 22.3 |

a. Generate a $98 \%$ confidence interval for the difference in mean physical functioning scores between medications.
(10 points)
b. Give reason for the method used in 5 a . above use significance level $\alpha=0.05$. ( 5 points)
c. What assumptions are necessary to justify the use of the method in 5 . a. above.( 5 points)
6. a. - b. A nutrition expert is examining a weight-loss program to evaluate its effectiveness. Ten subjects are randomly selected for the investigation. The subjects' initial weights are recorded; they follow the program for six weeks, and are weighed again. The data are as follows:

| Subject | Initial Weight Final Weight |  |
| :---: | ---: | ---: |
| 1 | 180 | 165 |
| 2 | 142 | 138 |
| 3 | 126 | 138 |
| 4 | 138 | 136 |
| 5 | 175 | 170 |
| 6 | 205 | 197 |
| 7 | 116 | 115 |
| 8 | 142 | 128 |
| 9 | 157 | 144 |
| 10 | 136 | 130 |

The difference data is not assumed to be normal due to an outlier in it.
a. Use significance level $\alpha=0.05$ to determine if the weight-loss program is effective. Compute the p-value of the test.
b. Compute the Spearman correlation coefficient between initial weight and final weight and determine whether the correlation is significant at $\alpha=0.01$. (8 points)
7. The following data reflect ages of student at completion of eighth grade. Test if there is a significant difference in the mean age at completion of eighth grade for rural, suburban and urban students at alpha $=0.025$. The following data were collected from randomly selected students at rural, suburban and urban schools.

| Rural | 14 | 14 | 14 | 14 | 13 | 13 | 13 | 12 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| Suburban | 14 | 14 | 14 | 13 | 13 | 13 | 13 | 13 | 12 | 12 |
| Urban | 16 | 16 | 15 | 15 | 15 | 14 | 14 | 14 | 13 | 12 |

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[^0]:    What additional assumptions are necessary to run the test?
    (10 points)

