Final Stat 160 Spring Term 2004 April 20*th* NAME:
FORM B

1. A survey was conducted to see what proportion of students preferred brand name clothes. Professor Jones selected 20 of her favorite students from her Stat 160 class. She asked them if they preferred brand clothes or not. Of the 20 students selected, 17 students said they preferred brand name clothes and the remaining 3 did not care about brand names. From this survey results what conclusions can you draw?.

   (a). **X** Results are invalid since sample chosen is not a random sample.

   (b). Brand name clothes are significantly more popular than unbranded ones.

   (c). More information is required to draw conclusions.

   (d). Need names of the brands.

2. There are 4 gold balls and 6 silver balls in the urn. If we are drawing balls one by one without replacement, what is the probability of getting a gold ball given that we already have 2 silver balls?

   (a) 2/8

   (b) **X** 1/2

   (c) 1/4

   (d) 2/5

   For the next 3 problems ' For the next three questions, refer to the following problem:

   A car manufacturer is producing a piston for its engines. The piston is supposed to have a diameter of 5.3 inches, but because of variability, the diameter of a piston follows a normal distribution with a mean of 5.3 and a standard deviation of 0.2. A quality control check inspects 25 pistons from a batch of pistons randomly and measures the average diameter. If the average diameter is at least 5.4, then the batch is rejected. And if the average diameter is at most 5.21, then the batch is returned to the manufacturer. The following are some of the RWEB outputs.

```
Rweb:> # CUMULATIVE NORMAL DISTRIBUTION
Rweb:> pnorm(5.21, 5.3, 0.04)
[1] 0.01222447

Rweb:> # CUMULATIVE NORMAL DISTRIBUTION
Rweb:> pnorm(5.21, 5.3, 0.2)
[1] 0.3263552

Rweb:> # CUMULATIVE NORMAL DISTRIBUTION
Rweb:> pnorm(5.4, 5.3, 0.2)
[1] 0.6914625

Rweb:> # CUMULATIVE NORMAL DISTRIBUTION
Rweb:> pnorm(5.4, 5.3, 0.04)
[1] 0.9937903
```

3. What is the chance that in one inspection, the batch will be rejected?

(a) 0.6914

(b) 0.3105

(c) **X** 0.0062

(d) 0.9938

4. How much percent of the time will the batch be returned to the manufacturer?

   (a) 68.36

   (b) 32.63

   (c) 99.78

   (d) **X** 1.22

5. If the size of the items selected from the batch was increased to 64, what is the new standard error of the sample mean diameter?

   (a) 0.0031

   (b) **X** 0.025

   (c) 0.04

   (d) 0.2 (the standard deviation does not change)

6. Suppose the fuel consumption in Michigan and Indiana were compared by taking a random sample of car-owners. Using LS Regression, where X=0 corresponds to Michigan, and X=1 for Indiana, the estimate of the slope is

   (a) The difference in mean fuel consumption of Michigan car owners minus Indiana car owners.

   (b) The Sample mean fuel consumption of Indiana car owners.

   (c) **X** The difference in mean fuel consumption of Indiana car owners minus Michigan car owners.

   (d) The Sample mean fuel consumption of Michigan car owners.

7. The sample correlation coefficient value for a perfect circular relationship will be

   (a). between +1 and -1

   (b). r = 1

   (c). r = -1

   (d). **X** r = 0

   For the next five problems:

   To test the effectiveness of the new weight-loss drug, REDUX, 10 women were split into two groups, group A, who took a placebo drug, and group B, who took the real drug, Redux. The amount of weight loss by each member of the groups over a six-month period is given below:

```
Group A  4 5 7 10 12
Group B  5 7 15 18 20
```

8. Compute the Wilcoxon Statistic T, (the number of times B beats A), for the problem.

   (a) 15

(b) **X** 19

(c) 12

(d) 6

9. What is the null hypothesis for this problem?

   (a) There is a shift in location between the two populations.

   (b) The new drug is effective in reducing weight.

   (c) There is a positive difference in the mean weights between the two groups.

   (d) **X** The new drug has the same effect as the old drug in reducing weight.

10. Under the null hypothesis, what is the expected value of the Wilcoxon test Statistic?

    (a) **X** 12.5

    (b) 0

    (c) 15

    (d) 5

11. What is the Wilcoxon estimate for the difference in weights?

    (a) **X** 6

    (b) 5.4

    (c) 8

    (d) 0

12. A confidence interval for the difference of the weight loss between the two groups is computed to be (6.8, 9.5). Which of the following is a conclusion that can be derived from the confidence interval?

    (a) The new drug is not any more effective in weight reduction than the old.

    (b) **X** The new drug is more effective in weight reduction than the old.

    (c) The test is inconclusive.

    (d) We can't derive a conclusion unless we do test of hypothesis.

13. If a dataset has outliers

    (a). **X** They should be investigated further to understand why they differ.

    (b). They should be thrown out of the dataset.

    (c). Dot plot should be used to identify them.

    (d). Should compute 95% confidence interval.

For the next three problems

A company manufactures and bottled grape juice. It uses a machine that automatically fills 16-ounce bottles. The amount dispensed has been observed to be approximately normally distributed with mean 16 ounces and standard deviation of 1.5 ounces.

```
Rweb:> # CUMULATIVE NORMAL DISTRIBUTION
Rweb:> pnorm(17, 16, 1.5)
[1] 0.7475075

Rweb:> # CUMULATIVE NORMAL DISTRIBUTION
Rweb:> pnorm(17, 16, 2.25)
[1] 0.6716394

Rweb:> # CUMULATIVE NORMAL DISTRIBUTION
Rweb:> pnorm(17, 16, 1.22)
[1] 0.7937985

Rweb:> # NORMAL PERCENTAGE POINT
Rweb:> qnorm(0.90, 16, 2.25)
[1] 18.88349

Rweb:> # NORMAL PERCENTAGE POINT
Rweb:> qnorm(0.90, 16, 1.5)
[1] 17.92233

Rweb:> # NORMAL PERCENTAGE POINT
Rweb:> qnorm(0.10, 16, 1.5)
[1] 14.07767
```

14. What is the probability that more than 17 ounces will be dispensed?

    (a) 0.7475

    (b) **X** 0.2525

    (c) 0.7938

    (d) 0.3284

15. What is the probability that the dispensed grape juice is between 13 ounces and 19 ounces?

    (a) **X** 0.95

    (b) 0.68

    (c) 0.99

    (d) 0.50

16. What is the 90th percentile of ounces of grape juice dispensed by the machine?

    (a) 16.00 ounces

    (b) 14.08 ounces

    (c) **X** 17.92 ounces

    (d) 18.88 ounces

    For the next two problems

    Consider the following output from RWEB for n=10 observations.

```
RWEB OUTPUT
-----------

 Min.   : 9.0
 1st Qu.:12.5
 Median :16.5
 Mean   :17.9
 3rd Qu.:24.0
 Max.   :28.0
 HODGES-LEHMANN ESTIMATE for data :18
 STANDARD DEVIATION of data :6.539623
```

17. List the 5 descriptive measures in the order min,max,range,median,IQR

    (a). **X** 9.0, 28.0, 19.0, 16.5, 11.5

    (b). 9.0, 24.0, 15.0, 16.5, 11.5

    (c). 9.0, 28.0, 17.9, 16.5, 11.5

    (d). 12.5, 24.0, 11.5, 16.5, 11.5

18. Construct the 95% confidence interval for mean.

    (a). (16.62, 21.95)

    (b). (16.62, 19.18)

    (c). (13.85, 19.18)

    (d). **X** (13.85, 21.95)

    For the next three problems.

    In a certain game, a player rolls 5 dice and wins if no two dice have the same value, meaning the number of dots in each of the upturned faces are distinct. A Stat 160 student was eager to compute the exact probability that the player wins, but he found that constructing a tree diagram was tedious. So he used resampling to approximate this probability.

19. Which among the following is the correct resampling code?

    (a) X

```
          Minimum Value = 1
Maximum Value = 6
Number to be Drawn = 5
With Replacement
```

    (b)

```
          Minimum Value = 1
Maximum Value = 6
Number to be Drawn = 5
Without Replacement
```

    (c)

```
          Minimum Value = 1
Maximum Value = 5
Number to be Drawn = 6
With Replacement
```

(d)
```
Minimum Value = 1
Maximum Value = 5
Number to be Drawn = 6
Without Replacement
```

20. The RWEB results are as follows:

```
Trial 1         4 6 6 3 3
Trial 2         2 3 4 6 1
Trial 3         3 1 1 2 5
Trial 4         2 2 3 5 1
Trial 5         3 1 4 6 5
Trial 6         3 1 5 4 6
Trial 7         3 2 2 6 1
Trial 8         5 1 2 6 2
Trial 9         5 6 6 5 2
Trial 10        1 5 2 3 1
Trial 11        1 4 5 1 6
Trial 12        4 2 6 2 5
```

Estimate the probability that the player loses.

(a) **X** 0.75

(b) 0.25

(c) 0.5

(d) 0.833

21. What is the error in estimation of the probability in the previous problem?

(a) 0.125

(b) **X** 0.25

(c) 0.2887

(d) 0.2153

22. The actual time of arrival of customers at a checkout counter follows a Uniform distribution. It is known that during a given 30-minute period, one customer arrived at the counter. Find the probability that the customer arrived after 25 minutes of the 30-minute period?

(a) 1/30

(b) 5/6

(c) **X** 1/6

(d) 1/2

23. It is known that a patient with a disease will respond to treatment with probability equal to .90. If three patients with the disease are treated and respond independently, find the probability that at least one will not respond?

(a) **X** 0.271

(b) 0.729

(c) 0.999

(d) 0.900

24. A particular soap company requires the median weight of packages of its product to be 17 ounces. A sample of 20 consecutive packages filled by the same machine is taken from the assembly line and weighed, with the following results (in ounces): 17.9, 17.5, 17.2, 17.3, 16.5, 16.8, 16.7, 17.2, 17.4, 17.6, 17.5, 17.8, 16.8, 16.5, 16.6, 17.7, 17.6, 17.7, 17.8, 17.2

    The sample was resampled a 100 times and the sorted resampled medians are given as follows.

```
Sorted Medians
--------------------------

16.8 16.8 16.8 17.0 17.2 17.2 17.2 17.2 17.2 17.2
17.2 17.2 17.2 17.2 17.2 17.2 17.2 17.2 17.2 17.2
17.2 17.2 17.2 17.25 17.25 17.25 17.25 17.25 17.25 17.25
17.25 17.25 17.25 17.25 17.29 17.29 17.29   17.29 17.3 17.3
17.3 17.3 17.35 17.35 17.35 17.35 17.35 17.4 17.4 17.4
17.4 17.4 17.4 17.4 17.4 17.4 17.4 17.4 17.4 17.45
17.45 17.45 17.45 17.45 17.45 17.45 17.45 17.45 17.45 17.5
17.5 17.5 17.5 17.5 17.5 17.5 17.5 17.5 17.5 17.5
17.5 17.5 17.5 17.5 17.5 17.5 17.5 17.5 17.5 17.55
17.55 17.55 17.55 17.55 17.6 17.6 17.6 17.6 17.6 17.6
```

    Based on the resampled medians, give a 95% confidence interval for the true median.

    (a). (17.2, 17.5)

    (b). (17.0, 17.6)

    (c). **X** (16.8, 17.6)

    (d). (16.8, 17.55)

    For the next 4 problems:

25. Consider the following problem

    An analyst is studying the relationship between shopping center traffic and a department store's daily sales. The analyst develops an index to measure the daily volume of traffic entering the shopping center, and an index of daily sales. The following table shows the index values for ten randomly selected days.

```
Traffic index (X) : 71   82   111   85   89   110   111   121   129   132
Sales index (Y) :   250  280  301   325  328  390   410   420   450   475
```

    The RWEB results are as follows :

```
Coefficients:
            Estimate   Std. Error  t value  Pr(>|t|)
(Intercept)  20.1752    56.9424    0.354   0.732265
x             3.2923     0.5372    6.129   0.000280
```

```
Interpret the slope parameter.
```

    (a). For every unit increase in the sales index, the traffic index goes up by 20.1752 units

(b). For every unit increase in the traffic index, the sales index goes up by 20.1752 units

(c). When traffic index equals 0, sales index equals 20.1752

(d). **X** For every unit increase in the traffic index, the sales index goes up by 3.2923 units

26. What is the response variable in the study?.

(a). Traffic index

(b). **X** Sales index

(c). Slope

(d). No response variable

27. What would be the sales index for a traffic index of 100 units.

(a). 39.4328

(b). 2020.812

(c). 100.00

(d). **X** 349.41

28. Interpret the coefficient of determination $R^2 = 0.824$ value for the same problem.

(a). 0.824% of the variation in the traffic index is explained by the sales index.

(b). 82.4% of the variation in the traffic index is explained by the sales index.

(c). 0.824% of the variation in the sales index is explained by the traffic index.

(d). **X** 82.4% of the variation in the sales index is explained by the traffic index.

29. A student was asked to enter some research data. He makes a typing error with the last observation. Instead of 28 he types it as 285. Numerical summaries were computed on the data. Identify the measures that will be robust.

(a). Maximum, IQR, H-L estimate

(b). Mean, Median, IQR

(c). **X** Median, H-L estimate, IQR

(d). Range, H-L estimate, Median

30. The Central Limit Theorem basically says the following except:

(a) The standard error of the sample mean decreases as the sample size increases.

(b) **X** As the sample size gets large, the variance of the sample mean gets larger.

(c) The expected value of the sample mean is equal to the population mean.

(d) Regardless of the parent distribution, the sample mean will have an approximately normal distribution for large values of n.

For the next two problems

A portion of the data obtained by Salsburg (1970) is given below. These data, based on six patients who received tranquilizer T, were taken from a double-blind clinical trial involving two tranquilizers. The measure used was the Hamilton (1960) depression scale factor IV (the "suicidal" factor). The pre (X) value was obtained at the second visit after initiation of therapy, whereas the post(Y) value was obtained at the second visit after initiation therapy.

Patient	X	Y
1	1.83	0.878
2	0.50	0.647
3	1.62	0.598
4	2.48	2.050
5	1.68	1.060
6	1.88	1.290

31. What type of design of experiment is the problem?

    (a) Completely Randomized Design

    (b) **X** Paired Design

    (c) Wilcoxon

    (d) Proportion

32. What is the null expected value of the signed-rank Wilcoxon test statistic?

    (a) 15

    (b) 21

    (c) 18

    (d) **X** 10.5

    For the next 2 problems

    Every person's blood type is A,B,AB or O. In addition, each individual either has the Rhesus (Rh) factor (+) or does not (-). A medical technician records a person's blood type and Rh factor.

33. What is the sample space for this experiment?

    (a) **X** A+, A-, B+, B-, AB+, AB-, O+, O-

    (b) A,B,AB,O,+,-

    (c) A+, B+, AB+, O+

    (d) A-, B-, AB-, O-

34. Suppose that a person is equilikely to have any of these blood types. What is the probability that an individual will have a blood type A without a Rhesus factor?

    (a) **X** 1/8

    (b) 1/4

    (c) 1/2

    (d) 3/4

35. In a certain town, 35% of the residents are opposed to the widening of Main street. A random sample of 20 residents were chosen. What is the expected number of residents who will oppose.

    (a). **X** 7

    (b). 5

    (c). 20

    (d). 10