BUS 3613, Business Statistics
Practice Test 1, Spring 2010

Your test will be of similar content and material, but the questions will be different and the questions may be asked in a different manner. The test questions will come from all the material we have covered in class.

This is a closed book, closed note test, and should be your work only. You may use a calculator as well as the provided formula sheet during this exam. Stay calm, read all of the instructions, and show your work when applicable. Some unjustified answers will receive minimal credit.

1. According to the 2003 Annual Consumer Spending Survey, the average monthly Bank of America Visa credit card charge was $1838. A sample of monthly credit card charges provides the following data on credit card charges:

   263  316  991  1710  4135  3396  1351  1333  170

   In order: 170  263  316  991  1333  1351  1710  3396  4135

   a. Compute the mean for this data.

   \[
   \overline{x} = \frac{170 + 263 + 316 + 991 + 1333 + 1351 + 1710 + 3396 + 4135}{9} = 1518.3
   \]

   b. Compute the median for this data.

   \[\text{Median} = 1333\]

   c. The skewness measure for these data is 1.08. What is the shape of the distribution?

   Skewed to the right.

   (Also notice Mean > Median)

   d. If the standard deviation is approximately 1395.9, find the variance for this data.

   \[s^2 = \left(\frac{1395.9}{1518.3}\right)^2 \approx 1.94853681\]

   e. Find the coefficient of variation for this data.

   \[\left(\frac{1395.9}{1518.3} \times 100\right) \approx 91.9\%\]

   f. Is 4135 an outlier for this data? Explain.

   \[\frac{4135 - 1518.3}{1395.9} \approx 1.87\]

   Not an outlier
2. A telephone survey to determine viewer response to a new television show obtained the following data. Viewers were asked to rate the show on a scale of 1 (poor) to 25 (excellent).

<table>
<thead>
<tr>
<th>Rating</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-5</td>
<td>4</td>
</tr>
<tr>
<td>6-10</td>
<td>8</td>
</tr>
<tr>
<td>11-15</td>
<td>11</td>
</tr>
<tr>
<td>16-20</td>
<td>14</td>
</tr>
<tr>
<td>21-25</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>50</td>
</tr>
</tbody>
</table>

a. Make a relative frequency distribution table for this data.

<table>
<thead>
<tr>
<th>Rating</th>
<th>Relative Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-5</td>
<td>0.08</td>
</tr>
<tr>
<td>6-10</td>
<td>0.16</td>
</tr>
<tr>
<td>11-15</td>
<td>0.22</td>
</tr>
<tr>
<td>16-20</td>
<td>0.28</td>
</tr>
<tr>
<td>21-25</td>
<td>0.26</td>
</tr>
</tbody>
</table>

b. Make a cumulative relative frequency distribution table for this data.

<table>
<thead>
<tr>
<th>Rating</th>
<th>Cumulative Relative Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-5</td>
<td>0.08</td>
</tr>
<tr>
<td>1-10</td>
<td>0.24</td>
</tr>
<tr>
<td>1-15</td>
<td>0.46</td>
</tr>
<tr>
<td>1-20</td>
<td>0.74</td>
</tr>
<tr>
<td>1-25</td>
<td>1</td>
</tr>
</tbody>
</table>

c. Graph the data from part a using the most appropriate graph type.

[Histogram]

d. What type of graph should you use to display the data from part b? (Note: You need NOT make the graph.)

Ogive
3. The days to maturity for a sample of five money market funds are shown below. The dollar amounts invested in the funds are provided. Use the weighted mean to determine the mean number of days to maturity for dollars invested in these five money market funds.

<table>
<thead>
<tr>
<th>Days to Maturity</th>
<th>Dollar Value ($ millions)</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td><strong>85</strong></td>
<td></td>
<td><strong>1.1</strong></td>
</tr>
</tbody>
</table>

Weighted Mean = \( \frac{965}{85} \approx 11.4 \text{ days} \)

Note: If you think about units \( \frac{\text{\$ days}}{\text{\$}} \) it can help you decide what to divide by.

4. Using a market basket of 10 items including meat, milk, bread, eggs, coffee, potatoes, cereal, and orange juice, a magazine calculated the cost of the market basket in six cities and in six retirement areas across the country. For the six cities, the mean price for the basket was \$33 with a standard deviation of \$3.79. For the six retirement areas across the country, the mean price for the basket was \$32 with a standard deviation of \$1.90.

a. Describe, using complete sentences, what observation can be made comparing the six cities with the six retirement areas based on the standard deviations.

Since the standard deviation is larger for the six cities, there is more variability in the prices for the baskets purchased in the cities than for those purchased in the retirement areas.

b. Use a \( z \)-score to determine if a price of \$40 for a basket would be considered an outlier for the six retirement areas. Justify your answer.

\[
\begin{align*}
Z & = \frac{40 - 32}{1.90} \\
& \approx 4.21
\end{align*}
\]

Since the \( z \)-score is \( > 3 \), the price of \$40 would be an outlier.

[40 is more than 3 standard deviations from the mean]
5. *Drug Store News* provided data on annual pharmacy sales for the leading pharmacy retailers in the United States. The following data are annual sales in millions for 10 pharmacy retailers.

\[1700\ 12700\ 7739\ 1863\ 3400\ 1757\ 8637\ 2150\ 11660\ 7250\]

\[1700\ 1757\ 1863\ 2150\ 3400\ 1250\ 7739\ 8637\ 11660\ 12700\]

da. Make a stem-and-leaf display for this data.

\[
\begin{array}{c|c}
1 & 100, 157, 863 \\
2 & 150 \\
3 & 400 \\
4 & \\
5 & \\
6 & 250, 139 \\
7 & 8637 \\
8 & \\
9 & \\
10 & 660 \\
11 & 700 \\
12 & \\
\end{array}
\]

db. Find the five number summary for this data.

\[1700\ 1863\ 5325\ 8637\ 12700\]

dc. Draw a box plot for this data.

\[
\begin{align*}
\text{IQR} &= Q_3 - Q_1 = 8637 - 1863 = 6774 \\
\text{Lower Limit} &= Q_1 - 1.5(\text{IQR}) = 1863 - 1.5(6774) = -8298 \\
\text{Upper Limit} &= Q_3 + 1.5(\text{IQR}) = 8637 + 1.5(6774) = 18198 \\
\end{align*}
\]

No outliers.
6. Managers of a stereo and sound equipment store in San Francisco would like to investigate whether a relationship exists between the number of commercials shown and sales at the store during the following week. On 10 occasions during the past three months, the stores used weekend television commercials to promote sales at its stores and then computed the sales for the following week. The following scatter diagram displays the data for the 10 weeks that data was collected.

![Scatter Diagram](image)

a. Is the direction of the association positive or negative? Explain in a complete sentence what this says about the number of commercials and stereo sales. Positive

more commercials were run that had more sales during the follow week

b. Which of the following Pearson product moment correlation coefficients would best describe the data? Explain what this coefficient tells you about the data. Your choices are \( r_{xy} = 0.93, r_{xy} = 0.03, r_{xy} = -0.84, r_{xy} = -0.10. \)

The points are fairly linear and are going up (positively correlated)

7. The results of a national survey showed that on average, adults sleep 6.9 hours per night. Suppose that the standard deviation is 1.2 hours. \( \bar{X} = 6.9, \sigma = 1.2 \)

a. Use Chebyshev’s theorem to calculate the percentage of individuals who sleep between 4.5 and 9.3 hours. \( X = 4.5 \)

\[
z = \frac{4.5 - 6.9}{1.2} = -2
\]

\[
1 - \frac{1}{2^2} = 1 - \frac{1}{4} = \frac{3}{4}
\]

b. Use Chebyshev’s theorem to calculate the percentage of individuals who sleep between 3.9 and 9.9 hours.

\( X = 3.9 \)

\[
z = \frac{3.9 - 6.9}{1.2} = -2
\]

\[
1 - \frac{1}{(2)^2} = 1 - \frac{1}{4} = \frac{3}{4}
\]

\( X = 9.9 \)

\[
Z = \frac{9.9 - 6.9}{1.2} = 2.5
\]

84% of the individuals sleep between 3.9 and 9.9 hours.
8. A survey of commercial buildings served by the Cinergy-Cincinnati Gas & Electric Company asked what main heating fuel was used and what year the building was constructed. The cross tabulation data is below.

<table>
<thead>
<tr>
<th>Year Constructed</th>
<th>Electricity</th>
<th>Natural Gas</th>
<th>Oil</th>
<th>Propane</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>1968-1973</td>
<td>40</td>
<td>183</td>
<td>12</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>1974-1979</td>
<td>24</td>
<td>26</td>
<td>2</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>1980-1986</td>
<td>37</td>
<td>38</td>
<td>1</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>1987-1991</td>
<td>48</td>
<td>70</td>
<td>2</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Years</th>
<th>Electricity</th>
<th>NG</th>
<th>Oil</th>
<th>Propane</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>1968-1973</td>
<td>26.8%</td>
<td>57.7%</td>
<td>70.6%</td>
<td>71.4%</td>
<td>50%</td>
</tr>
<tr>
<td>1974-1979</td>
<td>16.1%</td>
<td>8.2%</td>
<td>11.8%</td>
<td>28.6%</td>
<td>0%</td>
</tr>
<tr>
<td>1980-1986</td>
<td>24.8%</td>
<td>12.0%</td>
<td>5.9%</td>
<td>0%</td>
<td>42.9%</td>
</tr>
<tr>
<td>1987-1991</td>
<td>32.2%</td>
<td>22.1%</td>
<td>11.8%</td>
<td>0%</td>
<td>7.1%</td>
</tr>
</tbody>
</table>

a. Using this table, make a crosstabulation of this data using column percentages.

b. Use your percentages from part a to construct a histogram for the fuel type Oil.

![Histogram](image)

c. Describe the shape of the histogram you constructed in part b. Be as specific as possible.

Skewed to the right.