Practice Exam 1: Chp. 1, 2, 3 Solutions

1. a) ordinal  b) ratio  c) nominal  d) interval

2. a) continuous  b) discrete

3. a) \( \frac{3}{5} = 0.6 = 60\% \)
   b) \( 0.14 \% = 0.0014 \)
   c) \( 63.5\% \text{ of } 500 = 0.635(500) = 317.5 \)

4. a) convenience  d) stratified
   b) systematic  e) random
   c) cluster

5. a) observational study
   The subjects received no treatment.
   b) experiment
   The subjects were modified - one group watched the animation and the other studied the textbook,

6. a) The sample is the 21,588 returned surveys.
   b) The population is the 3,000 stockholders.
   c) The sample is not likely to be representative of the population since the stockholders choose to respond. (Voluntary Response Sample)
7. White
   (in 1000 cells/ltr.)

<table>
<thead>
<tr>
<th>Range</th>
<th>Tally</th>
<th>(a)</th>
<th>(b)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.0 - 5.9</td>
<td>TH TH TH TH</td>
<td>16</td>
<td>40.0%</td>
</tr>
<tr>
<td>6.0 - 7.9</td>
<td>TH TH TH</td>
<td>11</td>
<td>27.5%</td>
</tr>
<tr>
<td>8.0 - 9.9</td>
<td>TH TH TH</td>
<td>8</td>
<td>20.0%</td>
</tr>
<tr>
<td>10.0 - 11.9</td>
<td>TH</td>
<td>3</td>
<td>7.5%</td>
</tr>
<tr>
<td>12.0 - 13.9</td>
<td>TH</td>
<td>2</td>
<td>5.0%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>40</strong></td>
<td><strong>100%</strong></td>
<td></td>
</tr>
</tbody>
</table>

(c) Cumulative Freq.

<table>
<thead>
<tr>
<th>Range</th>
<th>Freq.</th>
</tr>
</thead>
<tbody>
<tr>
<td>less than 6.0</td>
<td>16</td>
</tr>
<tr>
<td>less than 8.0</td>
<td>27</td>
</tr>
<tr>
<td>less than 10.0</td>
<td>35</td>
</tr>
<tr>
<td>less than 12.0</td>
<td>38</td>
</tr>
<tr>
<td>less than 14.0</td>
<td>40</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>40</strong></td>
</tr>
</tbody>
</table>

(d) The distribution is skewed right.

8. Rough Draft
   Number of Cardiograms

<table>
<thead>
<tr>
<th>Stem</th>
<th>Leaf</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>342</td>
</tr>
<tr>
<td>2</td>
<td>503</td>
</tr>
<tr>
<td>3</td>
<td>1262322</td>
</tr>
<tr>
<td>4</td>
<td>3445</td>
</tr>
<tr>
<td>5</td>
<td>721</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>stem</th>
<th>leaf</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>234</td>
</tr>
<tr>
<td>2</td>
<td>035</td>
</tr>
<tr>
<td>3</td>
<td>122226</td>
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<tr>
<td>4</td>
<td>3445</td>
</tr>
<tr>
<td>5</td>
<td>127</td>
</tr>
</tbody>
</table>
9. a) Pareto

![Pareto Chart]

Types of Spam

b) Central Angles

- Adult: 19% → 0.19(360°) = 68°
- Financial: 21% → 0.21(360°) = 76°
- Health: 8% → 0.08(360°) = 29°
- Internet: 6% → 0.06(360°) = 22°
- Leisure: 6% → 0.06(360°) = 22°
- Products: 25% → 0.25(360°) = 90°
- Scams: 13% → 0.13(360°) = 47°

Totals: 100% → 360°

OK close to 360°
10. **Eastbound**

\[
\bar{x} = \text{mean} = 21.3\text{ y.r} \\
\text{mode} = 20\text{ y.r} \quad \& \quad 19\text{ y.r} \\
\text{range} = 34-15 = 19\text{ y.r} \\
S = \text{std. dev.} = 5.3\text{ y.r}
\]

**Westbound**

\[
\bar{x} = 29.5\text{ y.r} \\
\text{mode} = 21\text{ y.r} \quad \& \quad 24\text{ y.r} \\
\text{range} = 45-21 = 24\text{ y.r} \\
S = 9.1\text{ y.r}
\]

(b) \(C.V. = \frac{5.3}{21.3} \times 100\% = 24.9\%

The Westbound data shows more variation since its coefficient of variation is larger.

11. 15, 19, 20, 20, 20, 21, 22, 22, 22, 23, 23, 23, 24, 25, 25, 25, 28, 28, 29, 29, 30, 30, 40

\(n = 25\)

A) **5-Number Summary**

\[
\begin{align*}
\text{min} &= 15 \\
P_{25} &= Q_1 = 22 \\
\text{median} &= P_{50} = Q_2 = 23 \\
P_{75} &= Q_3 = 28 \\
\text{max} &= 40
\end{align*}
\]

\[
\begin{align*}
L &= .25(25) = 6.25 \rightarrow 7^{th}\text{ position} \\
L &= .5(25) = 12.5 \rightarrow 13^{th}\text{ position} \\
L &= .75(25) = 18.75 \rightarrow 19^{th}\text{ position}
\end{align*}
\]

Box plot

\[
\begin{align*}
b) & \quad P_{25} = \boxed{29}\text{ thousands of dollars} \\
c) & \quad P_{40} = \boxed{23}\text{ thousands of dollars} \\
d) & \quad \text{Percentile of 24} = \frac{24}{25} \times 100 = 96\% \quad \boxed{P_{96}} = 24\text{ thousands of dollars}
\end{align*}
\]
12. **Management Test**

\[ \bar{x} = 80 \]
\[ s = 12 \]
\[ \text{score} = 72 \]

**Z-scores**

\[ z = \frac{72 - 80}{12} \]
\[ z = -0.67 \]

**Production Test**

\[ \bar{x} = 20 \]
\[ s = 5 \]
\[ \text{score} = 19 \]

\[ z = \frac{19 - 20}{5} \]
\[ z = -0.20 \]

The 2-score for the employee is greater than the manager's, so the employee did relatively better.