Topic 1 Problems

Problem 1
(a) A non-numerical version of the Question:

Do either Wal-Mart or the consumer group appear to be correct in their claims about the percentage of Wal-Mart stores in the U.S. which generate at least 20% of sales revenue from foreign-made goods?

Step 1 What percentage of all 6400 Wal-Mart stores in the U.S. generate at least 20% of sales revenue from foreign-made goods?

Step 2 Population = all 6400 Wal-Mart stores in the U.S.

Step 3 Sample = the 40 Wal-Mart stores randomly selected by the auditing company.

Step 4 Variable = a Yes/No answer to whether or not a particular Wal-Mart store generates at least 20% of sales revenue from foreign-made goods.

Step 5 Exactly $13/40 = 0.325$ or 32.5% of the 40 stores audited generate at least 20% of sales revenue from foreign-made goods.

Step 6 Approximately 32.5% of all 6400 Wal-Mart stores in the U.S. generate at least 20% of sales revenue from foreign-made goods.

(b) Neither Wal-Mart nor the consumer group appears to be correct in its claim, since the estimated 32.5% of stores which generate at least 20% of sales revenue from foreign-made goods is greater than 10% (so Wal-Mart is incorrect) but less than 50% (so the consumer group is also incorrect.)

Problem 2
(a) (A1)

(b) (A1)

(c) Variable 1 = price of diesel, in dollars

Variable 2 = price of regular gas, in dollars

(d) (A3)
Problem 3

(a) (A1)

(b) (A5)

(c)  • The average price of regular gas at the five Iowa service stations whose prices for regular gas were recorded in the database is $3.638.

• The average price of diesel at the five Iowa service stations whose prices for diesel were recorded in the database is $3.688.

(d)  • The average price of regular gas on Sept. 30, 2011 at all Iowa service stations which sell both regular gas and diesel is approximately $3.638.

• The average price of diesel on Sept. 30, 2011 at all Iowa service stations which sell both regular gas and diesel is approximately $3.688.

Topic 2 Problems

1.

(a) $s_{Brown}^2 = 4$, $s_{Brown} = 2$

(b) $s_{Black}^2 = 16$, $s_{Black} = 4$

(c) Black

(d)

\[ s_{Brown} = 2 < 4 = s_{Black} \]

Or equivalently,

\[ s_{Brown}^2 = 4 < 16 = s_{Black}^2 \]

(e) Approximately 95% of all brown squirrels measure between 14 and 22 centimeters.

(f) Approximately 95% of all black squirrels measure between 10 and 26 centimeters.

(g) Black since the “95%-possible” lengths of black squirrels extend from a low of 10 to a high of 26 — a range of 16, greater than the range of 8 for brown squirrels.
2. 

(a) 

<table>
<thead>
<tr>
<th>Number of Exams</th>
<th>Frequency</th>
<th>Relative Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>5</td>
<td>0.25</td>
<td>25</td>
</tr>
<tr>
<td>1</td>
<td>9</td>
<td>0.45</td>
<td>45</td>
</tr>
<tr>
<td>2</td>
<td>6</td>
<td>0.30</td>
<td>30</td>
</tr>
</tbody>
</table>

(The histogram below is computer-generated with MINITAB but sketching a handwritten histogram is fine!)

(b) 0.30
(c) 0.70
(d) 0.30

3. 

(a) Using 32 categories would be too many so let’s group the measurements into 11 classes, each of width 3. (Other choices for number of classes are okay, too.)

<table>
<thead>
<tr>
<th>Class of Applications</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–2.9</td>
<td>14</td>
<td>28</td>
</tr>
<tr>
<td>3–5.9</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>6–8.9</td>
<td>9</td>
<td>18</td>
</tr>
<tr>
<td>9–11.9</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>12–14.9</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>15–17.9</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>18–20.9</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>21–23.9</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>24–26.9</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>27–29.9</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>30–32.9</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>50</td>
<td>100</td>
</tr>
</tbody>
</table>
(b) 36/50 = 0.72 or 72%

4.

(a)

- Stem = first 2 digits
- Leaf = 3rd digit (ones digit)

(b) There are two different ways to draw the stem plot. Both plots are equally valid. Which one you draw just depends on which one you think looks the best! (But in both plots the leaves are drawn in increasing order.)

- The first plot below shows the way we did it in class.

| 64 | 6 8 |
| 65 | 0 2 2 3 3 4 5 8 |
| 66 | 2 6 7 9 |
| 67 | 0 1 1 4 7 8 8 9 9 |
| 68 | 2 |

- In the second plot the stems are broken into two rows, with leaves in the respective ranges 0–4 and 5–10.

| 64 | 6 8 |
| 65 | 0 2 2 3 3 4 |
| 65 | 5 8 |
| 66 | 2 |
| 66 | 6 7 9 |
| 67 | 0 1 1 4 |
| 67 | 7 8 8 9 9 |
| 68 | 2 |
5.

(a) 

<table>
<thead>
<tr>
<th>Number of Skips</th>
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</thead>
<tbody>
<tr>
<td>0</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
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<tr>
<td>5</td>
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<td>6</td>
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<td>7</td>
</tr>
<tr>
<td>8</td>
</tr>
<tr>
<td>9</td>
</tr>
</tbody>
</table>

(b) The Bell Curve Rule would probably not provide an accurate description of the population of all school children since measurements of the variable $x = \text{Number of Skips}$ is not bell shaped!

These data are called skewed to the right (instead of bell-shaped) since several larger numbers are spread away from the main group.

(c) 21 skips

6.

- $\bar{x} = 5.8$
- $m = 5.5$

7.

(a) 7.786 (rounded to 3 places)
(b) 7.8
(c) The consumer is more likely to be interested in the maximum satisfaction rating — in this case, for Gateway.

8.

- $\bar{x} = 2$
- $s = 1.581$
9. 

(a) \( \bar{x} = 48.5 \quad s = 30.59 \)

(b) 

\[
\begin{align*}
\bar{x} \pm s &= 48.5 \pm 30.59 = (17.91, 79.09) \\
\bar{x} \pm 2s &= 48.5 \pm (2)(30.59) = (-12.68, 109.69) \\
\bar{x} \pm 3s &= 48.5 \pm (3)(30.59) = (-43.27, 140.27)
\end{align*}
\]

Therefore:

1. Bob checks out approximately 68% of all customers in between 17.91 and 79.09 seconds.
2. Bob checks out approximately 95% of all customers in less than 109.69 seconds.
3. Bob checks out almost all customers in less than 140.27 seconds.

(c) The negative checkout times implied by the Bell Curve Rule are, of course, impossible. So we should be suspicious as to whether or not Bob’s times really are bell-shaped!

10. 

(a) \( \bar{x} = 6.26 \quad s = 4.19 \)

(b) 

\[
\begin{align*}
\bar{x} \pm s &= 6.26 \pm 4.19 = (2.07, 10.45) \\
\bar{x} \pm 2s &= 6.26 \pm (2)(4.19) = (-2.12, 14.64) \\
\bar{x} \pm 3s &= 6.26 \pm (3)(4.19) = (-6.31, 18.83)
\end{align*}
\]

Therefore (negative inflation is known as deflation):

1. In approximately 68% of all years the inflation rate varies between 2.07% and 10.45%.
2. In approximately 95% of all years the inflation rate varies between −2.12% and 14.64%.
3. In almost all years the inflation rate varies between −6.31% and 18.83%.

11. 

(a) 2.5%

(b) 84%

**Tip for Problem 11:**

- Draw a bell curve similar to the one on page 55 in the Notebook, except replace the Greek letter “mu” (\( \mu \)) with the number \( 75 \) at the bottom center of the bell. (The bottom of a bell curve is just an ordinary number line!)

- Use the Bell Curve Rule to divide the bell into six parts. Calculate the percentage of measurements in each part. (The percentages add to 100%.)

- Come to office hours (in Shaeffer Hall or one of the two tutor labs) for assistance.