Solution for Section 1.2
Due Feb 08, 07

6. \( \{X_i\} = \{50,50,50,50,\ldots\} \), so the sample mean is \( \overline{X} = 50 \)

   Let \( \overline{Y} \) be the affective mean

   Then, \( \overline{Y} = a + b \overline{X} \) where \( a = 50, b = 1 \)

   Thus, \( \overline{Y} = 50 + \overline{X} \), That means the mean increase by $50.

   The standard deviation: \( SD_Y = |b| \cdot SD_X \)

   Thus, \( SD_Y = SD_X \), That means the standard deviation is unchanged.

8. a) The sample mean Apgar score:

   \[
   \overline{X} = \frac{1}{N} \sum_{i=1}^{n} X_i \cdot f_i , \text{ where } N = \text{total number of the babies}
   \]

   Then, \( \overline{X} = \frac{1}{1000} \sum_{i=1}^{11} X_i \cdot f_i \)

   \[
   = \frac{1}{1000} \left( 0 \cdot 1 + 1 \cdot 3 + 2 \cdot 2 + 3 \cdot 4 + 4 \cdot 25 + 5 \cdot 35 + 6 \cdot 198 + 7 \cdot 367 + 8 \cdot 216 + 9 \cdot 131 + 10 \cdot 18 \right)
   \]

   \[
   = \frac{1}{1000} \left( 0 + 3 + 4 + 12 + 100 + 175 + 1188 + 2569 + 1728 + 1179 + 180 \right)
   \]

   \[
   = \frac{1}{1000} (7138) = 7.138 \quad \overline{X} = 7.138
   \]

b) The sample standard deviation of the Apgar score:

   \[
   SD = \sqrt{\frac{1}{N-1} \sum_{i=1}^{n} f_i (X_i - \overline{X})^2} = \sqrt{\frac{1}{999} \cdot 1716.956} = 1.31
   \]

<table>
<thead>
<tr>
<th>Score: ( X_i )</th>
<th>Number of Babies; ( f_i )</th>
<th>( X_i \cdot f_i )</th>
<th>( f_i \cdot (X_i - \overline{X})^2 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>0</td>
<td>50.951044</td>
</tr>
<tr>
<td>1</td>
<td>3</td>
<td>3</td>
<td>113.025132</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>4</td>
<td>52.798088</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>12</td>
<td>68.492176</td>
</tr>
<tr>
<td>4</td>
<td>25</td>
<td>100</td>
<td>246.1761</td>
</tr>
<tr>
<td>5</td>
<td>35</td>
<td>175</td>
<td>159.98654</td>
</tr>
<tr>
<td>6</td>
<td>198</td>
<td>1188</td>
<td>256.418712</td>
</tr>
<tr>
<td>7</td>
<td>367</td>
<td>2569</td>
<td>6.989148</td>
</tr>
<tr>
<td>8</td>
<td>216</td>
<td>1728</td>
<td>160.497504</td>
</tr>
</tbody>
</table>
c) The sample median is the average of the 500th and 501st value when arranged in order. Both these values are equal to 7, so the median is 7.

16. a) Seems certain to be an error.
   b) Could be correct.

Solution for Section 1.3

Due Feb 08, 07

4. a) Construct a histogram for the results of each method.
b) Construct comparative box plots for the two methods.

c) Using the box plots, what differences can be seen between the results of the two methods.
   The results of Method 1 are on the whole lower than the results of Method 2. Also Method 1 produces results that are distributed somewhat symmetrically, while the results of Method 2 are somewhat skewed to the right, which can be seen from the median being closer to the first quartile than the third. The results of Method 2 are more spread out than those of Method 1 as well.

6 a) The mean is greater than the median.
   The histogram should be skewed to the right. Here is an example.
b) The mean is less than the median
   The histogram should be skewed to the left. Here is an example.

   ![Histogram of Mean > Median](image)

   ![Histogram of Mean < Median](image)

   c) The mean is approximately equal to the median
      The histogram should be symmetric. Here is an example.
12. a) (4) Mean > Median
   b) (2) Mean < Median, and has an outlier.
   c) (1) Mean < Median
   d) (3) Mean = Median

Solution for Section 2.1

Due Feb 08, 07

2. (a) \{1, 2, 3, 4\}

   (b) \(P(\text{even number}) = P(2) + P(4) = \frac{3}{8} + \frac{1}{8} = \frac{1}{2}\)

   (c) No, the set of possible outcomes is still \{1, 2, 3, 4\}.

   (d) Yes, a list of equally likely outcomes is then \{1, 1, 2, 2, 3, 3, 4, 4\}, so \(P(\text{even}) = P(2) + P(4) = \frac{3}{9} + \frac{2}{9} = \frac{5}{9}\).

4. (a) False

   (b) True

   (c) True. This is the definition of probability.

6. \[
P(A \cup B) = P(A) + P(B) - P(A \cap B)
\]
   \[
= 0.95 + 0.90 - 0.88
\]
   \[
= 0.97
\]
8. (a) \( P(O) = 1 - P(\text{not } O) \)
   \[= 1 - (P(A) + P(B) + P(AB)) \]
   \[= 1 - (0.35 + 0.10 + 0.05) \]
   \[= 0.50 \]

(b) \( P(\text{does not contain } B) = 1 - P(\text{contains } B) \)
   \[= 1 - (P(B) + P(AB)) \]
   \[= 1 - (0.10 + 0.05) \]
   \[= 0.85 \]