

Chapter 2 Homework Solutions

Section 2.1

1. Range = $12.7 - 3.9 = 8.8$. Class width = $8.8/9 = 0.98$ which we round up to 1.

| |
|-------------|
| 3.9 – 4.8 |
| 4.9 – 5.8 |
| 5.9 – 6.8 |
| 6.9 – 7.8 |
| 7.9 – 8.8 |
| 8.9 – 9.8 |
| 9.9 – 10.8 |
| 10.9 – 11.8 |
| 11.9 – 12.8 |

The class boundaries are: 3.85, 4.85, 5.85, 6.85, 7.85, 8.85, 9.85, 10.85, 11.85, 12.85

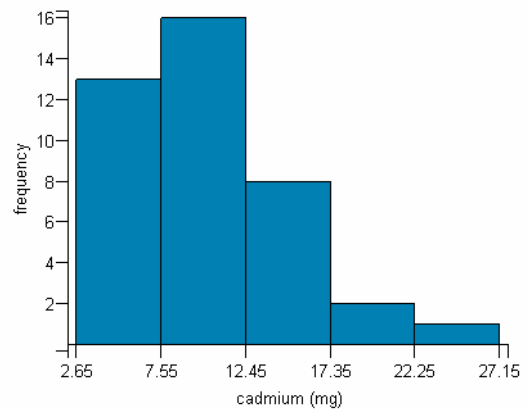
3. Range = $3305 - 1024 = 2281$. Class width = $2281/6 = 380.2$ which we round up to 381.

| |
|-------------|
| 1024 – 1404 |
| 1405 – 1785 |
| 1786 – 2166 |
| 2167 – 2547 |
| 2548 – 2928 |
| 2929 – 3309 |

The class boundaries are: 1023.5, 1404.5, 1785.5, 2166.5, 2547.5, 2928.5, 3309.5.

5. The frequency table is:

| | | | |
|----------|------|-------------|-----------|
| Min: | 2.7 | Class | Frequency |
| Max: | 27 | 2.7 - 7.5 | 13 |
| Range: | 24.3 | 7.6 - 12.4 | 16 |
| Classes: | 5 | 12.5 - 17.3 | 8 |
| Width: | 4.86 | 17.4 - 22.2 | 2 |
| Rounded: | 4.9 | 22.3 - 27.1 | 1 |

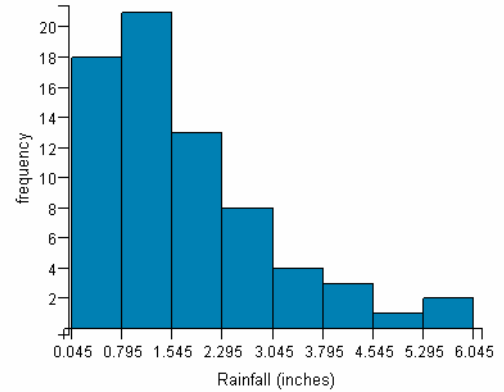


The class boundaries are: 2.65, 7.55, 12.45, 17.35, 22.25, 27.15.

The distribution is skewed to the right.

7. The frequency table is:

| Min: | 0.05 | Class | Freq. |
|----------|--------|-------------|-------|
| Max: | 6 | 0.05 - 0.79 | 18 |
| Range: | 5.95 | 0.80 - 1.54 | 21 |
| Classes: | 8 | 1.55 - 2.29 | 13 |
| Width: | 0.7438 | 2.30 - 3.04 | 8 |
| Rounded: | 0.75 | 3.05 - 3.79 | 4 |
| | | 3.80 - 4.54 | 3 |
| | | 4.55 - 5.29 | 1 |
| | | 5.30 - 6.04 | 2 |

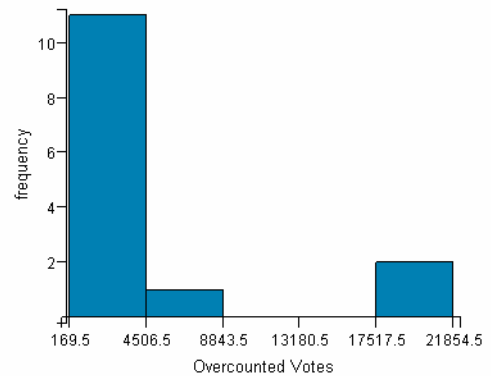


The class boundaries are: 0.045, 0.795, 1.545, 2.295, 3.045, 3.795, 4.545, 5.295, 6.045.

The distribution is skewed to the right.

9. The frequency table is:

| Min: | 170 | Class | Freq. |
|----------|-------|---------------|-------|
| Max: | 21855 | 170 - 4506 | 11 |
| Range: | 21685 | 4507 - 8843 | 1 |
| Classes: | 5 | 8844 - 13180 | 0 |
| Width: | 4337 | 13181 - 17517 | 0 |
| | | 17518 - 21854 | 2 |

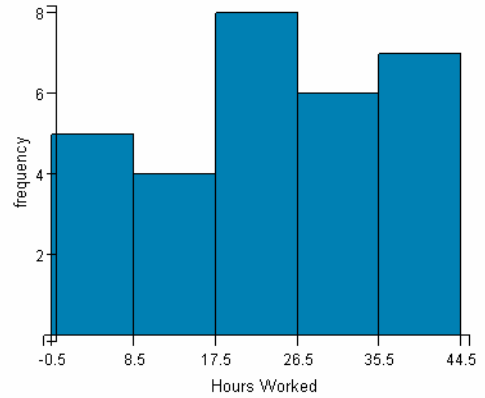


The class boundaries are: 169.5, 4506.5, 8843.5, 13180.5, 17517.5, 21854.5.

The distribution is skewed to the right.

11. The frequency table is:

| | | Class | Freq. |
|----------|----|---------|-------|
| Min: | 0 | 0 - 8 | 5 |
| Max: | 40 | 9 - 17 | 4 |
| Range: | 40 | 18 - 26 | 8 |
| Classes: | 5 | 27 - 35 | 6 |
| Width: | 9 | 36 - 44 | 7 |



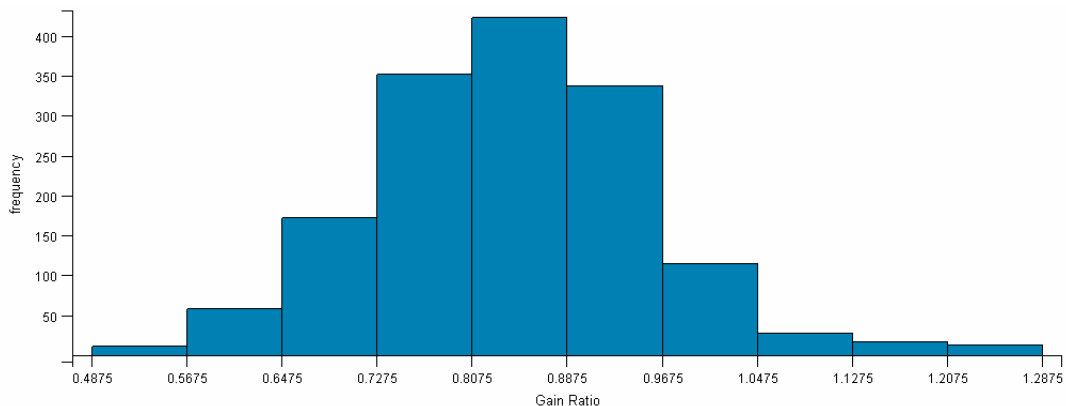
The class boundaries are: -0.5, 8.5, 17.5, 26.5, 35.5, 44.5.

The distribution is multimodal, but very roughly uniform.

13. The frequency table is:

| | | Class | Freq. |
|----------|--------|---------------|-------|
| Min: | 0.488 | 0.488 - 0.567 | 12 |
| Max: | 1.280 | 0.568 - 0.647 | 59 |
| Range: | 0.792 | 0.648 - 0.727 | 172 |
| Classes: | 10.000 | 0.728 - 0.807 | 348 |
| Width: | 0.079 | 0.808 - 0.887 | 425 |
| Rounded: | 0.080 | 0.888 - 0.967 | 342 |
| | | 0.968 - 1.047 | 116 |
| | | 1.048 - 1.127 | 28 |
| | | 1.128 - 1.207 | 17 |
| | | 1.208 - 1.287 | 13 |

The class boundaries are: 0.4875, 0.5675, 0.6475, 0.7275, 0.8075, 0.8875, 0.9675, 1.0475, 1.1275, 1.2075, 1.2875.



The distribution is roughly symmetric and bell shaped or normal.

Section 2.2 Solutions

1.

| | |
|----------|-----|
| n | 5 |
| mode | 5 |
| median | 5 |
| midrange | 8.5 |
| mean | 7.6 |

3.

| | |
|----------|-------------|
| n | 17 |
| mode | No Mode |
| median | 84.73 |
| midrange | 79.81 |
| mean | 82.80647059 |

5.

| | |
|----------|-------------------------------------|
| n | 40 |
| mode | Multi Modes: 4.5, 5.1, 5.5, 13.1 |
| median | 9.2 |
| midrange | 14.85 |
| mean | 10.0325 |

7.

| | |
|----------|-------------------------|
| n | 70 |
| mode | Bimodal: 0.8 and 0.9 |
| median | 1.375 |
| midrange | 3.025 |
| mean | 1.702142857 |

9.

| | |
|----------|---------|
| n | 15 |
| mode | No Mode |
| median | 2124 |
| midrange | 11012.5 |
| mean | 5654.8 |

11.

| | |
|----------|------|
| n | 30 |
| mode | 40 |
| median | 25 |
| midrange | 20 |
| mean | 23.7 |

13.

| | |
|----------|---|
| n | 1532 |
| mode | The sample size is so large we use the histogram from section 2.1, #13. The class with the highest bar is 0.808 to 0.887. We will use the midpoint of this class for the mode, which is 0.8475. |
| median | 0.838 |
| midrange | 0.884 |
| mean | 0.8395953 |

15.

| Class | $f =$ Frequency | $x =$ Midpoint | fx |
|-------------|--------------------|-------------------|--------|
| 12.0 – 16.9 | 2 | 14.45 | 28.9 |
| 17.0 – 21.9 | 0 | 19.45 | 0 |
| 22.0 – 26.9 | 7 | 24.45 | 171.15 |
| 27.0 – 31.9 | 8 | 29.45 | 235.6 |
| 32.0 – 36.9 | 4 | 34.45 | 137.8 |
| 37.0 – 41.9 | 3 | 39.45 | 118.35 |
| 42.0 – 46.9 | 1 | 44.45 | 44.45 |
| | 25 | | 736.25 |

Here, we use $\bar{x} \approx \frac{\sum f \cdot x}{n} = \frac{\sum f \cdot x}{\sum f} = \frac{736.25}{25} = 29.45$

Section 2.3 Solutions

1.

| | |
|-----------------|-------------|
| Range: | 13 |
| Std. Dev. | 5.272570531 |
| Variance: | 27.8 |
| Lower Quartile: | 3.5 |
| Upper Quartile: | 13 |
| IQR | 9.5 |

3.

| | |
|-----------------|-------------|
| Range: | 35.5 |
| Std. Dev. | 11.09078781 |
| Variance: | 123.0055743 |
| Lower Quartile: | 73.905 |
| Upper Quartile: | 91.835 |
| IQR | 17.93 |

5.

| | |
|-----------------|-------------|
| Range: | 24.3 |
| Std. Dev. | 4.987234345 |
| Variance: | 24.87250641 |
| Lower Quartile: | 6.05 |
| Upper Quartile: | 12.9 |
| IQR | 6.85 |

7.

| | |
|-----------------|-------------|
| Range: | 5.95 |
| Std. Dev. | 1.313615315 |
| Variance: | 1.725585197 |
| Lower Quartile: | 0.79 |
| Upper Quartile: | 2.35 |
| IQR | 1.56 |

9.

| | |
|-----------------|-------------|
| Range: | 10104 |
| Std. Dev. | 7530.650619 |
| Variance: | 56710698.74 |
| Lower Quartile: | 890 |
| Upper Quartile: | 7826 |
| IQR | 6936 |

11.

| | |
|-----------------|-------------|
| Range: | 40 |
| Std. Dev. | 13.76439685 |
| Variance: | 189.4586207 |
| Lower Quartile: | 16 |
| Upper Quartile: | 35 |
| IQR | 19 |

13.

| | |
|-----------------|-------------|
| Range: | 0.792 |
| Std. Dev. | 0.117722945 |
| Variance: | 0.013858692 |
| Lower Quartile: | 0.835 |
| Upper Quartile: | 0.8415 |
| IQR | 0.0065 |

15.

| Class | $f =$ Frequency | $x =$ Midpoint | fx | fx^2 |
|-------------|--------------------|-------------------|--------|-----------|
| 12.0 – 16.9 | 2 | 14.45 | 28.9 | 417.605 |
| 17.0 – 21.9 | 0 | 19.45 | 0 | 0 |
| 22.0 – 26.9 | 7 | 24.45 | 171.15 | 4184.6175 |
| 27.0 – 31.9 | 8 | 29.45 | 235.6 | 6938.42 |
| 32.0 – 36.9 | 4 | 34.45 | 137.8 | 4747.21 |
| 37.0 – 41.9 | 3 | 39.45 | 118.35 | 4668.9075 |
| 42.0 – 46.9 | 1 | 44.45 | 44.45 | 1975.8025 |
| | 25 | | 736.25 | 22932.563 |

$$s \approx \sqrt{\frac{\sum f \cdot x^2 - \frac{1}{n} (\sum f \cdot x)^2}{n-1}} = \sqrt{\frac{22932.563 - \frac{1}{25} (736.25)^2}{25-1}} = \sqrt{\frac{1250}{24}} = \sqrt{52.083333} = 7.22$$

The variance is $s^2 = 52.083333 \approx 52.08$

Section 2.4 Homework Solutions

1. Percentile for 11 = $\frac{3}{5} \cdot 100 = 60^{\text{th}}$ $z\text{-score} = \frac{x - \bar{x}}{s} = \frac{11 - 7.6}{5.27} = 0.65.$

This is not unusual.

3. Percentile for 96.18 = $\frac{15}{17} \cdot 100 = 88^{\text{th}}$ $z\text{-score} = \frac{x - \bar{x}}{s} = \frac{96.18 - 82.81}{11.09} = 1.21.$ This is not unusual.

5. Percentile for 21 = $\frac{39}{40} \cdot 100 = 97.5^{\text{th}}$ $z\text{-score} = \frac{x - \bar{x}}{s} = \frac{21 - 10.03}{4.99} = 2.20.$

This is unusual.

7. Percentile for 4.61 = $\frac{67}{70} \cdot 100 = 95.7^{\text{th}}$ $z\text{-score} = \frac{x - \bar{x}}{s} = \frac{4.61 - 1.702}{1.314} = 2.21.$

This is unusual.

9. Percentile for 520 = $\frac{1}{15} \cdot 100 = 6.7^{\text{th}}$ $z\text{-score} = \frac{x - \bar{x}}{s} = \frac{520 - 5654.8}{7530.65} = -0.68.$ This is not unusual.

11. Percentile for 40 = $\frac{23}{30} \cdot 100 = 76.7^{\text{th}}$ $z\text{-score} = \frac{x - \bar{x}}{s} = \frac{40 - 23.7}{13.8} = 1.18.$

This is not unusual.

13. Percentile for 0.520 = $\frac{3}{1533} \cdot 100 = 0.02^{\text{th}}$ $z\text{-score} = \frac{x - \bar{x}}{s} = \frac{0.520 - 0.8396}{0.1177} = -2.71.$

This is unusual.