Section 2-3

Histograms

VISUALIZING DATA
In this section, we will learn how to visualize data with a histogram. The goal is not simply to construct the graphs – but rather to learn something about the data and understand the nature of their distributions.

HISTOGRAMS
A histogram is a graph consisting of bars of equal width drawn adjacent to each other (unless there are gaps in the data). The horizontal scale represents classes of quantitative data values and the vertical scale represents frequencies. The heights of the bars correspond to the frequency values.

QWERTY WORD RATING

<table>
<thead>
<tr>
<th>Rating</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 2</td>
<td>20</td>
</tr>
<tr>
<td>3 - 5</td>
<td>14</td>
</tr>
<tr>
<td>6 - 8</td>
<td>15</td>
</tr>
<tr>
<td>9 - 11</td>
<td>2</td>
</tr>
<tr>
<td>12 - 14</td>
<td>1</td>
</tr>
</tbody>
</table>

QWERTY WORD RATING RELATIVE FREQUENCY HISTOGRAM

<table>
<thead>
<tr>
<th>Rating</th>
<th>Relative Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 2</td>
<td>38.5%</td>
</tr>
<tr>
<td>3 - 5</td>
<td>26.9%</td>
</tr>
<tr>
<td>6 - 8</td>
<td>28.8%</td>
</tr>
<tr>
<td>9 - 11</td>
<td>3.8%</td>
</tr>
<tr>
<td>12 - 14</td>
<td>1.9%</td>
</tr>
</tbody>
</table>
DRAWING A FREQUENCY HISTOGRAM FROM RAW DATA ON THE TI-83/84

1. Press STAT; select 1:Edit…
2. Enter your data values in L1. (Note: You could enter them in a different list.)
3. Press WINDOW. Set Xmin to the lower class boundary of the first class; set Xmax to the upper class boundary of the last class; and set Xscl to the class width. (Note: You may need to set Ymin and Ymax to see the histogram.)
5. Turn the plot ON. For Type, select the histogram (last one on first row).
6. For Xlist, enter L1 by pressing 2ND, 1.
7. For Freq, enter the number 1.
8. Press GRAPH.

DRAWING A FREQUENCY HISTOGRAM FROM A FREQUENCY DISTRIBUTION ON THE TI-83/84

1. Compute the midpoint of each class.
2. Press STAT; select 1:Edit…
3. Enter the midpoints in L1 and the frequency for the class in L2.
4. Press WINDOW. Set Xmin to the lower class boundary of the first class; set Xmax to the upper class boundary of the last class; and set Xscl to the class width. (Note: You may need to set Ymin and Ymax to see the histogram.)
6. Turn the plot ON. For Type, select the histogram (last one on first row).
7. For Xlist, enter L1 by pressing 2ND, 1.
8. For Freq, enter L2 by pressing 2ND, 2.
9. Press GRAPH.

CRITICALLY THINKING: INTERPRETING HISTOGRAMS

One key characteristic of a normal distribution is that it has a “bell” shape. The histogram below illustrates this.

![Normal Distribution](image)

COMMON DISTRIBUTION SHAPES

In addition to the bell-shaped (normal distribution), there are some other common distribution shapes:
- Uniform
- Skewed to the right
- Skewed to the left

BELL-SHAPED (NORMAL) DISTRIBUTION

In a bell-shaped (normal) distribution, (1) the frequencies increase to a maximum and then decrease, and (2) the graph has symmetry, with the left half of the histogram being roughly a mirror image of the right half.

![Normal Distribution](image)

UNIFORM DISTRIBUTION

With a uniform distribution, the different possible values occur with approximately the same frequency, so the heights of the bars on the histogram are approximately uniform.

![Uniform Distribution](image)
SKEWED TO THE RIGHT

Data skewed to the right (also called positively skewed) have a long right tail.

SKEWED TO THE LEFT

Data skewed to the left (also called negatively skewed) have a long left tail.