Definitions: (13.3 Organizing Data)

**Piece of data:** a single response to an experiment.

**Frequency distribution:** a listing of the observed values and the corresponding frequency of occurrence of each value.

**Lower class limits:** the smallest values that can belong to each of the classes in a frequency distribution (when the data is grouped).

**Upper class limits:** the largest values that can belong to each of the classes in a frequency distribution (when the data is grouped).
Class width: the difference between two successive lower class limits.

Modal class: the class with the greatest frequency.

Class marks: the midpoints of the classes.

Ascending order: from smallest to largest

Descending order: from largest to smallest
Rules for Data Grouped by Class:

1. The classes should be of the same width.

2. The classes should not overlap.

3. Each piece of data should belong to only one class.

(Usually use 5-20 classes)
p. 676 #24 Use the following data which represent the 1997 population of the world’s largest cities, in millions of people (rounded to the nearest 100,000).

27.5 13.8 11.5 10.3 9.5 7.0 6.4
17.3 12.7 11.5 10.1 9.3 7.0 6.3
17.0 12.3 10.6 9.9 9.1 6.9 6.0
16.5 12.1 10.6 9.7 8.5 6.8 6.0
16.3 11.9 10.5 9.6 7.6 6.5 5.4

\[
\text{smallest} = 5.4; \text{largest} = 27.5 \\
\text{range} = \text{largest} - \text{smallest} \\
= 27.5 - 5.4 = 22.1
\]

I want about 5 classes

\[
\frac{\text{range}}{\text{no. of classes}} = \frac{22.1}{5} \approx 4.42 \quad \text{(about how many possible values in each class)}
\]

5 is close to 4.42 and "nicer"
A frequency distribution for this data is:

<table>
<thead>
<tr>
<th>Class limits</th>
<th>Frequencies</th>
<th>Class marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.4-10.3</td>
<td>20</td>
<td>7.85</td>
</tr>
<tr>
<td>10.4-15.3</td>
<td>10</td>
<td>12.85</td>
</tr>
<tr>
<td>15.4-20.3</td>
<td>4</td>
<td>17.85</td>
</tr>
<tr>
<td>20.4-25.3</td>
<td>0</td>
<td>22.85</td>
</tr>
<tr>
<td>25.4-30.3</td>
<td>1</td>
<td>27.85</td>
</tr>
</tbody>
</table>

Lower class limits: 5.4, 10.4, 15.4, 20.4, 25.4

Upper class limits: 10.3, 15.3, 20.3, 25.3, 30.3

Class width: 5

Class marks: 7.85, 12.85, 17.85, 22.85, 27.85

(midpoints)

\[
\frac{5.4+10.3}{2} = \frac{15.7}{2} = 7.85
\]
Histograms and frequency polygons are graphs with observed values on the horizontal scale and frequencies on the vertical scale.
For previous problem:

Histogram:
(Vertical axis must start at 0)

Frequency polygon:

Population in millions:

7.85 12.85 17.85 22.85 27.85

Population in millions:

7.85 12.85 17.85 22.85 27.85
#18. Use the histogram below to answer the following questions.

(histograph given)

Monthly rent for students

Number of Students

```
Total = sum of frequencies
      = 2 + 4 + 6 + 8 + 7 + 3 + 1 = 31
```
a.) How many students were surveyed? 31
b.) What are the lower and upper class limits of the first and second classes?
c.) How many students have a monthly rent in the class with a class mark of $352? 6
(d.) What is the class mark of the modal class? (largest f) 403
e.) Construct a frequency distribution from this histogram. Use a first class of 225 – 275.

b.) 1st class class mark = 250
class width 51 (center of 51 scores)

250

class limits (250-25, 250+25)
(225, 275) 1st class
(276, 326) 2nd class
A stem-and-leaf display is a tool that organizes and groups the data while allowing us to see the actual values that make up the data.

#24. Distance to Work. Twenty workers at a small company were asked how many miles they drive to work, one way. The responses are as follows. Construct a stem-and-leaf display. For single-digit data, use a stem of 0.

```
| 12 | 13 | 15 | 18 |
| 19 | 22 |
```

0 | 2 3 5 8 \\
1 |
2 | 1 2 3 5 7 \\
3 | 3 4 \\
4 | 1
#10. (Reading from a circle graph)

Online Households worldwide: 66.6 million

Estimate the number of households on line in each region from the circle graph.

<table>
<thead>
<tr>
<th>Region</th>
<th>Percent</th>
<th>Number of Households</th>
</tr>
</thead>
<tbody>
<tr>
<td>North America</td>
<td>57% = .57</td>
<td>.57 x 66.6 = 37.962 million</td>
</tr>
<tr>
<td>Europe</td>
<td>25% = .25</td>
<td>.25 x 66.6 = 16.65 million</td>
</tr>
<tr>
<td>Asia/Pacific</td>
<td>15% = .15</td>
<td>.15 x 66.6 = 9.99 million</td>
</tr>
<tr>
<td>Other</td>
<td>3% = .03</td>
<td>.03 x 66.6 = 1.998 million</td>
</tr>
</tbody>
</table>

Homeworks: Sections 13.3, 13.4