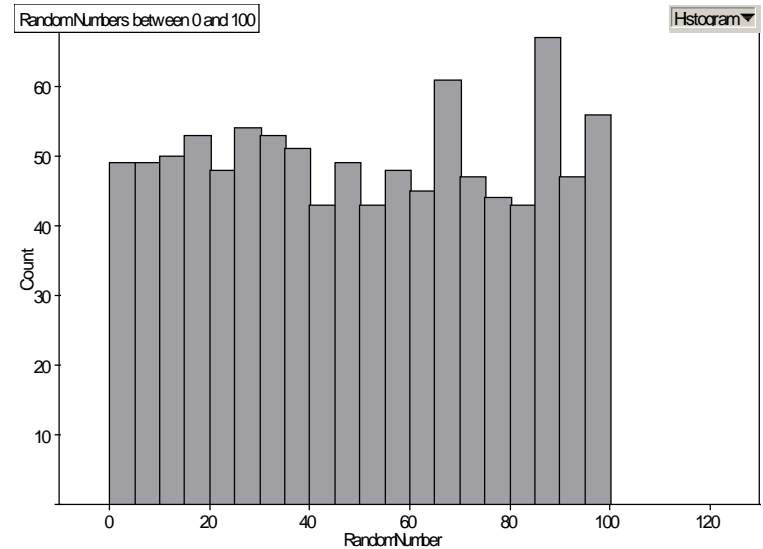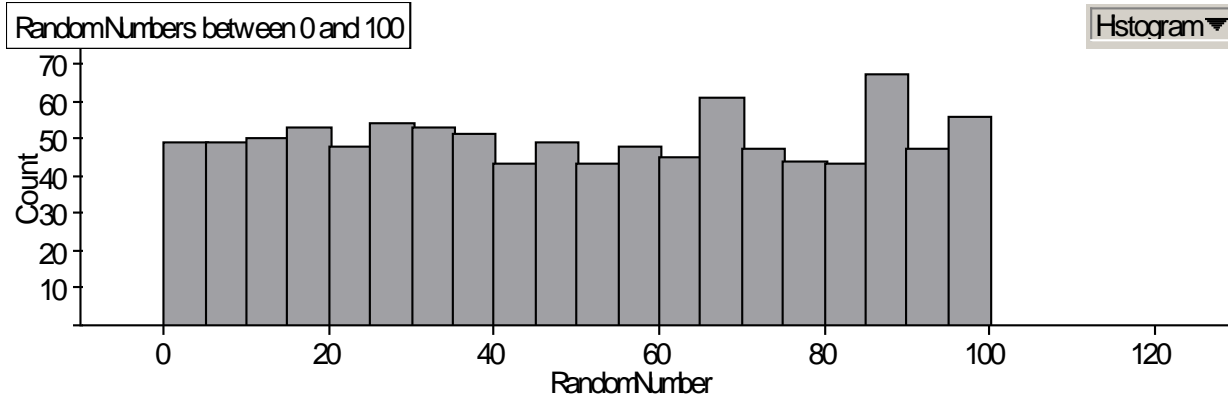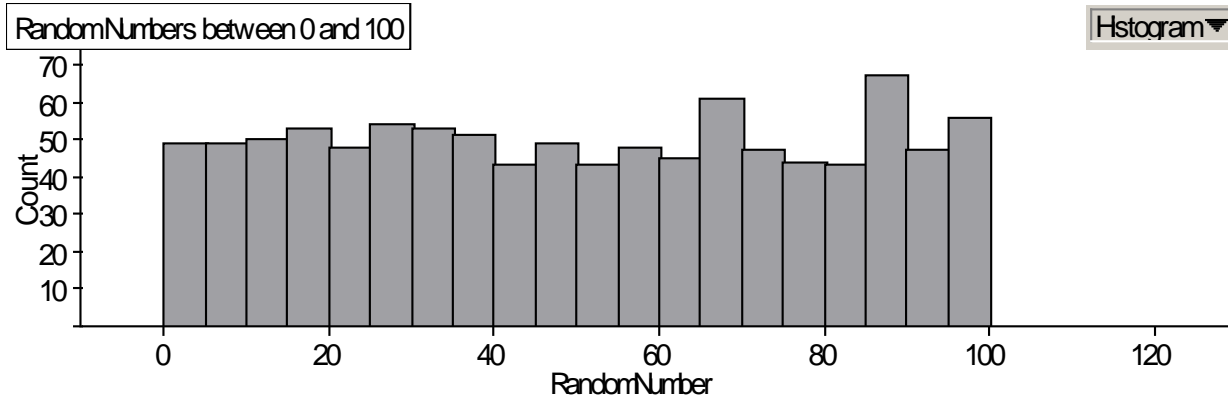# Misleading Graphs

# Misleading Graphs

- What makes a graph meaningful?
- What makes a graph misleading?

# Examine the graphs below.

# Examine the graphs below.



Random Numbers between 0 and 100 — Histogram

- Are they similar?
  Are they different?



Random Numbers between 0 and 100 — Histogram
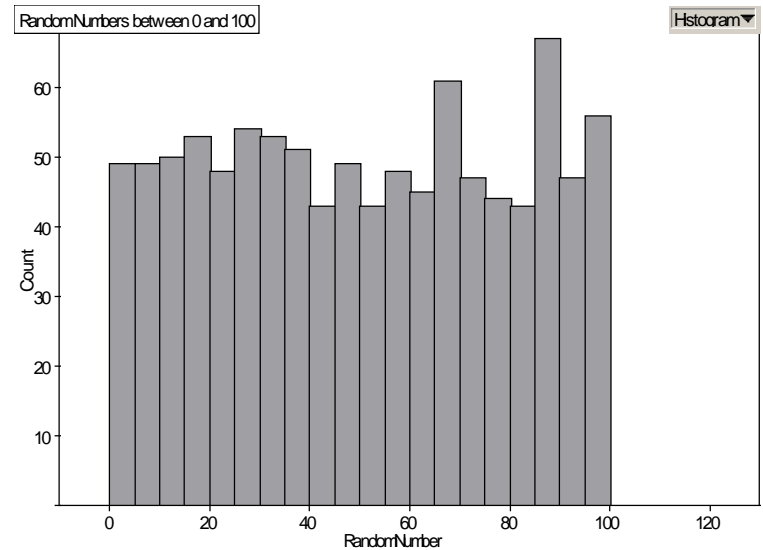
# Examine the graphs below.
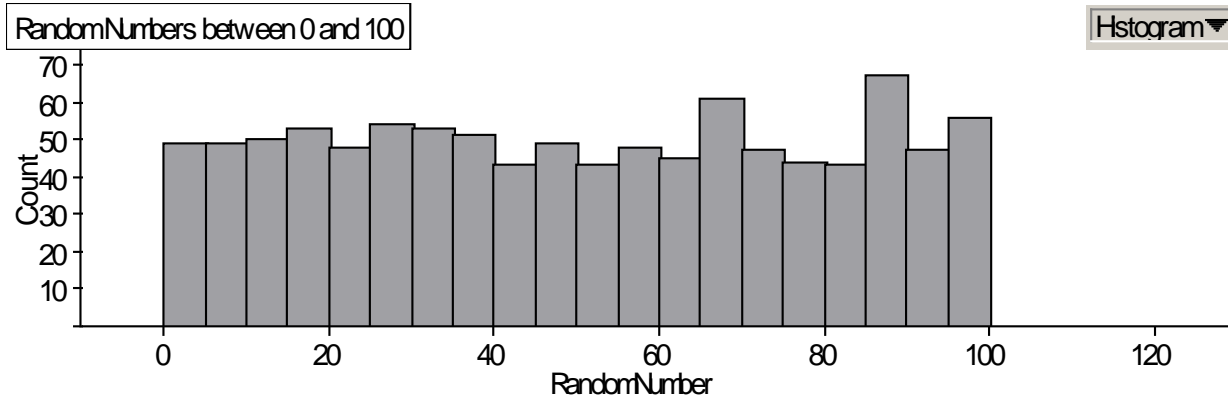


- These are the same graph!

# Examine the graphs below.


Random Numbers between 0 and 100
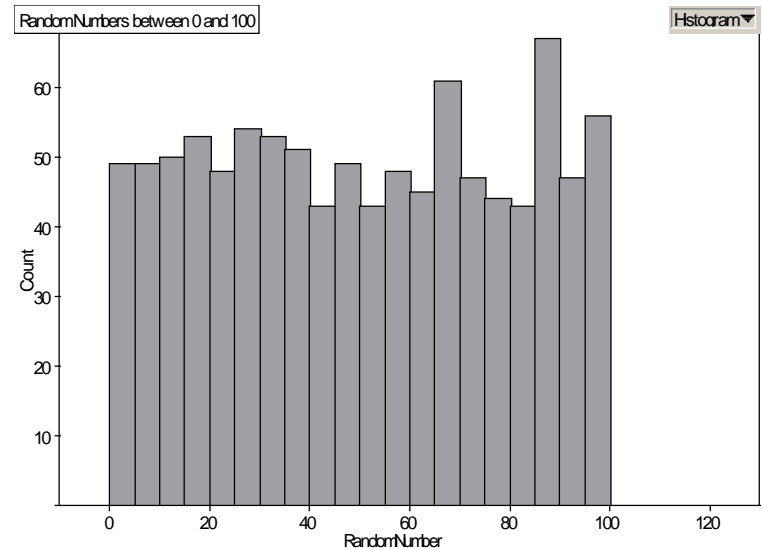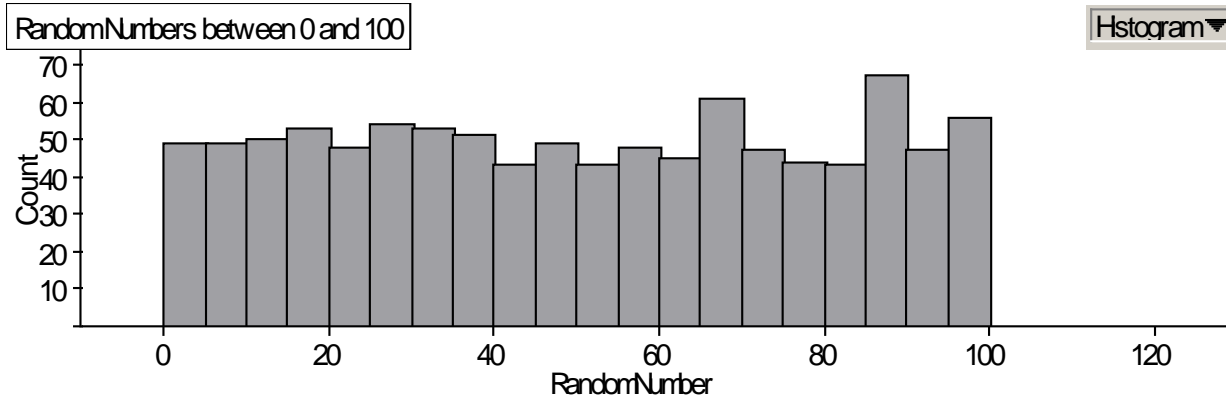
- **These are the same graph!**
  - **The graph above has been stretched horizontally.**


Random Numbers between 0 and 100

# Examine the graphs below.

Random Numbers between 0 and 100

Histogram ▼
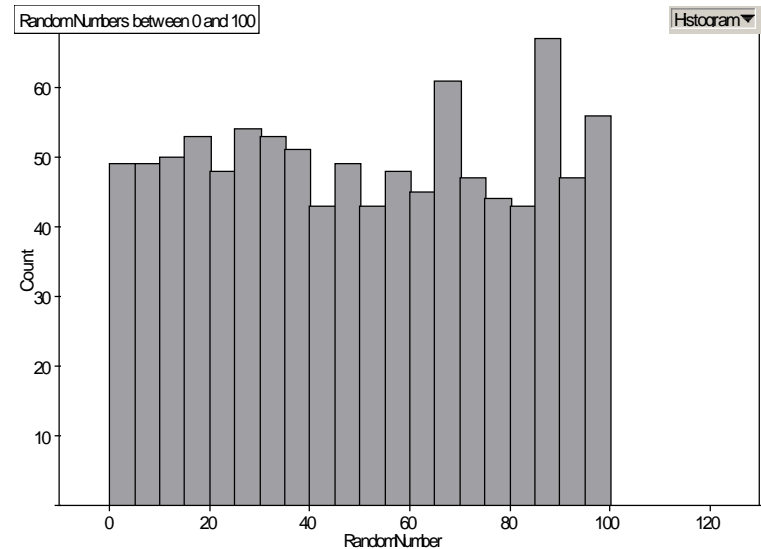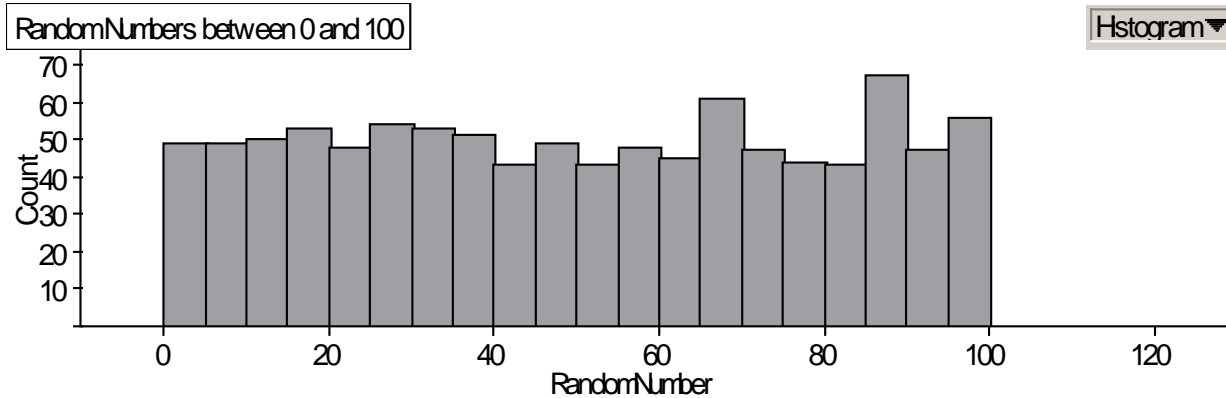


- **These are the same graph!**
  - **The graph to the right has been compressed horizontally.**

Random Numbers between 0 and 100

Histogram ▼

# Examine the graphs below.

Random Numbers between 0 and 100 — Histogram ▼
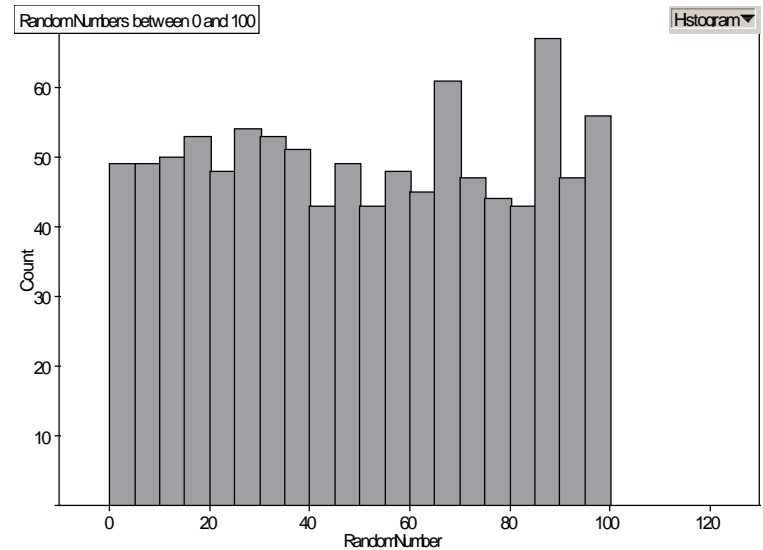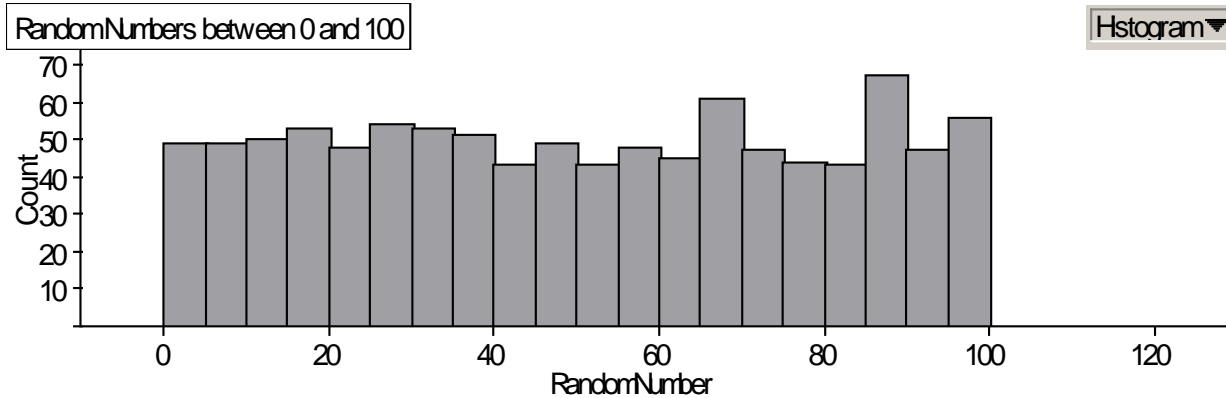


- **These are the same graph!**
  - **The graph above has been compressed vertically.**

Random Numbers between 0 and 100 — Histogram ▼

# Examine the graphs below.



Random Numbers between 0 and 100
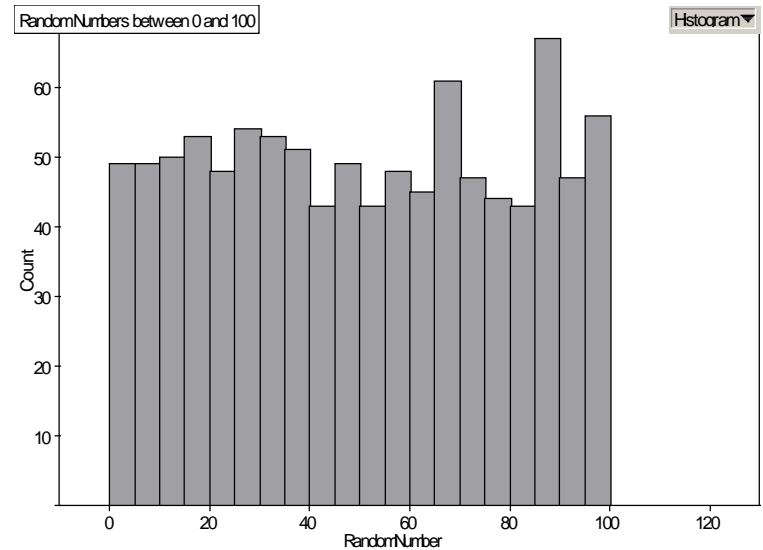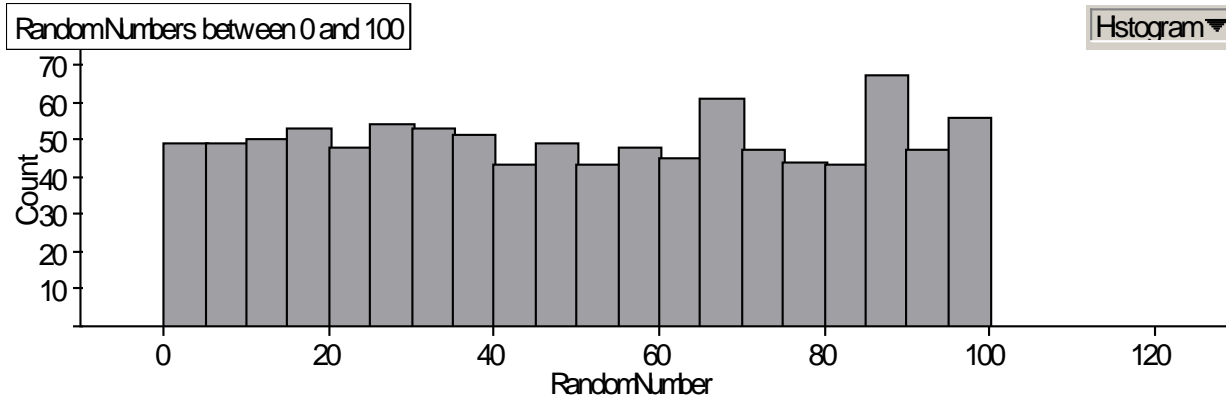
- **These are the same graph!**
  - **The graph to the right has been stretched vertically.**



Random Numbers between 0 and 100
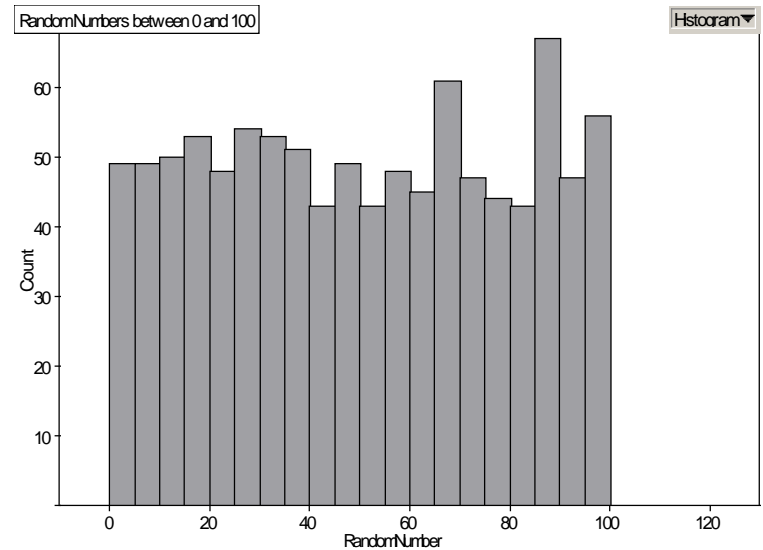
# Examine the graphs below.
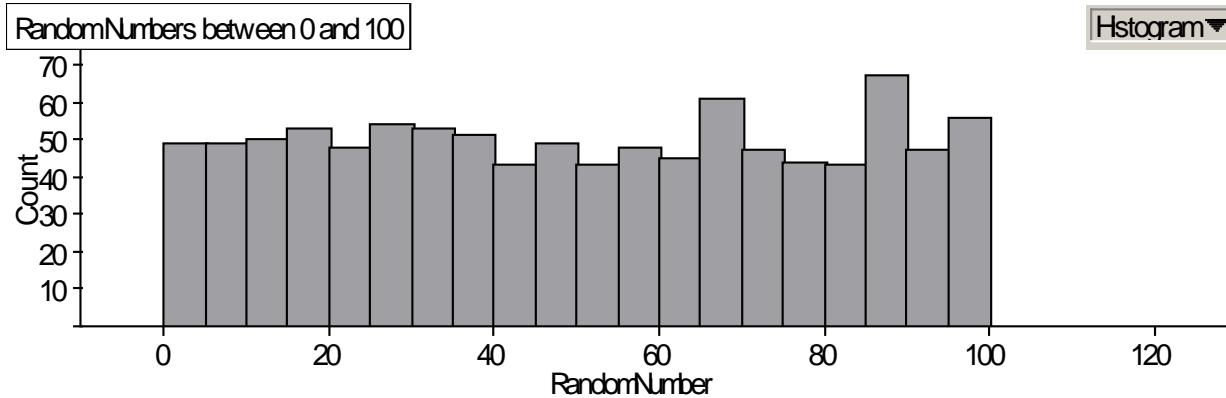


- **These are the same graph!**
  - **Stretching or compressing a graph affects how the information is perceived.**
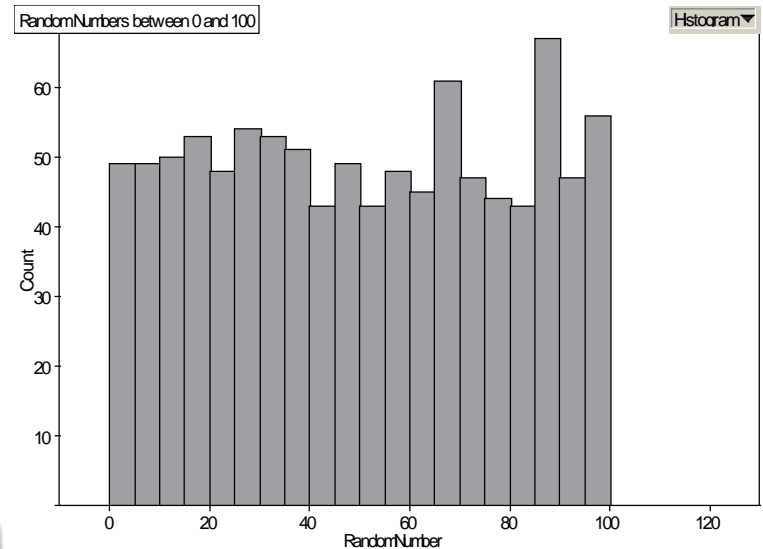
# Pie Chart

- **Is the graph below *comprehensible* or is it *misleading*?**

**Solar Eclipses by Month (1901-2000)**
**Relative Frequency**
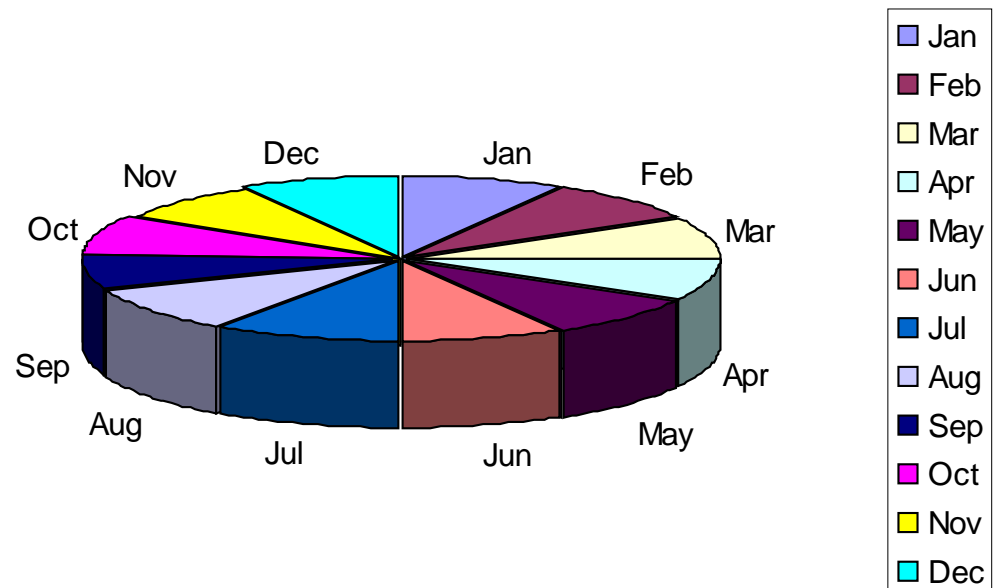
# Pie Chart

- **Is the graph below *comprehensible* or is it *misleading*?**

**Solar Eclipses by Month (1901-2000)**
**Relative Frequency**
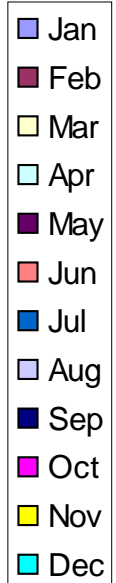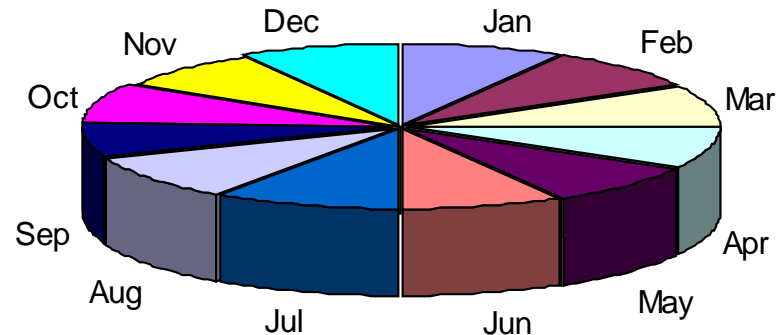
- **All the important information is missing from this graph!**

# Pie Chart

- ## What is missing from this pie chart?

**Solar Eclipses by Month (1901-2000)**
**Relative Frequency**



Legend:
- Jan
- Feb
- Mar
- Apr
- May
- Jun
- Jul
- Aug
- Sep
- Oct
- Nov
- Dec
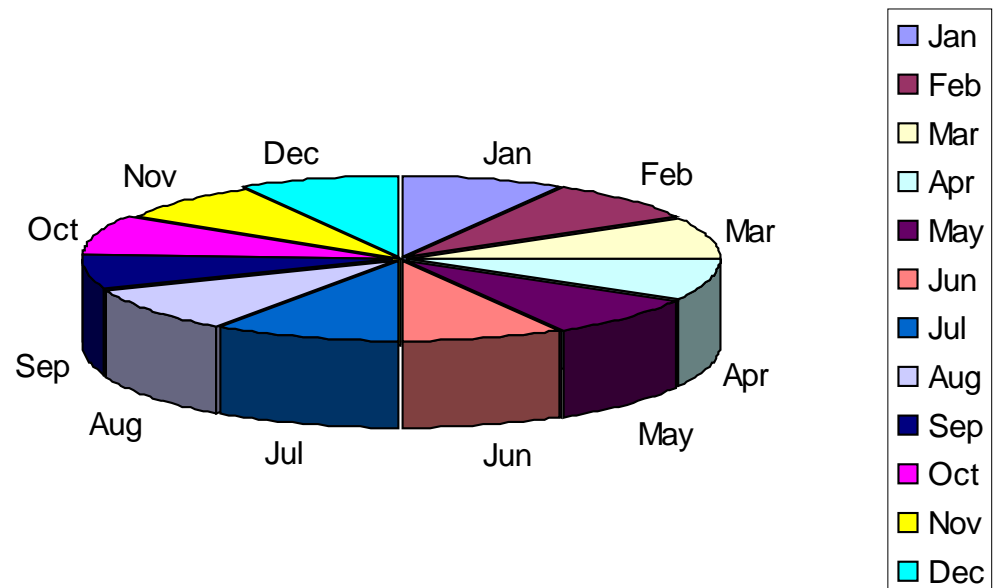
# Pie Chart

- ## What is missing from this pie chart?

**Solar Eclipses by Month (1901-2000)**
**Relative Frequency**

- ## A pie chart must display the percentage (i.e. relative frequency) for each sector of the pie.
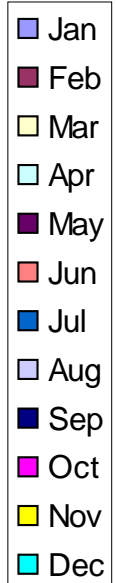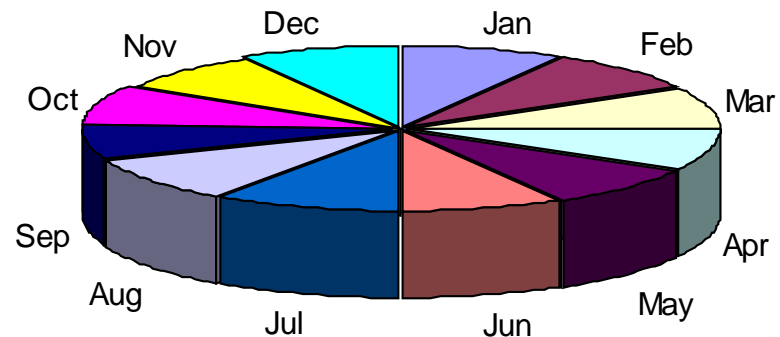


| | |
|---|---|
| ☐ | Jan |
| ☐ | Feb |
| ☐ | Mar |
| ☐ | Apr |
| ☐ | May |
| ☐ | Jun |
| ☐ | Jul |
| ☐ | Aug |
| ☐ | Sep |
| ☐ | Oct |
| ☐ | Nov |
| ☐ | Dec |

# Pie Chart

- ## What is missing from this pie chart?

**Solar Eclipses by Month (1901-2000)**
**Relative Frequency**

- ## There are no percentages displayed in this pie chart.
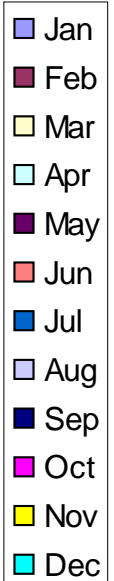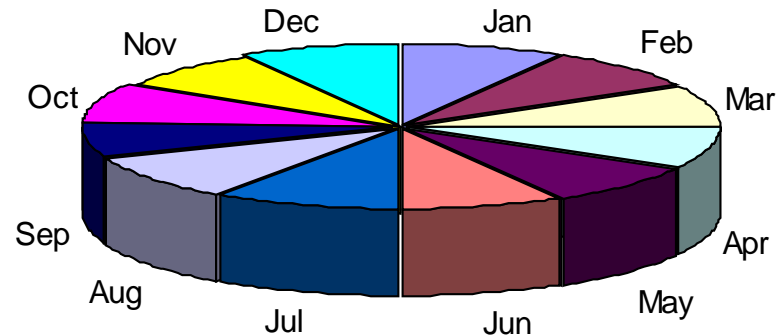


Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

# Pie Chart

- **What else should be changed in order to make this pie chart *meaningful* and *comprehensible?***

**Solar Eclipses by Month (1901-2000)**
**Relative Frequency**

- **To be meaningful, the sectors of a pie chart must be displayed so that their proportions can be compared.**
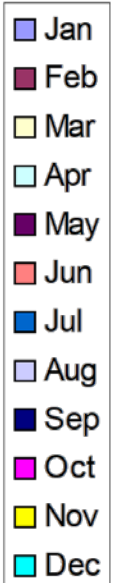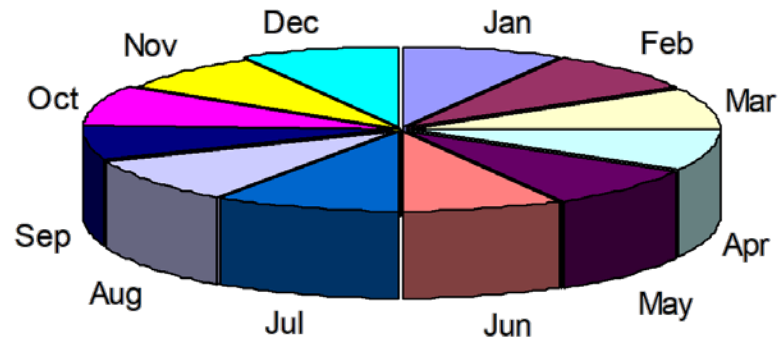
# Pie Chart

- **What else should be changed in order to make this pie chart *meaningful* and *comprehensible*?**

**Solar Eclipses by Month (1901-2000)**
**Relative Frequency**

- **A 3-dimensional pie does not allow one to view the proportions of the sectors of the pie.**
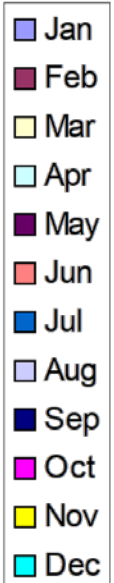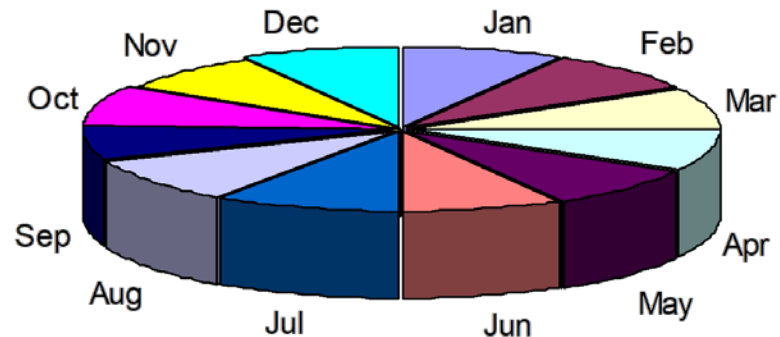
# Pie Chart

- **What else should be changed in order to make this pie chart *meaningful* and *comprehensible*?**

**Solar Eclipses by Month (1901-2000)**
**Relative Frequency**

- **A pie chart must be created as a circle so that the face of the pie can be viewed and the proportions of the sectors can be compared.**
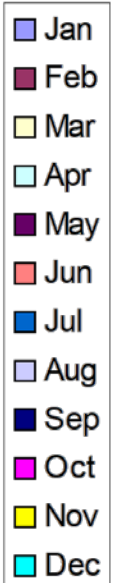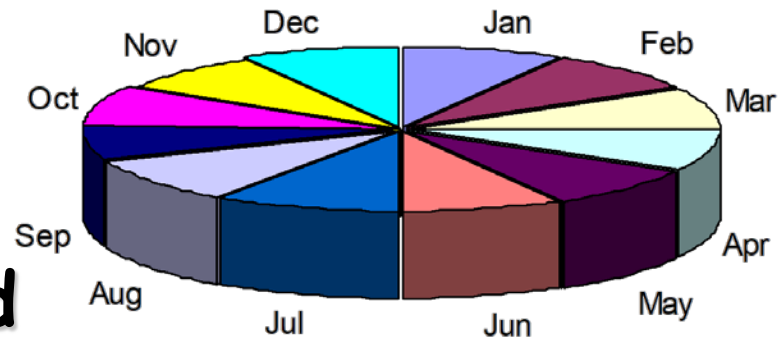
# Pie Chart

- **What else should be changed in order to make this pie chart *meaningful* and *comprehensible*?**

- **The title is meaningless!**
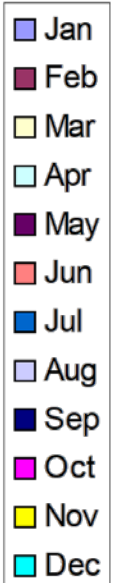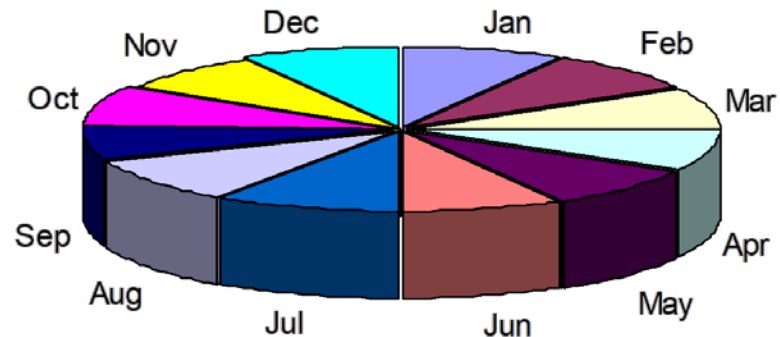


**Solar Eclipses by Month (1901-2000)**
**Relative Frequency**

# Pie Chart

- **What else should be changed in order to make this pie chart *meaningful* and *comprehensible*?**

**Solar Eclipses by Month (1901-2000)**
**Relative Frequency**

- **The title itself demonstrates that this pie chart is meaningless as relative frequency has not been included.**
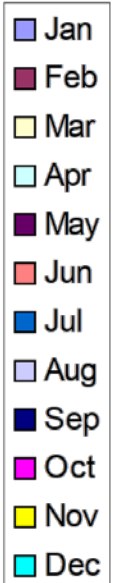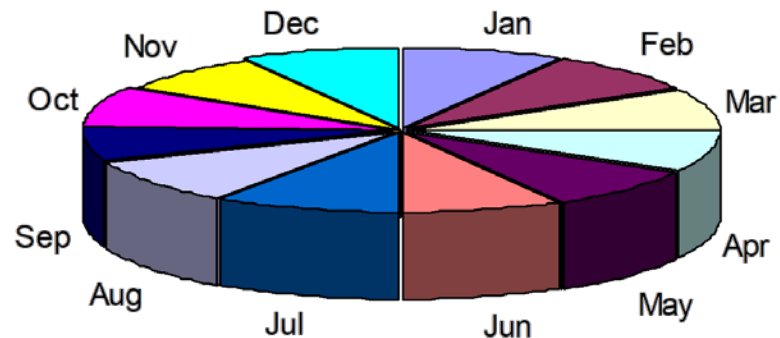


Legend: Jan, Feb, Mar, Apr, May, Jun, Jul, Aug, Sep, Oct, Nov, Dec

# Pie Chart

- **What else should be changed in order to make this pie chart *meaningful* and *comprehensible*?**

- **Since the legend included with this "graph" does not share any information, it serves no purpose.**
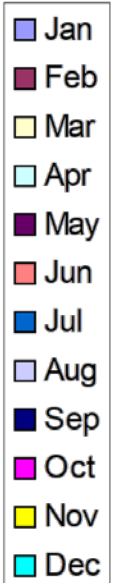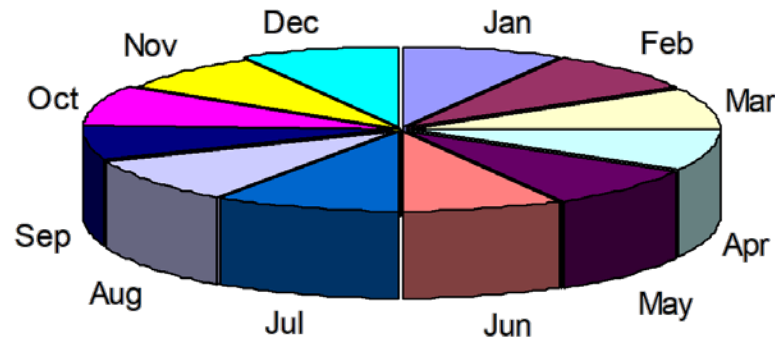


Solar Eclipses by Month (1901-2000)
Relative Frequency

# Discuss/examine the graph below.

- What else should be changed in order to make this "bar graph" *meaningful* and *comprehensible?*



| | |
|---|---|
| Made False Claims | 22% |
| Listed Phony Previous Employer | 25% |
| False Education Degree Claims | 27% |
| Employment Dates Altered | 30% |
| Inflated Job Title and Responsibility | 33% |
| Untruthful Reasons for Termination | 34% |
| Inflated Salary Claims | 41% |

# Discuss/examine the graph below.

- What else should be changed in order to make this "bar graph" *meaningful* and *comprehensible?*

- There is no title.

# Discuss/examine the graph below.

- What else should be changed in order to make this "bar graph" *meaningful* and *comprehensible*?

- There are no axes.

# Discuss/examine the graph below.

- What else should be changed in order to make this "bar graph" *meaningful* and *comprehensible?*

- There is no horizontal axis.

| | |
|---|---|
| Made False Claims | 22% |
| Listed Phony Previous Employer | 25% |
| False Education Degree Claims | 27% |
| Employment Dates Altered | 30% |
| Inflated Job Title and Responsibility | 33% |
| Untruthful Reasons for Termination | 34% |
| Inflated Salary Claims | 41% |

# Discuss/examine the graph below.

- What else should be changed in order to make this "bar graph" *meaningful* and *comprehensible?*

- There is no vertical axis.

| | |
|---|---|
| Made False Claims | 22% |
| Listed Phony Previous Employer | 25% |
| False Education Degree Claims | 27% |
| Employment Dates Altered | 30% |
| Inflated Job Title and Responsibility | 33% |
| Untruthful Reasons for Termination | 34% |
| Inflated Salary Claims | 41% |

# Discuss/examine the graph below.

- What else should be changed in order to make this "bar graph" *meaningful* and *comprehensible?*

- The bars are NOT in proportion!

| | |
|---|---|
| Made False Claims | 22% |
| Listed Phony Previous Employer | 25% |
| False Education Degree Claims | 27% |
| Employment Dates Altered | 30% |
| Inflated Job Title and Responsibility | 33% |
| Untruthful Reasons for Termination | 34% |
| Inflated Salary Claims | 41% |

# Discuss/examine the graph below.

- **What else should be changed in order to make this "bar graph" *meaningful* and *comprehensible*?**

- **Examine the first bar for which the relative frequency is 22% …**

| | |
|---|---|
| Made False Claims | 22% |
| Listed Phony Previous Employer | 25% |
| False Education Degree Claims | 27% |
| Employment Dates Altered | 30% |
| Inflated Job Title and Responsibility | 33% |
| Untruthful Reasons for Termination | 34% |
| Inflated Salary Claims | 41% |

# Discuss/examine the graph below.

- **What else should be changed in order to make this "bar graph" *meaningful* and *comprehensible*?**

- **Examine the first bar for which the relative frequency is 22% and compare this to the relative frequency for the last bar, 41%.**



Made False Claims — 22%

Listed Phony Previous Employer — 25%

False Education Degree Claims — 27%

Employment Dates Altered — 30%

Inflated Job Title and Responsibility — 33%

Untruthful Reasons for Termination — 34%

Inflated Salary Claims — 41%

# Discuss/examine the graph below.

- **What else should be changed in order to make this "bar graph" *meaningful* and *comprehensible*?**

- **Doubling the length for the first bar should be slightly greater (3%) than the length for the last bar.**

| | |
|---|---|
| Made False Claims | 22% |
| Listed Phony Previous Employer | 25% |
| False Education Degree Claims | 27% |
| Employment Dates Altered | 30% |
| Inflated Job Title and Responsibility | 33% |
| Untruthful Reasons for Termination | 34% |
| Inflated Salary Claims | 41% |

# Discuss/examine the graph below.

- What else should be changed in order to make this "bar graph" *meaningful* and *comprehensible?*

- The bars are NOT in proportion to one another.

| | |
|---|---|
| Made False Claims | 22% |
| Listed Phony Previous Employer | 25% |
| False Education Degree Claims | 27% |
| Employment Dates Altered | 30% |
| Inflated Job Title and Responsibility | 33% |
| Untruthful Reasons for Termination | 34% |
| Inflated Salary Claims | 41% |