Example 1: Let's construct our own frequency distribution which summarizes the height distribution in our class.

Height of Female Students in Ms. Gracey's Class

max. data value = 67
min. data value = 53
*We decided on 7 classes

Class width = $\frac{67-53}{7} = 2$

*Since we used the min as our starting value, the max wasn't in class 7 so we added another class.

Female Heigts (in inches)	Frequency
53 - 54	2
55 - 56	1
57 - 58	2
59 - 60	0
61 - 62	1
63 - 64	3
65 - 66	3
67 - 68	1

RELATIVE FREQUENCY DISTRIBUTION

In a relative frequency distribution, the frequency of a class is replaced with a relative frequency (aka a proportion) or a percentage frequency. The sum of the relative frequencies in a relative frequency distribution must be close to 1 or 100%.

equivalent

$$\text{relative frequency} = \frac{\text{class frequency}}{\text{sum of all frequencies}}$$

$$\text{percentage frequency} = \frac{\text{class frequency}}{\text{sum of all frequencies}} \times 100\%$$

CUMULATIVE FREQUENCY DISTRIBUTION

The cumulative frequency for a class is the sum of the frequencies for that class and all previous classes.

CRITICAL THINKING: INTERPRETING FREQUENCY DISTRIBUTION

In statistics, we are interested in the distribution of the data, and in particular, whether the data have a normal distribution.

Femaleheigts (in inches)	Frequency
53 - 54	2
55 - 56	1
57 - 58	2
59 - 60	0
61 - 62	1
63 - 64	3
65 - 66	3
67 - 68	1
Sum	13

Class 1:

$\frac{2}{13} \cdot 100\% \doteq 15.4\%$

Relative Frequency:

Femaleheigts (in inches)	Relative Frequency
53 - 54	15.4%
55 - 56	7.7%
57 - 58	15.4%
59 - 60	0%
61 - 62	7.7%
63 - 64	23.1%
65 - 66	23.1%
67 - 68	7.7%

NORMAL DISTRIBUTION

1. The ___frequencies___ start low, then increase to one or two high frequencies, then decrease to a low frequency.
2. The distribution is approximately ___symmetric___, with frequencies preceding the maximum being roughly a mirror image of those that follow the maximum.

GAPS

The presence of gaps can show that we have data from two or more different ___populations___. BE CAREFUL—the converse is not necessarily true!

Example 2: Consider the frequency distribution below.

Tar (mg) in filtered cigarettes	Frequency
2-5	2
6-9	2
10-13	6
14-17	15

a. Identify the class width

$\boxed{4}$

b. Identify the class midpoints

class 1: $\frac{2+5}{2} = 3.5$

class 2: 7.5

class 3: 11.5

class 4: 15.5

c. Identify the class boundaries

1.5, 5.5, 9.5, 13.5, 17.5

d. If the criteria are interpreted very loosely, does the frequency distribution appear to have a normal distribution?

No, since most of the frequencies are in the last class.

Example 3: Listed below are amounts of strontium-90 (in millibecquerels) in a simple random sample of baby teeth obtained from Pennsylvania residents born after 1979. Construct a frequency distribution with eight classes. Begin with a lower class limit of 110, and use a class width of ten.

155 142 149 130 151 163 151 142 156 133 138 161 128 144 172 137 151 166 147 163 145 116
136 158 114 165 169 145 150 150 158 151 145 152 140 170 129 188 156

Amounts of Strontium-90 (in millibecquerels)	Frequency
110-119	2
120-129	2
130-139	5
140-149	9
150-159	12
160-169	6
170-179	2
180-189	1

2.3 HISTOGRAMS

Key Concept…
In this section we discuss a visual tool called a histogram, and its significance in representing and analyzing data.

DEFINITION

A **histogram** is a graph consisting of bars of equal width drawn adjacent to each other without gaps. The horizontal scale represents classes of quantitative data values and the vertical scale represents frequencies.

HORIZONTAL SCALE: Use class boundaries or class midpoints

VERTICAL SCALE: Use class frequencies

A **relative frequency histogram** has the same shape and horizontal scale as a histogram, but the vertical scale is marked with relative frequencies (as percentages or proportion) instead of actual frequencies.

CRITICAL THINKING: INTERPRETING HISTOGRAMS

We analyze the histogram to see what we can learn about

C enter of the data

V ariation

D istribution

O utliers

T ime

Entering Data into a List

$\boxed{\text{Stat}}$

enter the given data

```
EDIT CALC TESTS
1:Edit…
2:SortA(
3:SortD(
4:ClrList
5:SetUpEditor
```

L1	L2	L3 1
156		
166		
147		
163		
145		
116		

L1(40) =

Making a histogram:

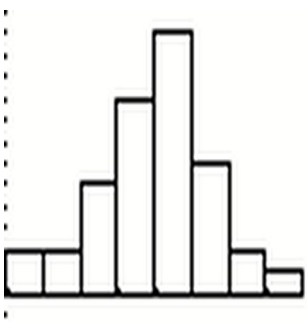
```
WINDOW
 Xmin=109.5
 Xmax=189.5
 Xscl=10
 Ymin=-1
 Ymax=13
 Yscl=1
 Xres=1
```

→ starting class boundary

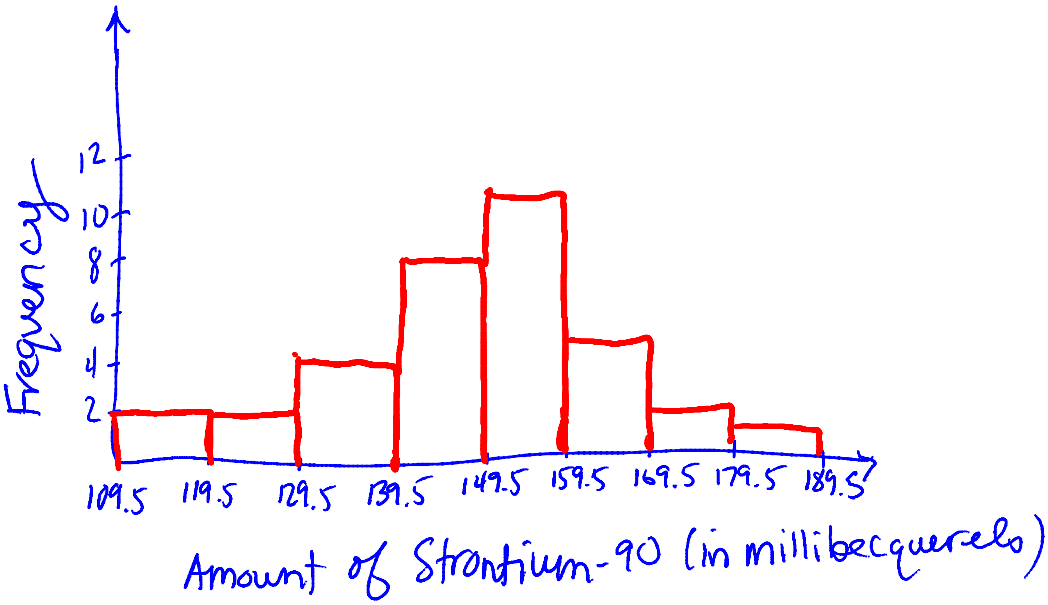
→ ending class boundary

→ class width

```
Plot1 Plot2 Plot3
On Off
Type:
Xlist:L1
Freq:1
```



Example 4: Use the frequency distribution from example 3 to construct a histogram.



2.4 STATISTICAL GRAPHICS

Key Concept…

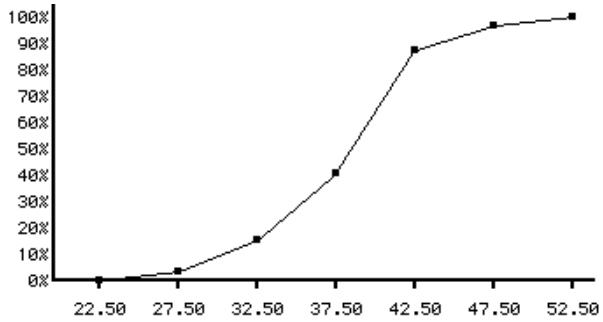
In this section we discuss types of statistical graphs other than _____.

Our objective is to identify a _____ graph for representing

a _____ set.

FREQUENCY POLYGON

A **frequency polygon** uses line segments connected to points directly above class

_____ values.

A **relative frequency polygon** uses relative frequencies for the _____ scale.