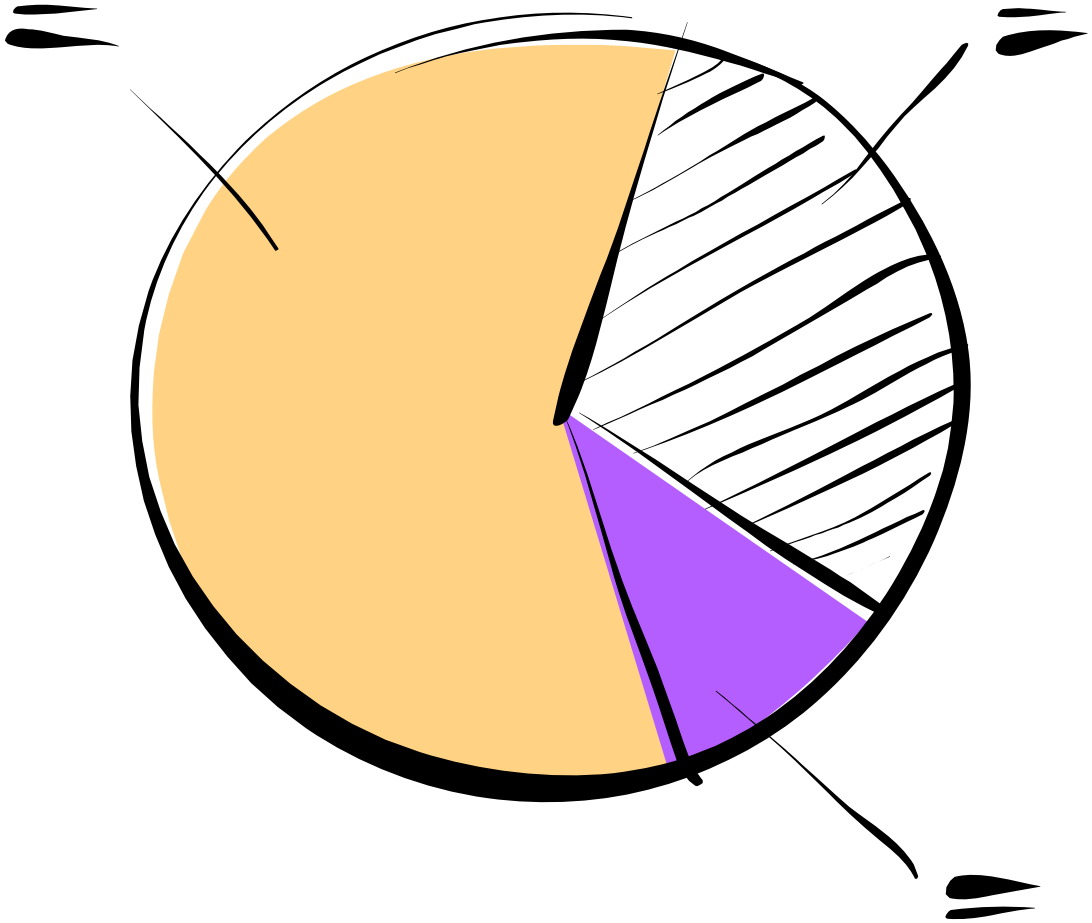
CHARTS AND GRAPHS



Suppose we give a test that results in the following 20 grades. How do we organize the results?

99, 52, 63, 71, 96, 59, 79, 75, 68, 58, 78, 84, 48, 49, 54, 86, 40, 66, 91, 87

The natural thing to do is to organize the data into classes. Notice also that the lowest grade is 40 and the highest is 99.

99, 52, 63, 71, 96, 59, 79, 75, 68, 58, 78, 84, 48, 49, 54, 86, 40, 66, 91, 87

CLASS
40 - 49
50 - 59
60 - 69
70 - 79
80 - 89
90 - 99

The smallest value that can go into a class is called its lower class limit.

99, 52, 63, 71, 96, 59, 79, 75, 68, 58, 78, 84, 48, 49, 54, 86, 40, 66, 91, 87

CLASS
40 - 49
50 - 59
60 - 69
70 - 79
80 - 89
90 - 99

Lower Class Limits: 40, 50, 60, 70, 80, 90

The largest value that can go into a class is called its upper class limit.

99, 52, 63, 71, 96, 59, 79, 75, 68, 58, 78, 84, 48, 49, 54, 86, 40, 66, 91, 87

CLASS
40 - 49
50 - 59
60 - 69
70 - 79
80 - 89
90 - 99

Lower Class Limits: 40, 50, 60, 70, 80, 90

Upper Class Limits: 49, 59, 69, 79, 89, 99

The class boundaries fall between consecutive classes and before the first class and after the last class.

99, 52, 63, 71, 96, 59, 79, 75, 68, 58, 78, 84, 48, 49, 54, 86, 40, 66, 91, 87

CLASS
40 - 49
50 - 59
60 - 69
70 - 79
80 - 89
90 - 99

Lower Class Limits: 40, 50, 60, 70, 80, 90

Upper Class Limits: 49, 59, 69, 79, 89, 99

Class Boundaries: 39.5, 49.5, 59.5, 69.5, 79.5, 89.5, 99.5

The class width is the difference between two consecutive lower class limits. When possible, use the same width for each class.

99, 52, 63, 71, 96, 59, 79, 75, 68, 58, 78, 84, 48, 49, 54, 86, 40, 66, 91, 87

CLASS
40 - 49
50 - 59
60 - 69
70 - 79
80 - 89
90 - 99

Lower Class Limits: 40, 50, 60, 70, 80, 90

Upper Class Limits: 49, 59, 69, 79, 89, 99

Class Boundaries: 39.5, 49.5, 59.5, 69.5, 79.5, 89.5, 99.5

Class Width: 50-40 = 10

The average of a lower class limit with its corresponding upper class limit is called the class midpoint.

99, 52, 63, 71, 96, 59, 79, 75, 68, 58, 78, 84, 48, 49, 54, 86, 40, 66, 91, 87

CLASS
40 - 49
50 - 59
60 - 69
70 - 79
80 - 89
90 - 99

Lower Class Limits: 40, 50, 60, 70, 80, 90

Upper Class Limits: 49, 59, 69, 79, 89, 99

Class Boundaries: 39.5, 49.5, 59.5, 69.5, 79.5, 89.5, 99.5

Class Width: 50-40 = 10

Class midpoints: 44.5, 54.5, 64.5, 74.5, 84.5, 94.5

To organize the data, we usually establish classes, perform tallies, and construct a frequency distribution.

99, 52, 63, 71, 96, 59, 79, 75, 68, 58, 78, 84, 48, 49, 54, 86, 40, 66, 91, 87

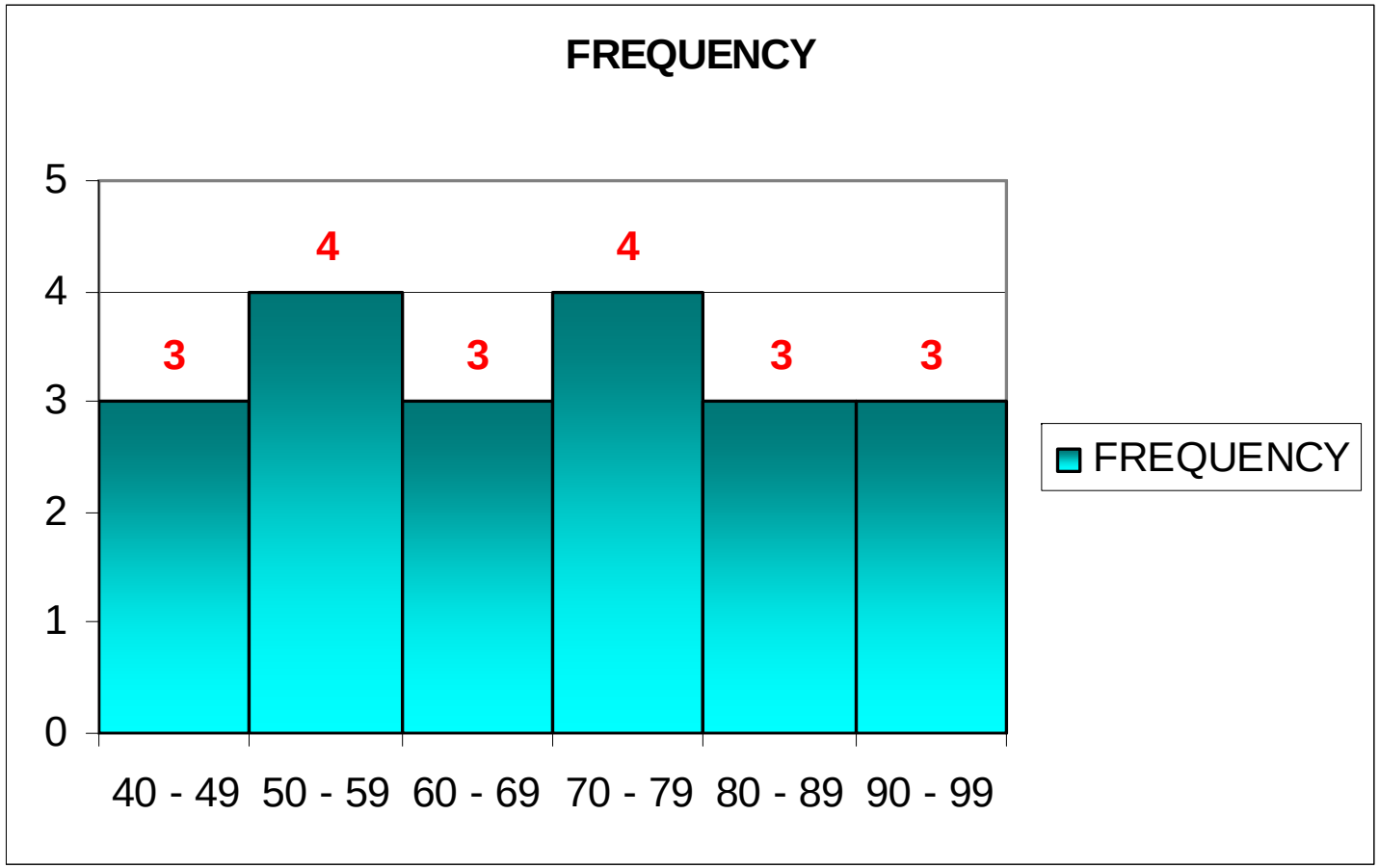
CLASS	TALLY	FREQUENCY
40 - 49	III	3
50 - 59	IIII	4
60 - 69	III	3
70 - 79	IIII	4
80 - 89	III	3
90 - 99	III	3

We can also express the results using proportions or percentages to get a percentage frequency distribution.

99, 52, 63, 71, 96, 59, 79, 75, 68, 58, 78, 84, 48, 49, 54, 86, 40, 66, 91, 87

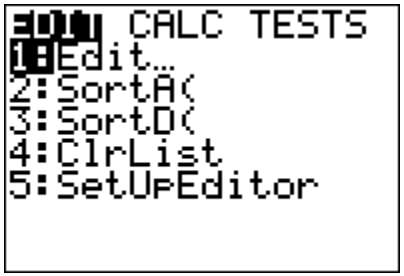
CLASS	TALLY	FREQUENCY	PERCENTAGE
40 - 49	III	3	15%
50 - 59	IIII	4	20%
60 - 69	III	3	15%
70 - 79	IIII	4	20%
80 - 89	III	3	15%
90 - 99	III	3	15%

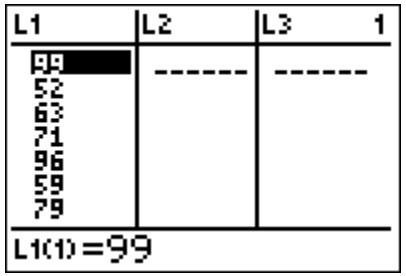
We can now create a bar graph of the frequencies called a histogram. Notice that usually there is no separation between the bars in a histogram.

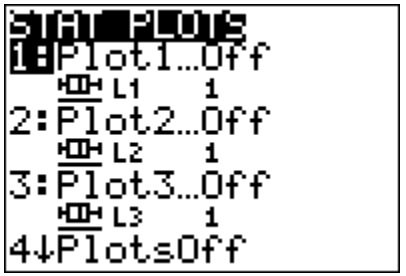


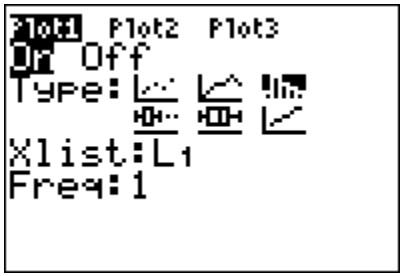
We can also create a histogram using our TI-86/84 calculator.

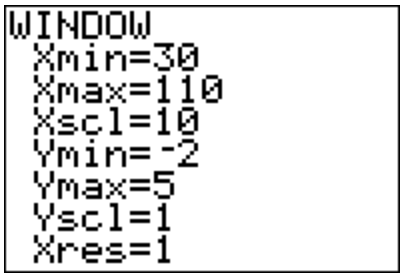
99, 52, 63, 71, 96, 59, 79, 75, 68, 58, 78, 84, 48, 49, 54, 86, 40, 66, 91, 87

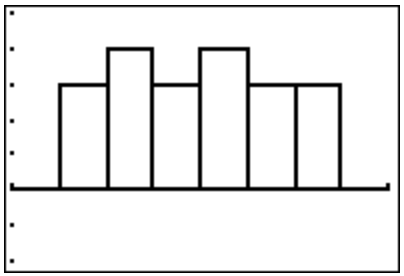


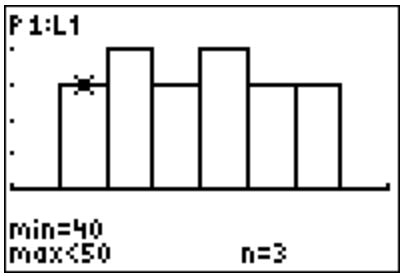






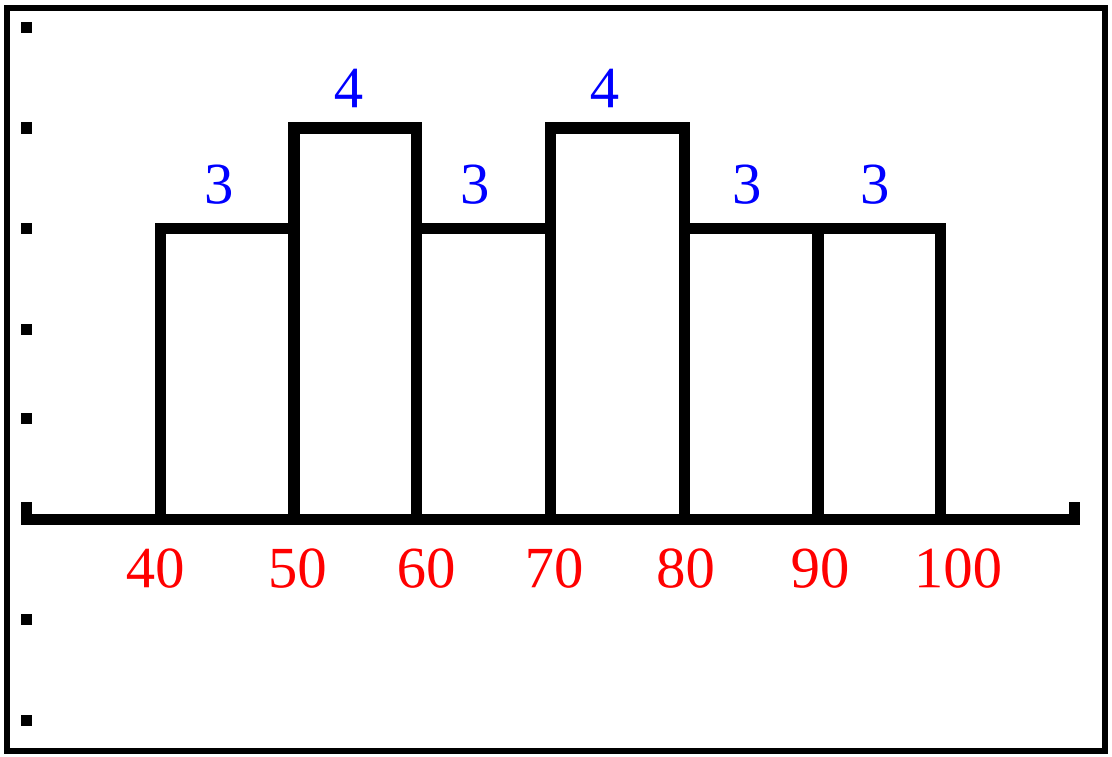






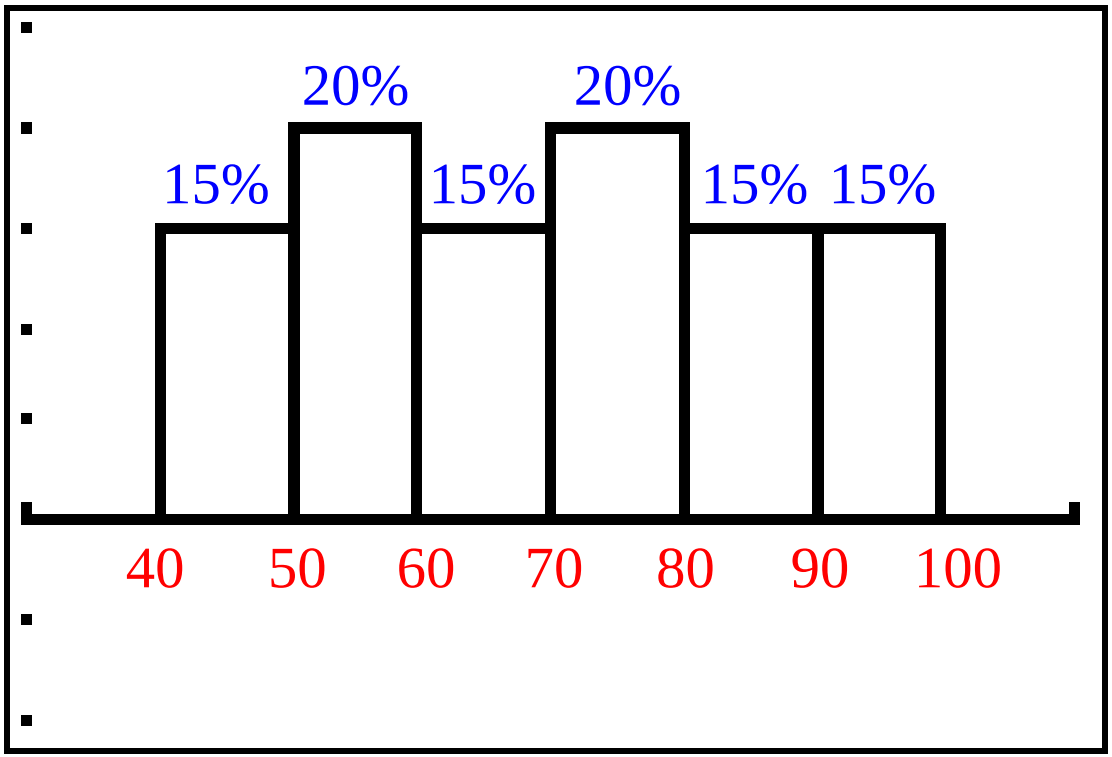
When using the calculator to create your histogram, label the lower class limits and the frequency of each bar.

99, 52, 63, 71, 96, 59, 79, 75, 68, 58, 78, 84, 48, 49, 54, 86, 40, 66, 91, 87



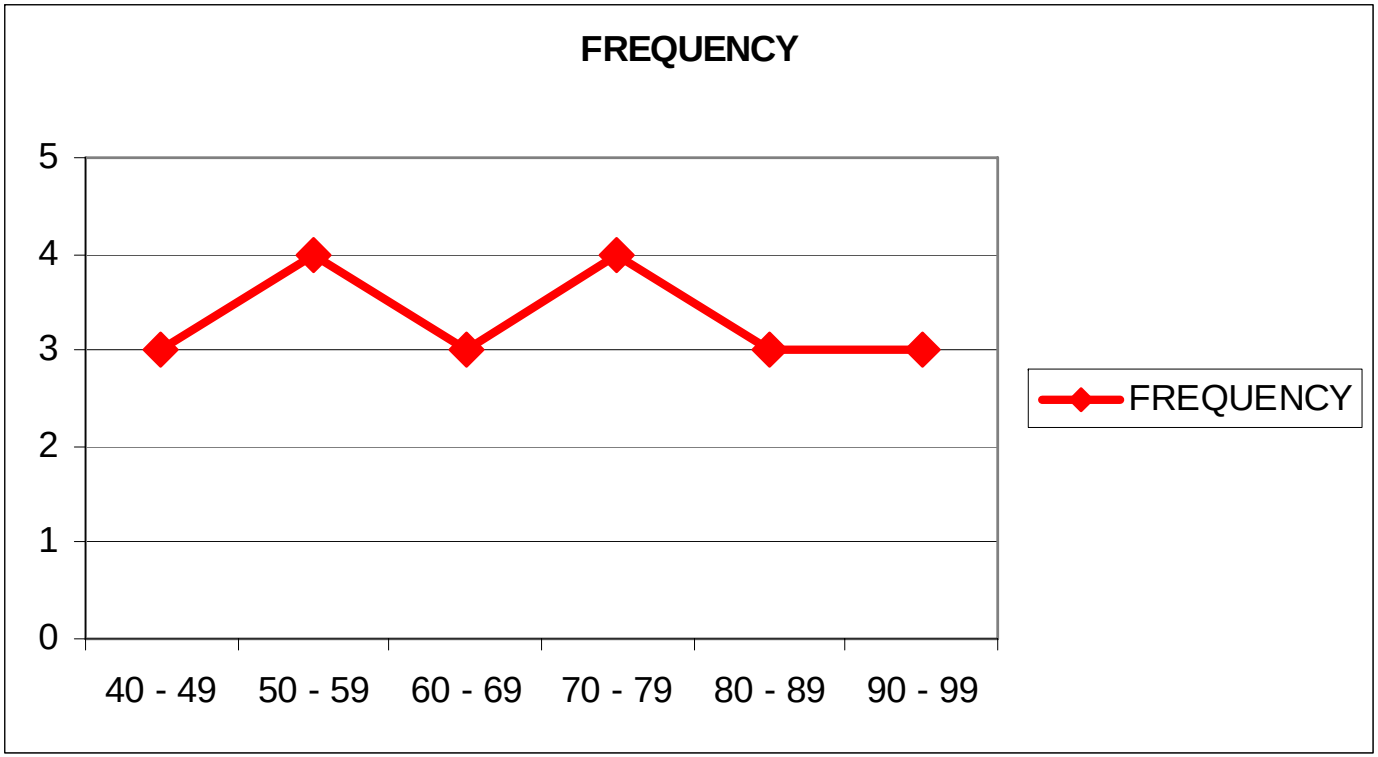
We can also create histograms that represent proportions or percentages instead of frequency counts.

99, 52, 63, 71, 96, 59, 79, 75, 68, 58, 78, 84, 48, 49, 54, 86, 40, 66, 91, 87



Below is the same data organized into a line graph instead of a histogram. Notice that the frequencies are plotted at the class midpoints.

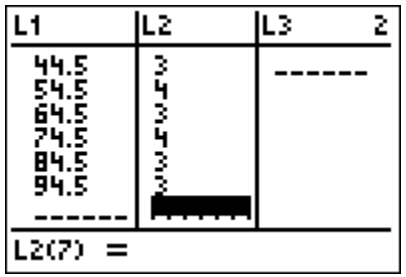
99, 52, 63, 71, 96, 59, 79, 75, 68, 58, 78, 84, 48, 49, 54, 86, 40, 66, 91, 87

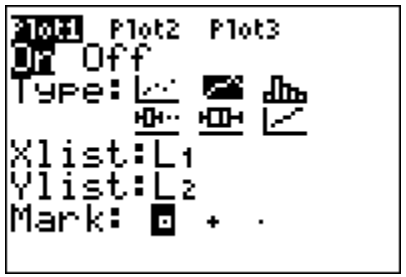


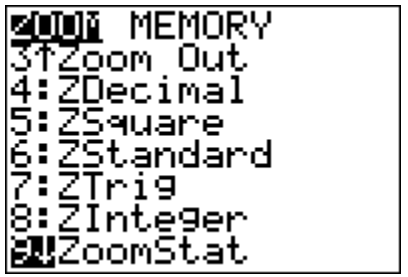
We can also create a line graph on our calculator by putting class midpoints in one list and frequencies in the other.

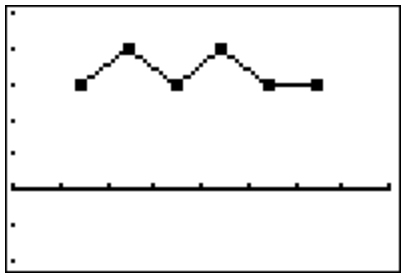
Class midpoints: 44.5, 54.5, 64.5, 74.5, 84.5, 94.5

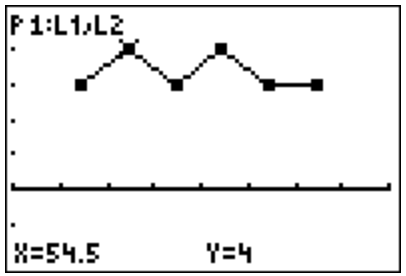
Frequencies: 3, 4, 3, 4, 3, 3







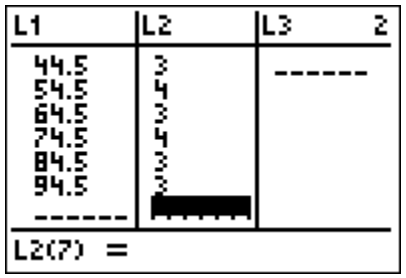


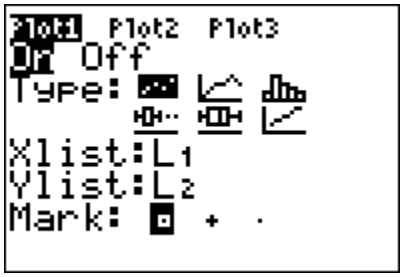


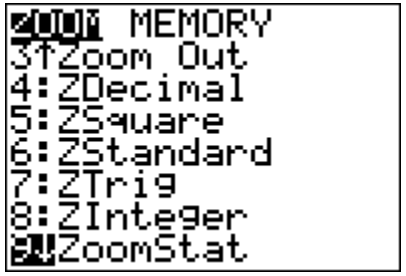
If we don’t connect the dots, then we call it a scatterplot.

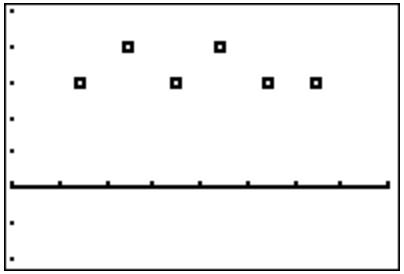
Class midpoints: 44.5, 54.5, 64.5, 74.5, 84.5, 94.5

Frequencies: 3, 4, 3, 4, 3, 3





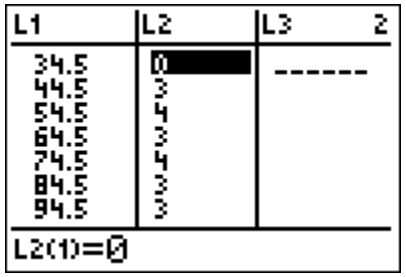


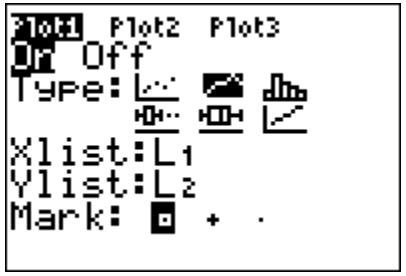


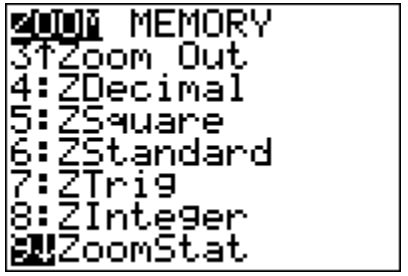
If we add the points (34.5, 0) & (104.5, 0) to tie down the ends, then we call it a frequency polygon.

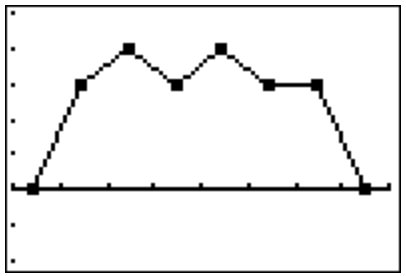
Class midpoints: 34.5, 44.5, 54.5, 64.5, 74.5, 84.5, 94.5, 104.5

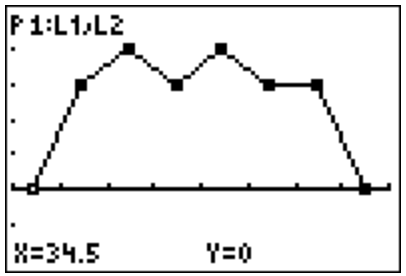
Frequencies: 0, 3, 4, 3, 4, 3, 3, 0







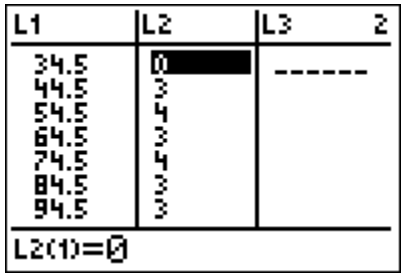


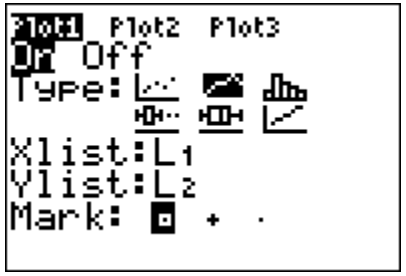


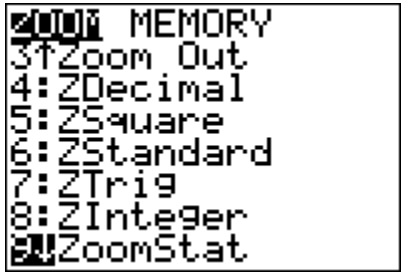
Anytime the homework asks you to do a frequency polygon, you can do a line graph instead.

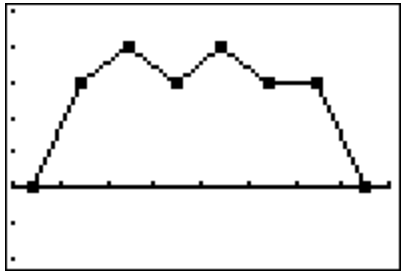
Class midpoints: 34.5, 44.5, 54.5, 64.5, 74.5, 84.5, 94.5, 104.5

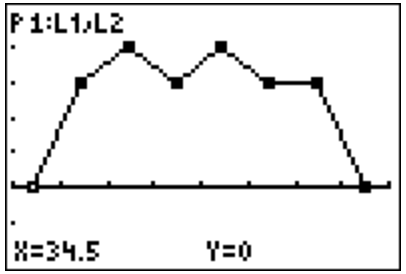
Frequencies: 0, 3, 4, 3, 4, 3, 3, 0



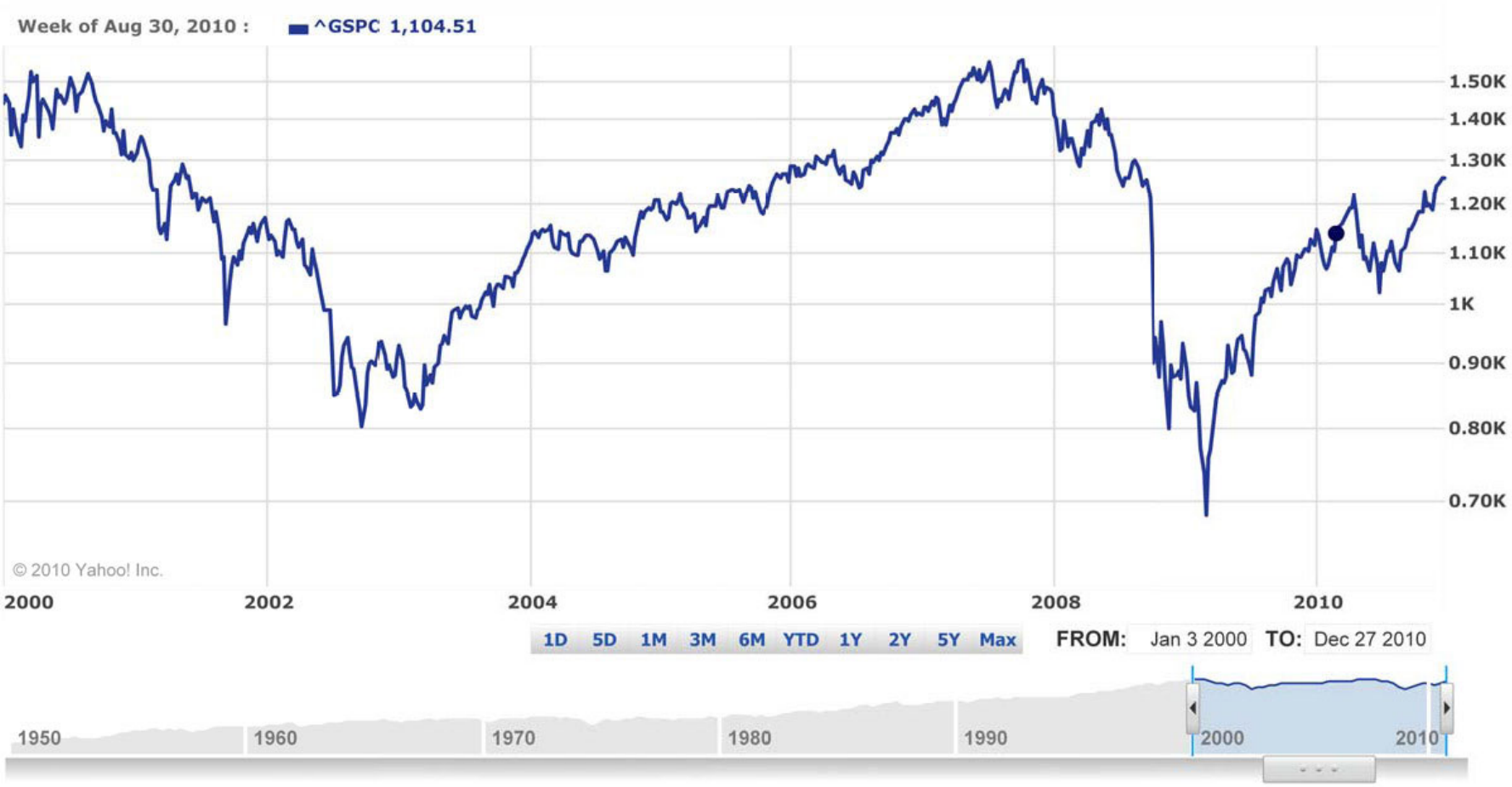






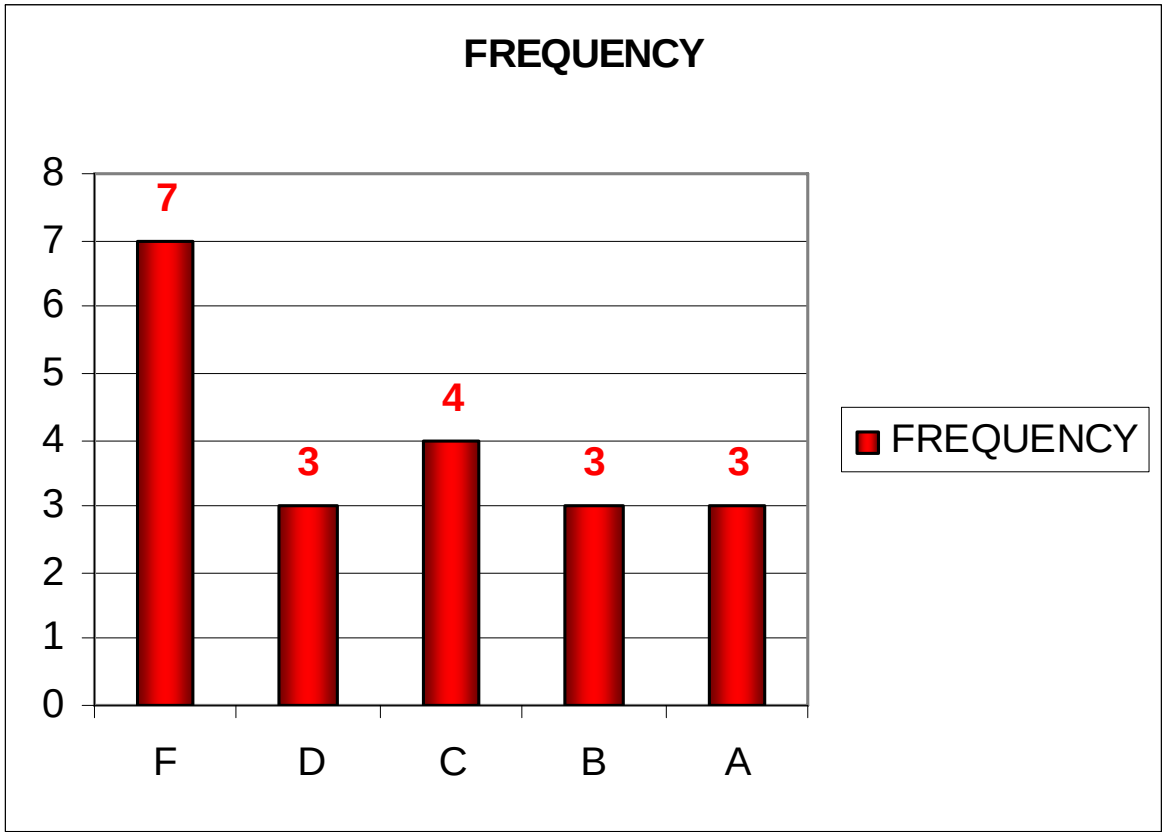


Also, if we plot numerical data over time, we call it a time-series. Below is a graph of the ups and downs of the S&P-500 over the past decade.



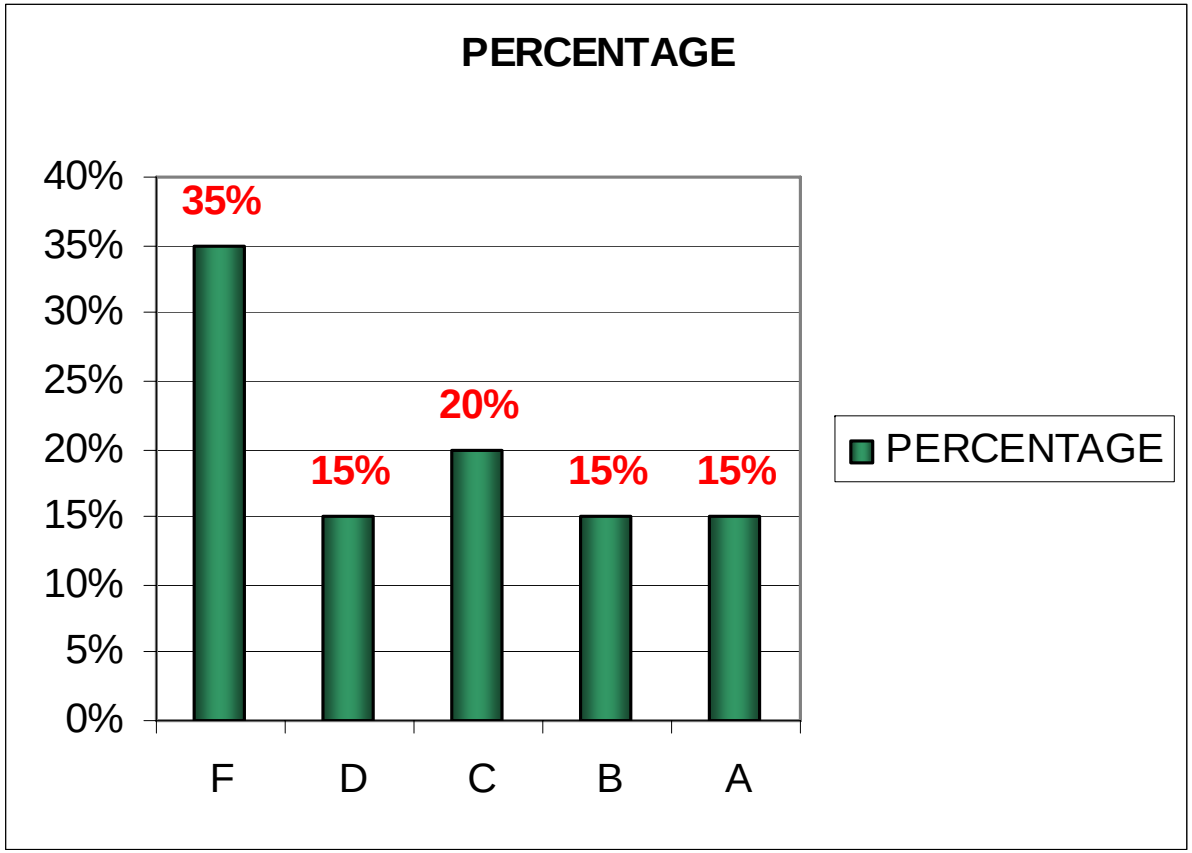
Another thing we can do is to create a frequency distribution and bar graph using letter grades instead of classes. When we create a graph using categories, it's traditional to put separation between the bars.

GRADE	FREQUENCY
F	7
D	3
C	4
B	3
A	3

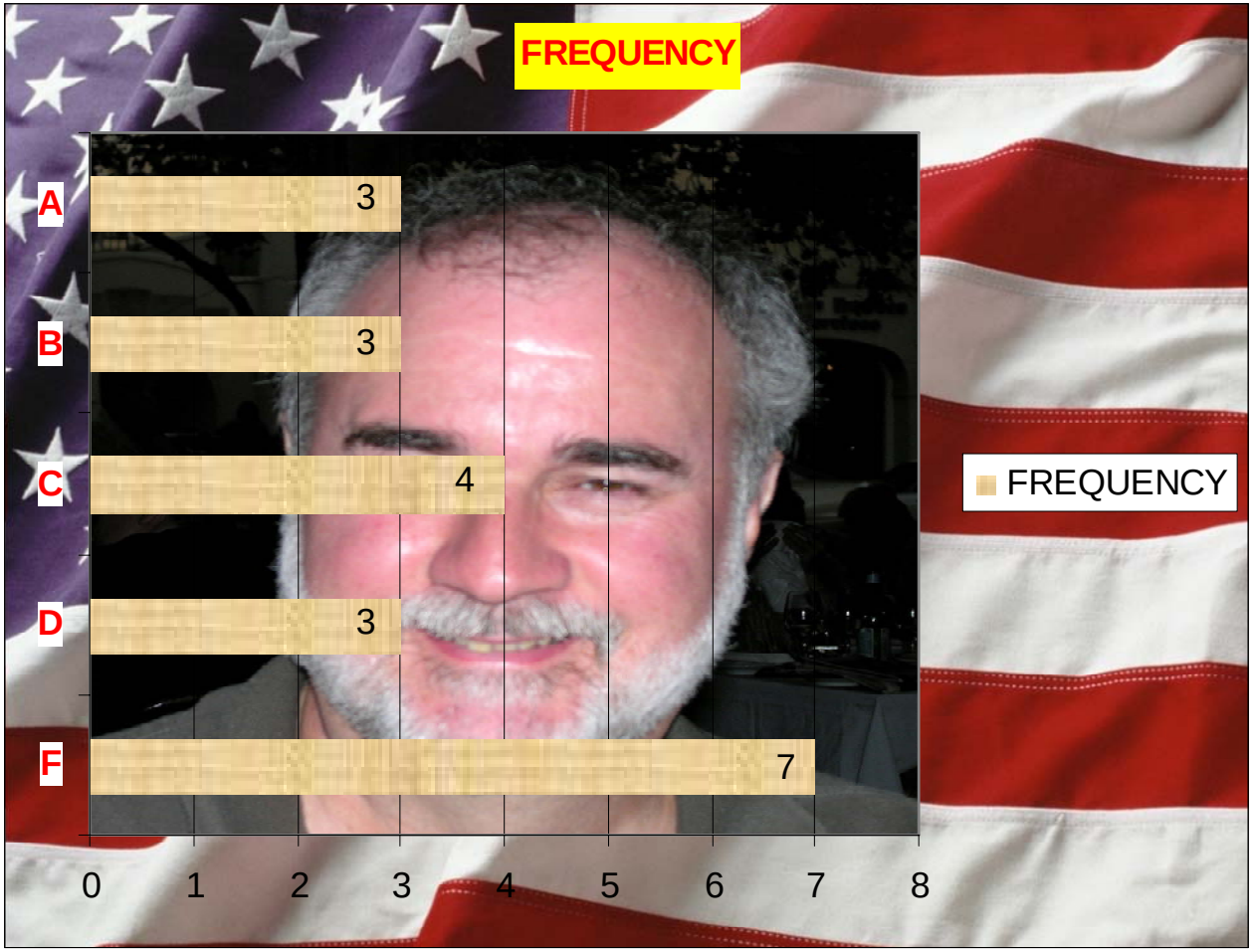


And of course, we can do this with percentages, too.

GRADE	PERCENTAGE
F	35%
D	15%
C	20%
B	15%
A	15%

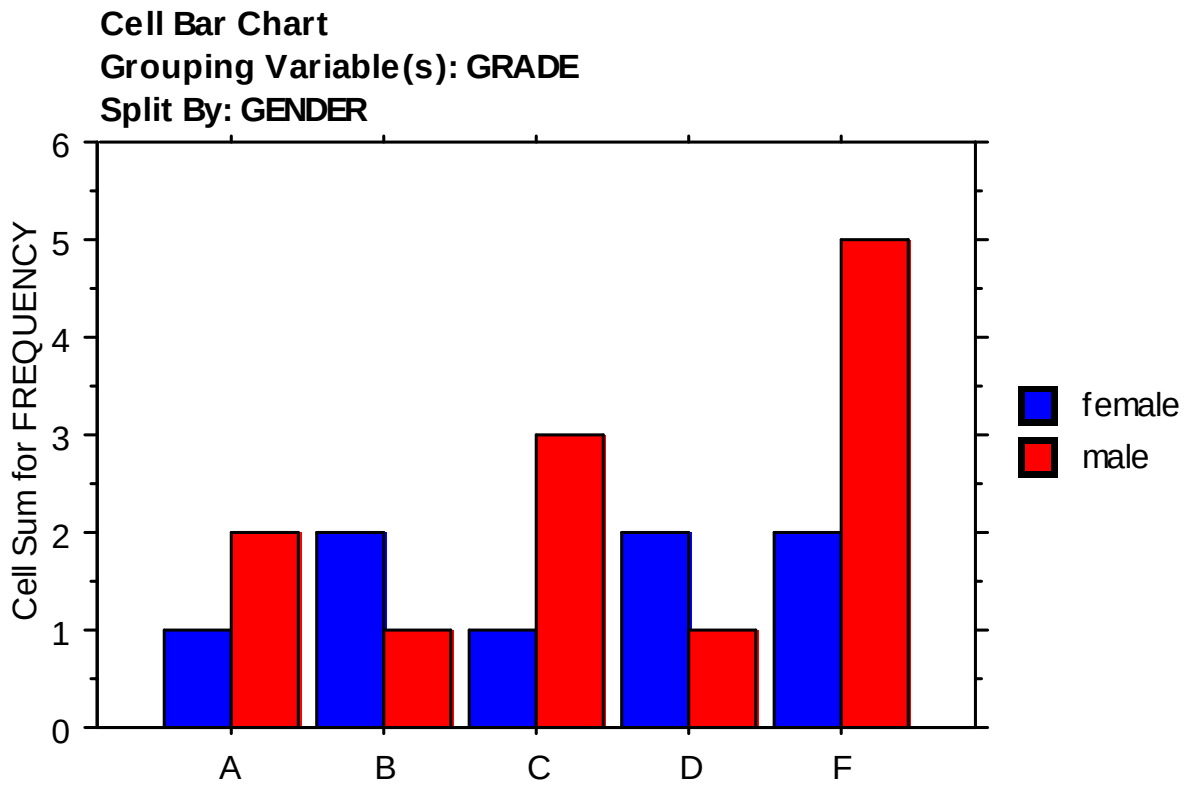


You can even make the bars horizontal instead of vertical, and in programs like *Excel* you can add all sorts of special effects!



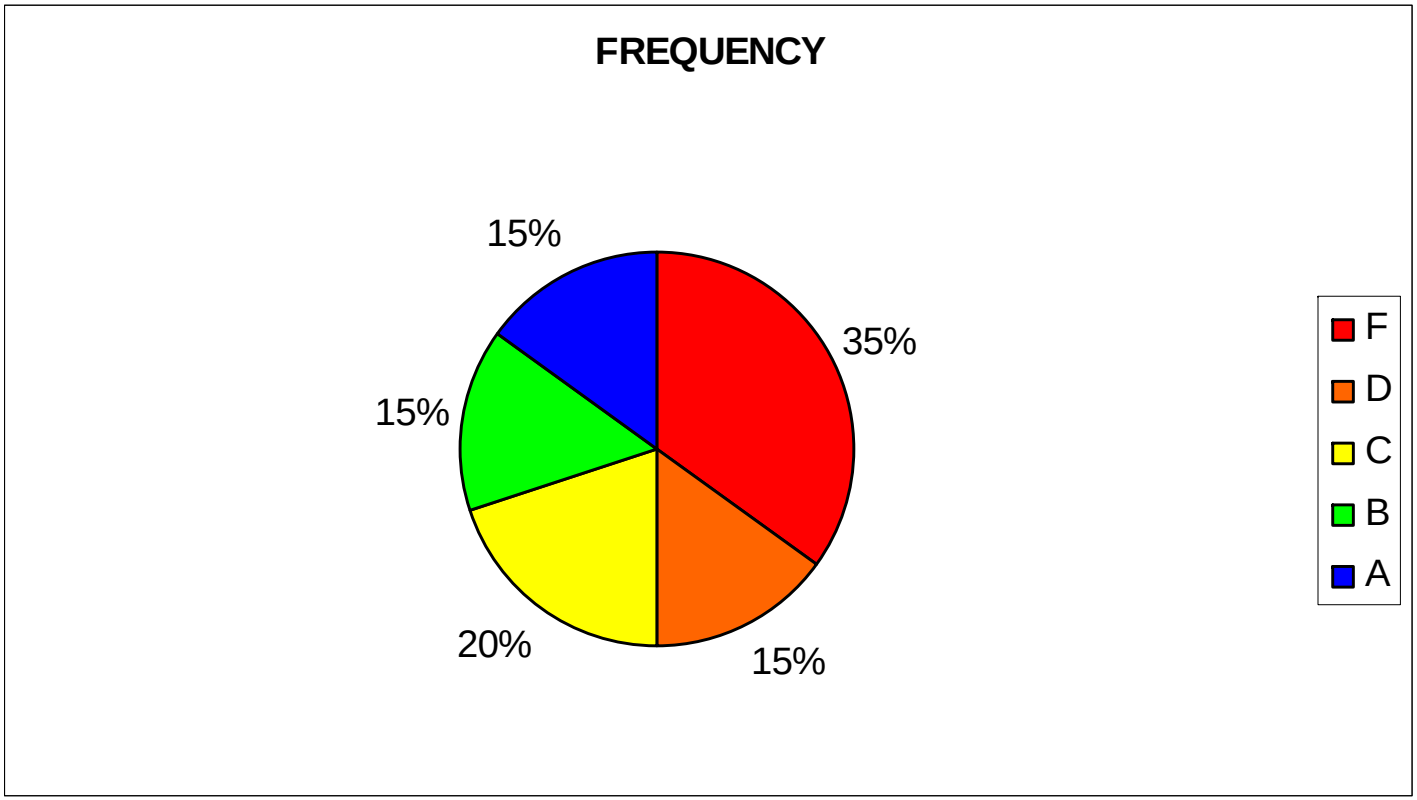
A multiple bar graph has two or more sets of bars,.

GRADE	GENDER	FREQUENCY
F	male	5
D	male	1
C	male	3
B	male	1
A	male	2
F	female	2
D	female	2
C	female	1
B	female	2
A	female	1



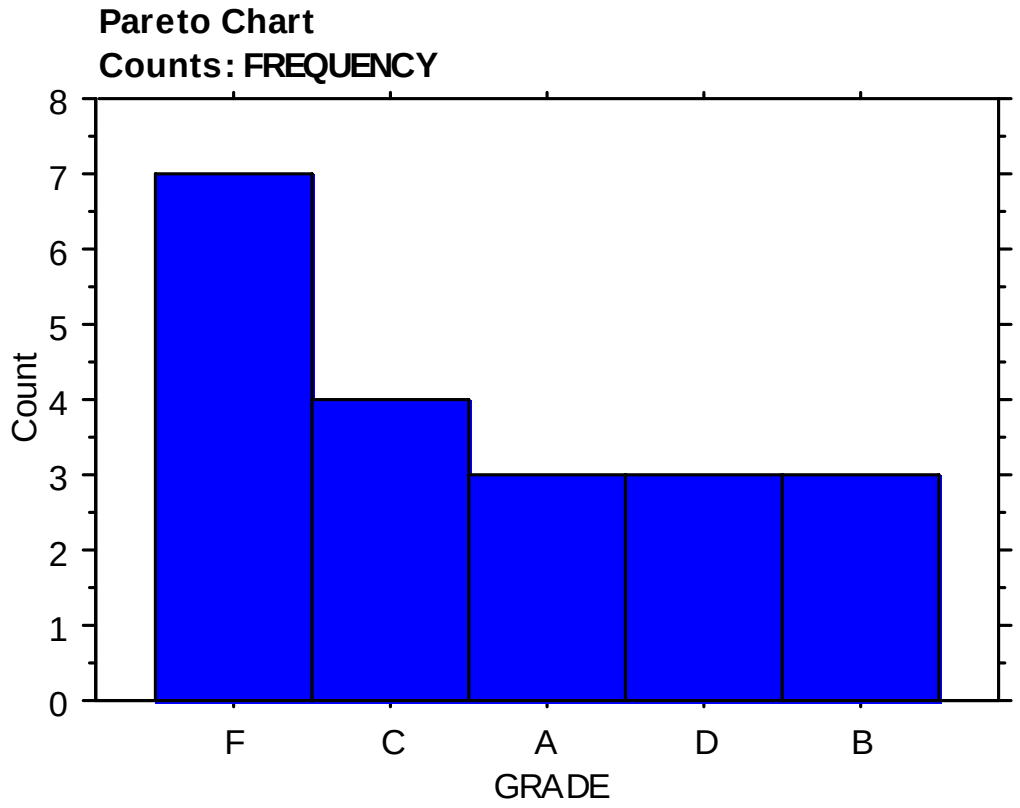
And let's not forget the ever popular pie chart!

GRADE	FREQUENCY
F	7
D	3
C	4
B	3
A	3



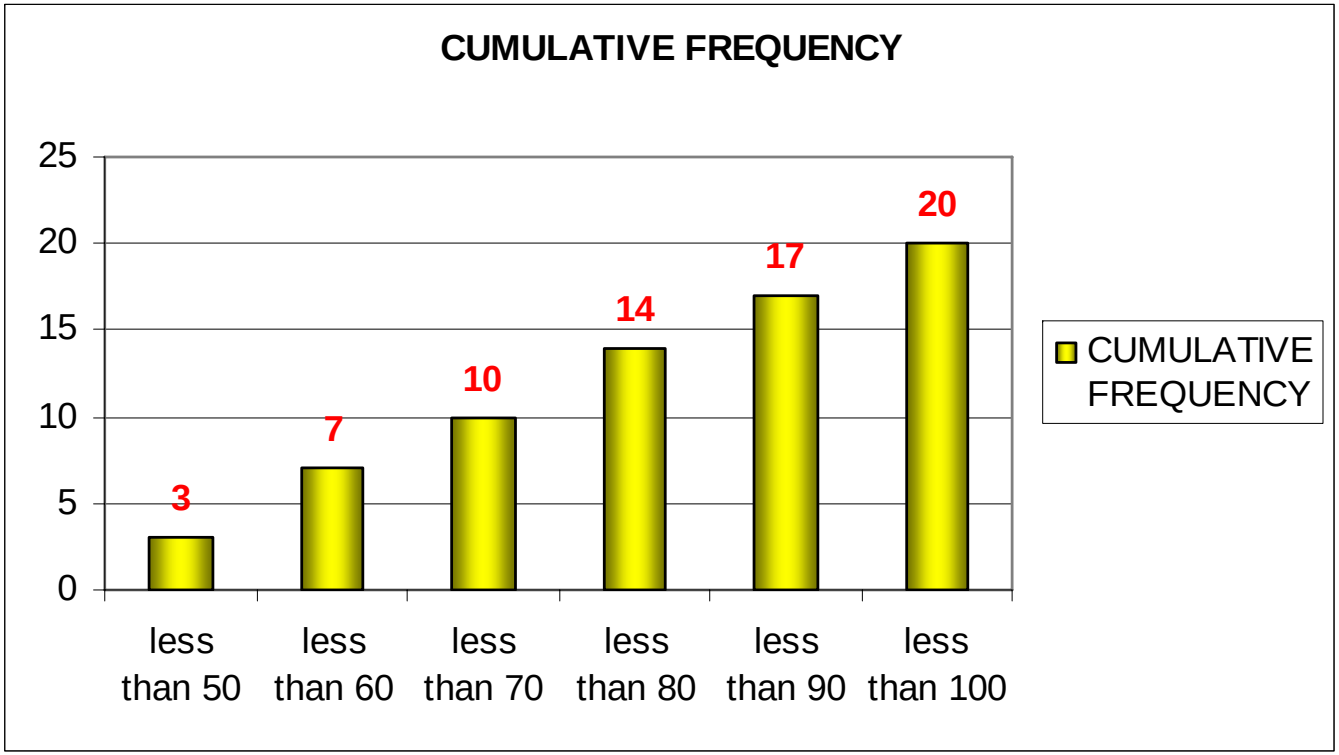
We're now going to look at some other kinds of data displays beginning with a Pareto chart. A Pareto chart arranges the bars in descending order by count or percentage.

GRADE	FREQUENCY
F	7
D	3
C	4
B	3
A	3



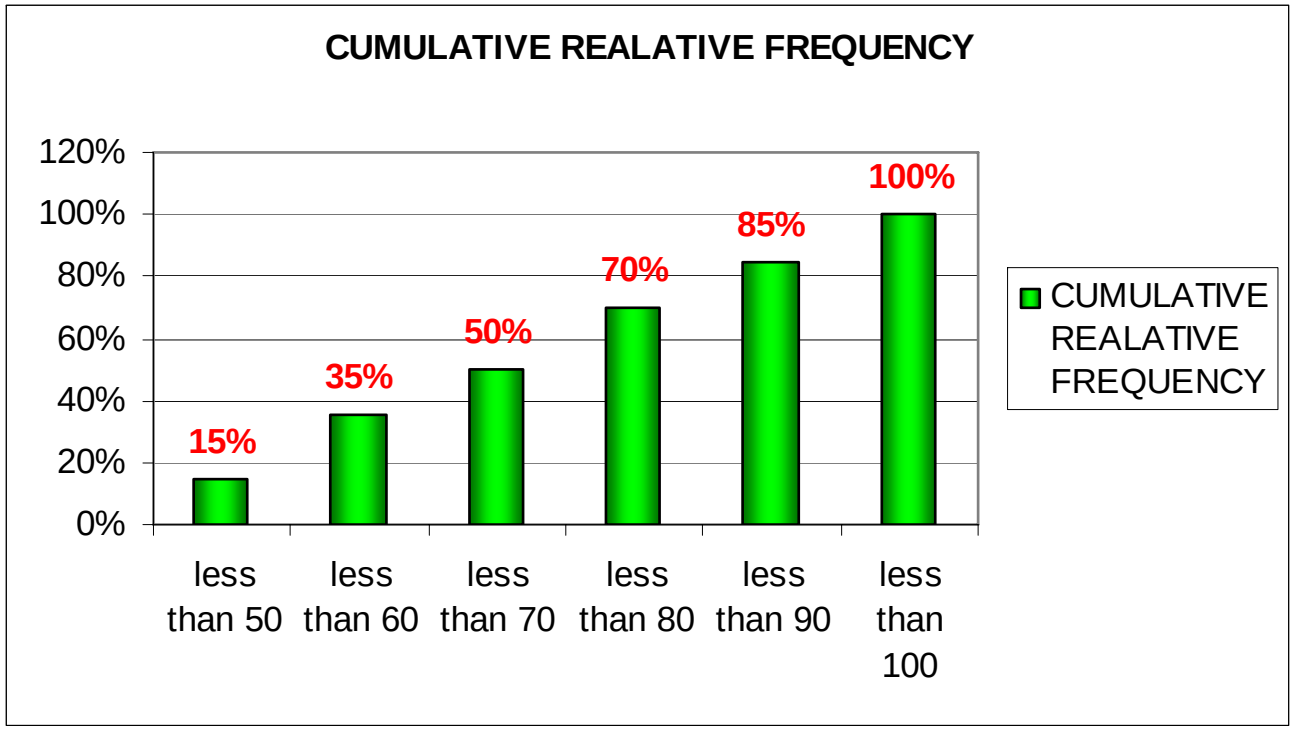
A variation of the frequency distribution we did earlier is the cumulative frequency distribution.

SCORE	CUMULATIVE FREQUENCY
less than 50	3
less than 60	7
less than 70	10
less than 80	14
less than 90	17
less than 100	20



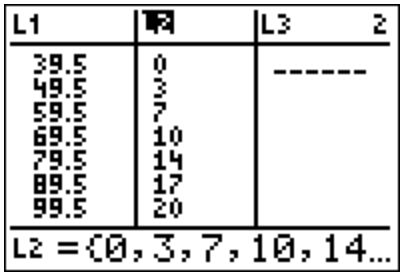
And of course, we can also do a cumulative relative frequency distribution.

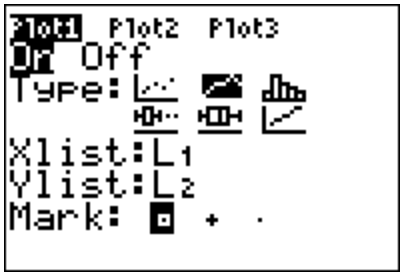
SCORE	CUMULATIVE REALATIVE FREQUENCY
less than 50	15%
less than 60	35%
less than 70	50%
less than 80	70%
less than 90	85%
less than 100	100%

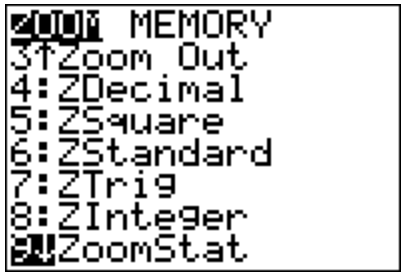


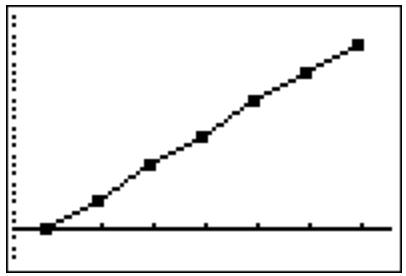
A line graph that displays cumulative frequencies is called an ogive. We will label the horizontal axis using class boundaries.

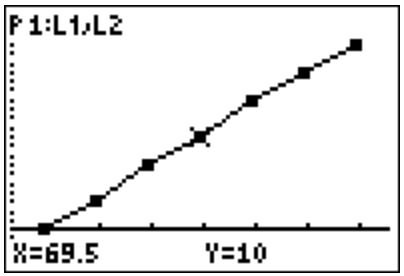
99, 52, 63, 71, 96, 59, 79, 75, 68, 58, 78, 84, 48, 49, 54, 86, 40, 66, 91, 87











Before technology, a preliminary organization of data was often done using a stem-&-leaf plot. Below is a display with single digit leaves.

99, 52, 63, 71, 96, 59, 79, 75, 68, 58, 78, 84, 48, 49, 54, 86, 40, 66, 91, 87

STEM	LEAF
4	8, 9, 0
5	2, 9, 8, 4
6	3, 8, 6
7	1, 9, 5, 8
8	4, 6, 7
9	9, 6, 1

We can turn this stem-&-leaf plot into a dot plot as follows.

STEM	LEAF
4	8, 9, 0
5	2, 9, 8, 4
6	3, 8, 6
7	1, 9, 5, 8
8	4, 6, 7
9	9, 6, 1