To find the mean, median and mode from a histogram, you first need to know how many data points were used.
Use the frequency table and find the total frequency.   **30**

Grade	Frequency
55 50-59	3
65 60-69	5
75 70-79	8
85 80-89	8
95 90-99	6

Mode: **75 + 85**

But can we be exact? **No**

Median: **75**

Mean: **78**

↓ Go into L₁   ↓ Go into L₂

Using a calculator to find mean, median and mode from a frequency table or histogram:
In the STAT list enter "category" into L1 and frequency into L2 (if the category is a range, take the midpoint)

Press STAT → CALC → #1 (1-var-stats) → L1, L2
$\bar{x}$ = mean
MED= median

Example 1:
Numbers of Advertising Spots

TABLE 2-6: Number of Advertising Spots Purchased during 2001 by Members of the Toronto Automobile Dealers' Association

96	93	88	117	127	95	113	96	108	94
148	156	139	142	94	107	125	155	155	103
112	127	117	120	112	135	132	111	125	104
106	139	134	119	97	89	118	136	125	143
120	103	113	124	138					

Create a histogram on your calculator. Then copy the graph. Then create a frequency table and stem and leaf plot for the data. Calculate the mean, median and mode from the frequency table/histogram

Go into the Calc.

Mean: 118.$\overline{7}$

Median: 115

Mode: 115

85	80 – 90	2
95	90 – 100	7
105	100 – 110	6
115	110 – 120	9
125	120 – 130	8
135	130 – 140	7
145	140 – 150	3
155	150 – 160	3

Stem	Leaf
8	8, 9
9	3, 4, 4, 5, 6, 6, 7,
10	3, 3, 4, 6, 7, 8
11	1, 2, 2, 3, 3, 7, 7, 8, 9
12	0, 0, 4, 5, 5, 5, 7, 7
13	2, 4, 5, 6, 8, 9, 9
14	2, 3, 8
15	5, 5, 6

Key: 15|6 = 156

Example 2: The prices of seven race cars sold last week are listed in the table below.

Price per Race Car	Number of Race Cars
$126,000	1
$140,000	2
$180,000	1
$400,000	2
$819,000	1

a) What is the mean value of these race cars, in dollars?

$315,000

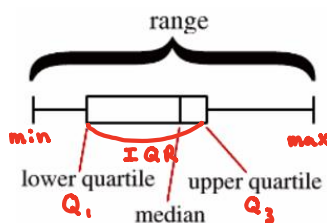b) What is the median value of these race cars, in dollars?

$180,000

c) State which of these measures of central tendency best represents the value of the seven race cars. Justify your answer.

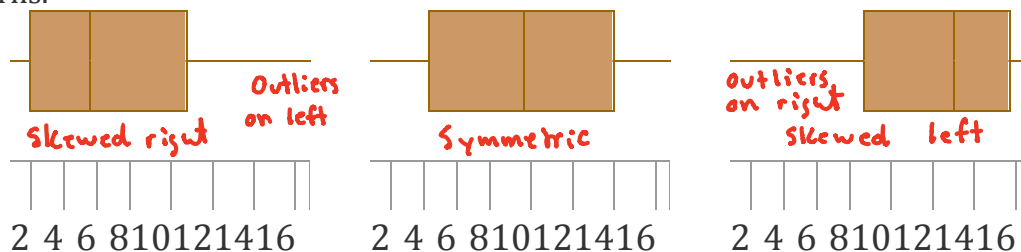Median; $819,000 is an outlier

Box and Whisker Plots

A **box plot** (or **box-and-whisker plot**) provides a visual tool for analyzing information about a data set using the five-number summary.

Boxplots display two common measures of the variability or spread in a data set:

- range   Max. – Min.
- interquartile range (IQR). $Q_3 - Q_1$

Boxplots often provide information about the shape of a data set. The examples below show some common patterns.

Skewed right   Outliers on left   Symmetric   outliers on right   Skewed left

2 4 6 8 10 12 14 16   2 4 6 8 10 12 14 16   2 4 6 8 10 12 14 16

Outliers: A data point that is distinctly separate from the rest of the data. One definition of outlier is any data point more than 1.5 interquartile ranges (IQRs) below the first quartile or above the third quartile.

Finding Outliers:

- Compute the IQR and multiply it by 1.5
- $Q_3 + 1.5IQR$
- $Q_1 - 1.5IQR$

How to Create a Box and Whisker Plot

1. Before drawing a box plot, you must start with a set of data that you find the 5-number summary for. (Minimum, Q1, Median, Q3, and Maximum)
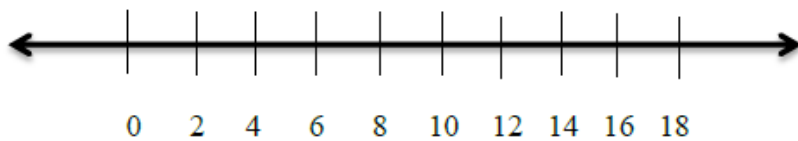   a. Let's use this set: {5, 7, 9, 6, 13, 1} → Put in L₁
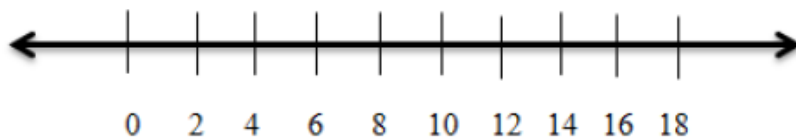   b. ~~Always put the vales in order first! {1, 5, 6, 7, 9, 13}~~
   c. Now you can find the 5-number summary:
      i. Minimum _____1_____
      ii. Q1 _____5_____
      iii. Median _____6.5_____
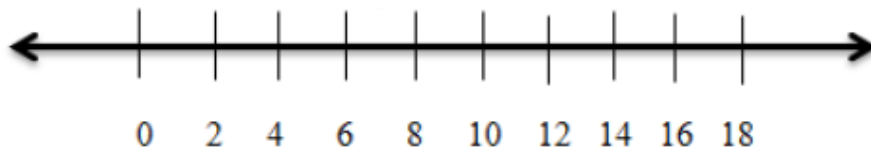   iv. Q3 _____9_____
      v. Maximum _____13_____

2. Begin with a number line that will fit your data, and fill in enough numbers so others will know what scale you are using.
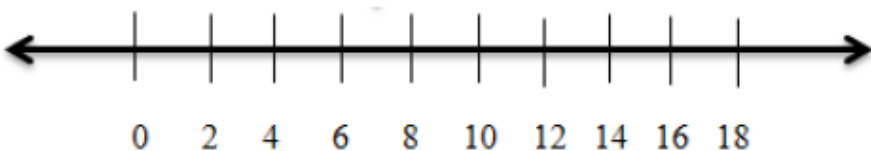
        0   2   4   6   8   10   12   14   16   18

3. Draw 5 dots above the number line to represent the 5-number summary.

        0   2   4   6   8   10   12   14   16   18

4. Next, draw a box around the first – third quartiles and separate using the median.

        0   2   4   6   8   10   12   14   16   18

5. Connect the minimum and maximum to the box plot by drawing straight lines (the whiskers). This demonstrates the range of the data.
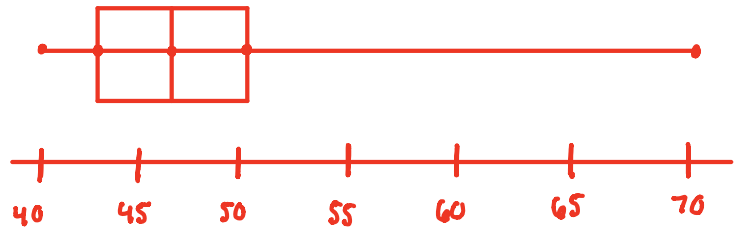
        0   2   4   6   8   10   12   14   16   18

Example 1 Draw a Box-and-Whisker Plot
The following is a list of speeds of 12 of the fastest animals.

Animal	Speed (mph)
Cheetah	70
Pronghorn antelope	61
Wildebeest	50
Lion	50
Thomson's gazelle	50
Quarter horse	47.5
Elk	45
Cape hunting dog	45
Coyote	43
Gray fox	42
Hyena	40
Zebra	40
Source: *The World Almanac*	

Min: 40
Q1: 42.5
Med: 46.25
Q3: 50
Max: 70

→ put in
L₁

Example 2 Draw Parallel Box-and-Whisker Plots
The following table shows the SAT mean verbal and math scores of college-bound seniors for several western states in 2001.

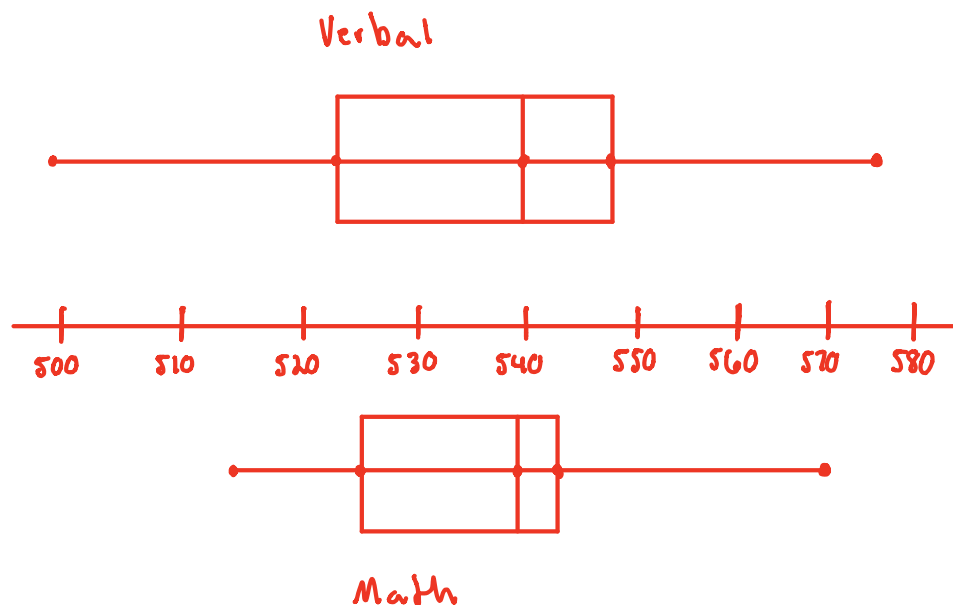| SAT Mean Verbal and Math Scores		
State	Verbal	Math
Arizona	523	525
California	498	517
Colorado	539	542
Idaho	543	542
Montana	539	539
Nevada	509	515
New Mexico	551	542
Oregon	526	526
Utah	575	570
Washington	527	527
Wyoming	547	545
Source: *The World Almanac*		

Verbal

Math

Min: 498
Q1: 523
Med: 539
Q3: 547
Max: 575

Verbal

Min: 515
Q1: 525
Med: 539
Q3: 542
Max: 570

Math

15

1. The chart below shows the frequency of runs batted in (RBI) by the American League batting leaders between 1907 and 1991.

| RBI	Frequency
70-90	2
90-110	11
110-130	39
130-150	17
150-170	9
170-190	7

   a) Find the mean, median and mode from the frequency table.
       (Be sure to use the middle number of the interval for
       calculations)

   b)   In 1991, the RBI champion in the American League
        was Cecil Fielder of the Detroit Tigers with 133 RBI's.
        Write a sentence to compare this number with the mean
        of the data.

2. A small warehouse employs a supervisor at $1200 a week, an inventory manager at $700 a week, six stock boys at $400 a week, and four drivers at $500 a week.

   a) Find the mean, median and mode wage.

   b) How many employees earn more than the mean wage?

   c) Which measure of center best describes a typical wage at this company, the mean or the median? Explain.

3. Three statistics classes all took the same test. Histograms of the scores for each class are shown below.
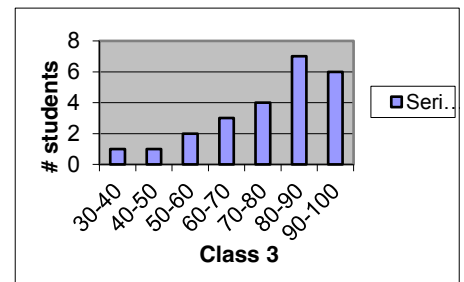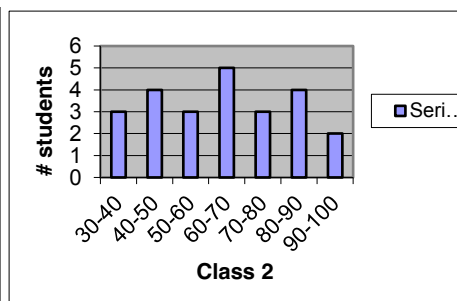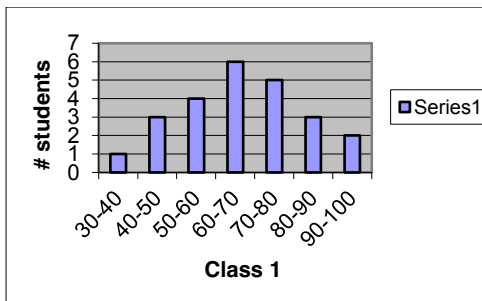
   a) Which class had the highest mean score?

   b) Which class had the highest median score?

   c) For which classes are the mean and median most different? Which is higher? Why?

   d) Describe the shape of *each* graph.

   e) Does there appear to be any gaps or outliers in any of the classes? If so, which ones? Explain.

   f) Which class did better on the test overall? Explain.

Refer to the precipitation data below that shows the normal monthly precipitation, in inches, from 1961 to 1990 for the following cities.

Month	Chicago	L.A.
Jan	1.53	2.40
Feb	1.36	2.51
March	2.69	1.98
April	3.64	0.72
May	3.32	0.14
June	3.78	0.03
July	3.66	0.01
Aug	4.22	0.15
Sept	3.82	0.31
Oct	2.41	0.34
Nov	2.92	1.76
Dec	2.47	1.66

4. Make a box – and – whisker plot for the amount of participation in each city. Use one number line to see the comparison between the two cities. Don't forget to label the five-number summary for each city. (You may want to use .5 as benchmarks on your number line, for ex: 0, 0.5, 1, 1.5, …)

5. How much precipitation would have had to fall in a given month to be considered an outlier in our given data? Find out for each city.

6. Describe the distribution of your data for each city (spread, gaps, outliers and shape of the graph)

7. Find the mean, median and mode for each city.

8. Compare the precipitation in each city, using their box – and –whisker plots and part b. Explain in complete sentences.

9. If next year, Chicago receives an extra inch of rain each month, how would that effect the five-number summary and the three measures of central tendency?