



**Problem 1 – Period 4 vs. Period 5 Test Results**

**Comparing distributions without graphing**

To the right are results from a recent test. The teacher wants to graphically display this data so the students can get a quick sense for how the class did and how they compare with the other class period. Additional benefits of displaying the data graphically are that the students won't see individual results and they will refresh their understanding of histograms and box plots.

Enter the test scores or link and receive the list **P4** and **P5** for period 4 and 5 data.

- Without graphing the data, describe each data set. To better estimate the center and spread of each data set, sort using **STAT 3:SortD(**. Then use **2nd STAT** to select the list P4. Repeat for P5, period 5.

- If you were to make a histogram, what would be an appropriate window? In other words, what is the range of the data?

- How wide would you make the bins in the histogram? For example, if you make the bin width 10, how many period 4 and period 5 students are there with test scores of 60 to 69?

Period 4	Period 5
95	82
98	79
97	93
65	45
55	44
92	91
86	78
95	80
91	99
94	100
93	76
78	66
85	72
100	88
69	74
66	80
91	95
78	83
100	84
	96
	100
	84
	62

**Comparing distributions using histograms**



Graph each data set using a histogram.

Press  $\boxed{Y=}$  and clear or turn off any functions that are graphed. Press  $\boxed{2nd} \boxed{Y=}$  for  $\boxed{[STAT PLOT][STAT PLOT]}$  to open the Stat Plot menu and choose Plot1.

Turn the plot **On**, choose the histogram icon for the plot type as shown on the right. Use  $\boxed{ALPHA}$  to enter **P4** for the Xlist, or find the list in  $\boxed{2nd} \boxed{[LIST]}$ .

Press  $\boxed{WINDOW}$  to explore the data in the window you chose in question #2, or set it up with the window settings on the right. The **Xscl** determines the bin width. Press  $\boxed{GRAPH}$  to see the histogram.

Press  $\boxed{TRACE}$  and the arrow keys to see the contents of each bar.

Press  $\boxed{WINDOW}$  and change the **Xscl** value to adjust the width of the bars of the histogram. Experiment with different **Xscl** values.

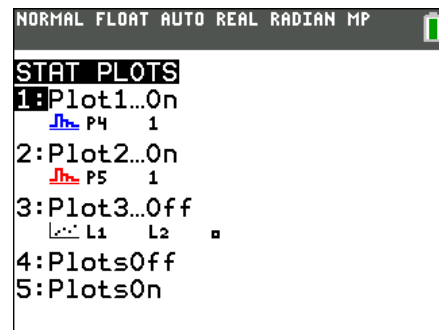
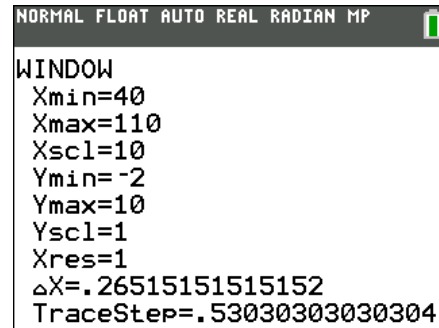
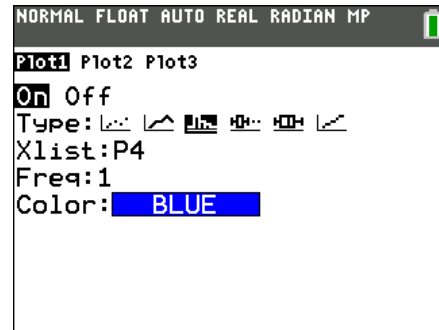
Repeat these steps to graph **P5** as a histogram in Plot2.

View the graphs together to compare them. Turn both Plot1 and Plot2 **On**.

4. Why is it important for the scales to be the same when comparing the data?

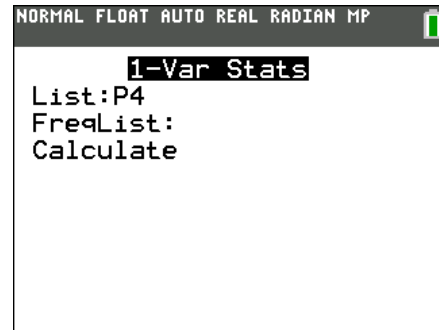
5. Compare the two histograms. Explain the shape and spread.

6. Estimate the mean and median for each team. Which bin do you think the mean will be in? Do you think the median will be to the left or right of the mean? Why?





Now compare your estimate of the mean and median to the actual values. Press **[STAT]**, arrow to the right once to select **CALC** and press **[ENTER]** to select one variable statistics. Press **[2nd]** **[LIST]** to select **P4** for the 4<sup>th</sup> period. Then arrow down to **Calculate** and press **[ENTER]**. The symbol for mean is  $\bar{x}$ . Arrow down to see the median, abbreviated **Med**. Repeat for **P5**, 5<sup>th</sup> period data.



- Record the actual mean and median for both teams and reflect on how your estimation compares.
- What would the graphs look like if the width of the bars is changed? Explore changing the bin width by changing the **Xscl** in **[WINDOW]**. What effect does this have?

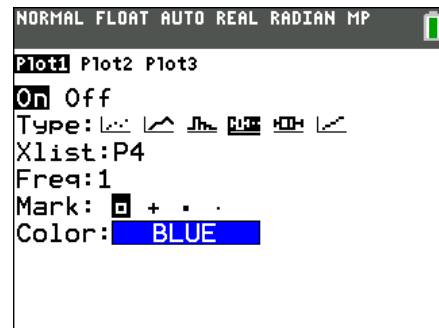
### Comparing distributions using box plots

Sometimes, a box plot is more appropriate or useful to compare two data sets.

Graph each data set using a box plot.

Press **[2nd]** **[Y=]** to change the **[STAT PLOT]** for **Plot1** and **Plot2** to the first type of box plot as shown on the right. Use **ZoomStat** to view the graph in an appropriate window.

Press **[TRACE]** and the arrow keys to see the minimum, lower quartile, median, upper quartile, and maximum of each box plot.



- What is the **IQR**, interquartile range, for period 4 and 5?
- What do the “dots” on period 5’s test score box plot graph indicate?

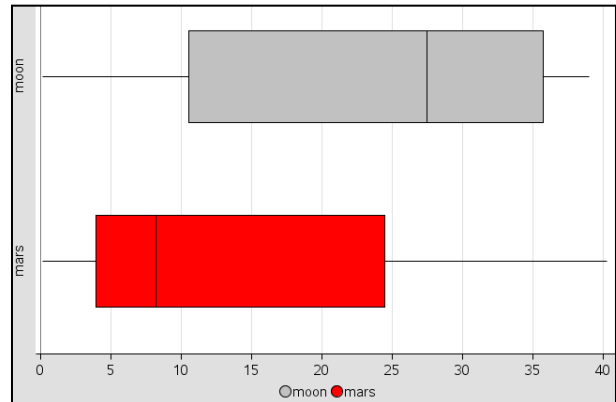


11. Why are there outliers for period 5, but not for period 4?
12. What do you notice about the top 25% of both classes? Compare the two box plots, including shape, spread, and the five-number summary.
13. What conclusions can you make about the test scores of the students in period 4 and 5? Each conclusion needs to be supported by a number or a graph.

**Problem 2 – Moon and Mars Driving Distance**

The graphs to the right come from data about the number of kilometers rovers have traveled on the Moon and Mars. The information comes from NASA JPL and was updated July 28, 2014.

14. Without exploring the actual data, what conclusions can you make from the box plot?



15. Find out how many rovers were manned and compare your conclusions with the details on the chart at <http://www.jpl.nasa.gov/news/news.php?release=2014-245>.