

## Lab 7 – Warm-Up Activity Worksheet – Statistical analysis of data

Reference: Taylor, Chapter 4

Group: \_\_\_\_\_

Analyst: \_\_\_\_\_

Experimenter: \_\_\_\_\_

Recorder: \_\_\_\_\_

### Record all your work in your lab book

1. Four lab groups compare their measurements of  $g$ , the acceleration due to gravity on the Earth's surface, as obtained by measuring the acceleration of a cart on a ramp. Each group repeated their measurement a number of times. Their results are shown in Table 1 below:

Table 1: Measurements of  $g$  ( $\text{m/s}^2$ )

Group A	Group B	Group C	Group D
9.346	9.451	10.227	10.220
9.043	9.736	10.088	9.356
9.537	9.841	10.020	9.850
9.377	9.987	10.932	9.528
9.334	9.732	10.714	9.952
9.429	10.194	10.377	9.500
9.365	9.680	9.986	10.045
9.065	9.882	10.084	10.170
9.259	9.966	10.256	10.656
9.264	9.821	10.498	9.703
9.167	10.020	9.967	8.731
9.721	9.881	9.718	9.380
9.081	9.604	9.938	10.477
9.179	9.349	10.383	9.264
9.122	10.265	10.398	10.281
9.006	9.649	10.413	9.862
9.252	9.826	10.267	10.518
9.232	9.941	10.346	8.820
9.683	9.828	10.181	9.701
9.238	9.574	10.516	9.196

- a. By looking at the data in the table, can you tell if all four sets of data are consistent? Why or why not?

- b. You should find a link to the data in your labscript. Use your spreadsheet program to show each data set as a histogram. Plot all the histograms in the same page; print out the final version and submit with this worksheet. Are all four sets of data consistent? Why or why not? Describe any differences that you notice.
- c. Which group do you think made the best measurement? Why?
- d. In previous labs, we discussed how the best estimate of the result was the mean of several measurements, and showed how the variance was a good representation of the spread of the data. We defined the standard deviation, and the uncertainty in the mean value. Use your spreadsheet program to calculate the mean and standard deviation of each set of data, and the uncertainty in the mean and show the results in the table below.

Group	Mean	Standard Deviation	Uncertainty in the Mean
A			
B			
C			
D			

- e. What is a good estimate of the uncertainty in Group C's measurement of  $g$ ?
- f. Which measurements are in agreement with the accepted value of  $g = 9.81 \text{ m/s}^2$ ? Justify your answer.