

## Activity 3.5 Applied Statistics

### Introduction

Today's consumers are constantly trying to judge the quality of products. But what is quality? How and by whom is quality determined? Some would say the designer creates specifications, which in turn dictate the quality of a product. That quality is also based on the acceptable value of a part within a whole product. Statistics are commonly used in manufacturing processes to control and maintain quality. This activity will allow you to apply statistics in order to analyze and determine the quality of a set of wooded cubes.

In this activity you will collect data and then perform statistical analyses to determine measures of central tendency and variation of the data. You will also represent the data using a histogram.

### Equipment

- Engineering notebook
- Pencil
- Dial caliper

### Procedure

1. Part of the manufacturing quality control testing for a toy is to measure the depth of a connector piece that must fit into another part. The designed depth is 4.1 cm. Every tenth part produced on the production line is measured. The following data was collected during a two minute production period.

4.1, 4.1, 4.0, 4.1, 3.9, 4.4, 3.9, 4.3, 4.0, 4.2, 4.0, 3.8

- a. Calculate each of the following measures of central tendency. Show your work.

Mean: \_\_\_\_\_

Median: \_\_\_\_\_

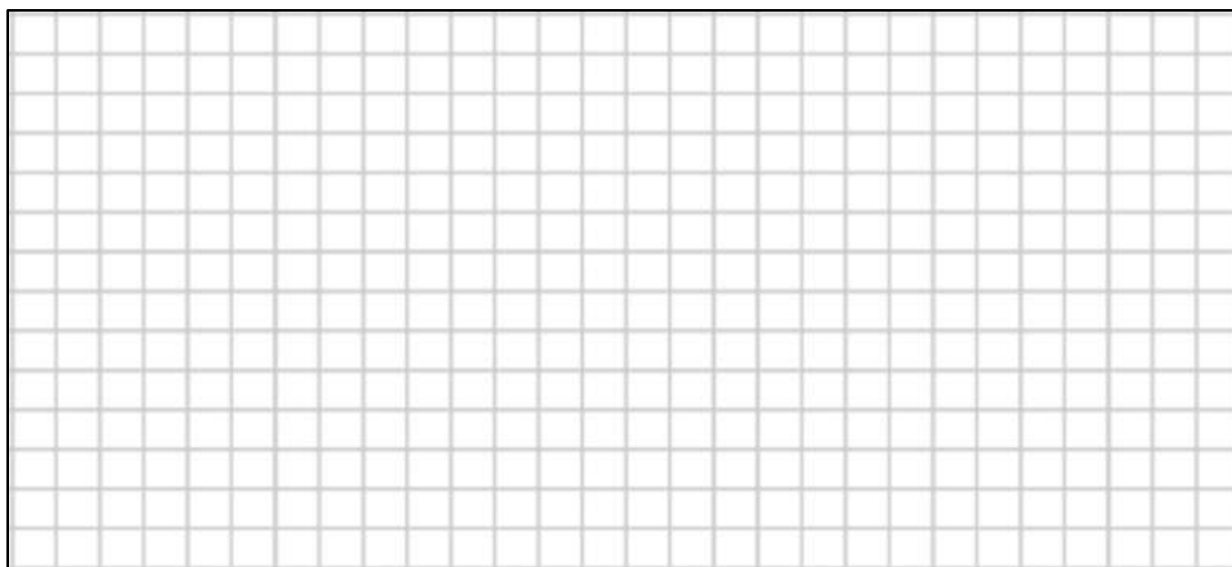
Mode: \_\_\_\_\_

- b. Calculate each of the following measures of variation for the data set. Show your work. A table has been provided to help you calculate the standard deviations. In the table round values in the last two columns to four decimal places. Report the standard deviation statistics to four decimal places.

- Range: \_\_\_\_\_

x	$x - \mu$	$(x - \mu)^2$
SUM		

- Standard Deviation of this data: \_\_\_\_\_
- c. Create a histogram for the data using the grid below. The horizontal axis should display each length measurement from the minimum to maximum recorded lengths. You may choose to begin with a dot plot and then fill in the bars. Be sure to label your axes.



- d. What class interval is appropriate for the measurement values reported as 4.1 cm?

2. Gather measurement data taken by your teammates on Activity 3.3 Making Linear Measurements for the largest outside diameter of the wheel. You should collect at least 5 measurements. In your engineering notebook, list each measurement value recorded by your team (including yours) and show calculations for the mean, median, mode, range and standard deviation. Remember the rules for rounding in statistics. Show your work.
3. Compare your results to a teammate's calculations. Make corrections to your work as necessary.

## **Conclusion**

1. How can statistics of a product's dimensions be used to assess the quality of the product?
2. In which phase(s) of a design process might statistics be most useful? Why?