



## Math Lesson 4: Distribution and Variability

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### Hawaii DOE Content Standards:

Math standard: [Data Analysis, Statistics, and Probability]-Pose questions and collect, organize, and represent data to answer those questions; Interpret data using methods of exploratory data analysis

### Key concept:

The shape of a data set helps summarize the data.

**Performance indicator:** After completing this lesson, students will . . .

- explore concepts of centers and variability
- use measurements in the investigation process

### Vocabulary:

Distribution shapes: symmetric, mound shaped, uniform

### Time:

One class period

### Materials:

TI-84 calculators, View Screen

### Adaptations/ Extensions:

1. *DDM – Mathematics in a World of Data*  
Lesson 12 and/or Lesson 14.
2. Worksheet #2 (See Appendix A)

### Activity:

Have half the students roll a die 10 times and record the number of times the various faces result. (Students will use a Worksheet 2 in Appendix A to record their outcomes). Graph the results on a dot plot on the wall.\* Let the other half of the students flip a coin ten times and record the number of heads they get in ten tosses. Plot their data on a similar dot plot on the wall. If the class is small, switch the groups and have them repeat the exercise, plotting the additional results.

- a. Discuss the shapes of the two distributions – why do you think they are different?\*
- b. Discuss why students got variable results – why didn't the coin toss result in 5 heads each time? Why didn't students tossing the die get an equal number of one's, two's, etc.? (See Appendix C.)

- c. Discuss center and spread of each of the two distributions. What do you notice? What is the range of each distribution?\*

Often small data sets will not display the features we are seeking, but rolling a die or flipping a coin a 100 times is not an easy thing to accomplish. So let's use our calculators to do the job for us.

To simulate the rolling of a die 100 times, go to MATH and arrow right to PRB. Enter 5:randInt/ENTER. After the parentheses type in (1, 6, 100). This tells the calculator that you want integers from 1 to 6 chosen randomly 100 times. But you will want the resulting data stored somewhere, so choose a list (let's say List 5) and continue by typing STO-->L5. (Your screen should show *randInt(1,6,100)-->L5*.) Now press ENTER. You will see displayed on your screen the results of your first several "rolls" of the die. Scroll to the right to see more. Now go to STAT/EDIT and look at the results stored in List 5. Now ask your calculator to plot a histogram using the data from List 5. Does your histogram look very uniform? Compare your histogram with the others in the class. All of you will have different results for our simulation. Perhaps you need more data to make your histogram appear more uniform. Follow the directions above, but this time ask for 500 rolls of the die. (Go to MATH and arrow right to PRB. Enter 5:randInt. After the parentheses type in (1, 6, 500)-->List 5.) Now plot the resulting histogram. Does the distribution look more uniform than your previous histogram?

**If at any time you need to clear the calculator screen and pressing the CLEAR button does not accomplish that, press "2nd QUIT".**

Now, let's see how many heads you will get in 10 tosses, but let's do it many more times by letting the calculator simulate the tosses. Clear all your lists. (STAT/EDIT/4/enter List number, press ENTER.) Go to MATH and arrow right to PRB. Enter 5:randInt. After the parentheses type in (0, 1, 10)-->List 1. We'll let 0's represent tails and 1's represent heads. The 10 in parentheses shows how many times we have "tossed the coin". The arrow comes from the STO--> button, showing that we have stored our results in List 1. You will see the entries for List 1 displayed below your instructions on the screen as in {0 1 1 0 0 0 1 0 1 1 }. To avoid having to count the number of 1's in the list to see how many heads you got, go to STAT/CALC/1-Var Stats/ENTER and look for  $\Sigma x$  which represents the sum of the entries in the list. This sum represents the number of heads in 10 tosses. Record the number of heads for each experiment on a chart. Repeat the experiment with the calculator as many times as needed. A quick way to do this is after you press enter for the instructions above, press 2<sup>nd</sup> ENTER which will take your screen back to the previous entry. Arrow back to highlight the list number and press delete. Now enter the number of another list and proceed as above. Keep adding the results to the dot plot to eventually see a mound-shaped distribution take shape.

