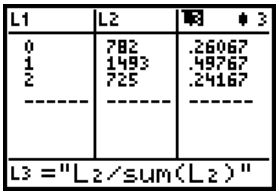
CHAPTER 6 PROBABILITY MODELS

Section 6.1 ▪ Sample Spaces with Equally Likely Outcomes

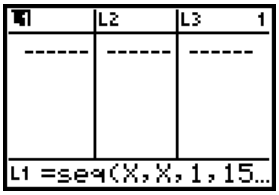
Where Do Probabilities Come From?

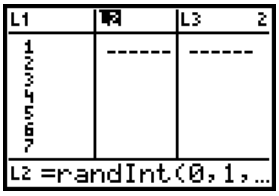


A frequency table can easily be converted into a relative frequency table using the List Editor of the TI-83 and TI-83 Plus. This allows you to assign probabilities based on observed data (long-run relative frequencies). First enter the possible values into list L1 and enter the frequencies into list L2. Then define list L3 as the relative frequencies with the expression **L2/sum(L2)**. You find the **sum(** command by pressing 2nd [LIST] MATH **5:sum(**.

For example, here are the data from Display 6.2 on page 330 of the *Statistics in Action* student text.

The Law of Large Numbers





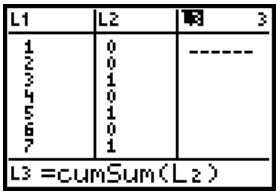
You can use the TI-83 and TI-83 Plus to simulate flipping a coin, keep track of the cumulative proportion of heads, and make a graph similar to Display 6.4 on page 334 of the *Statistics in Action* student text.

a. Enter the flip numbers into list L1, for example, the whole numbers 1 to 150. The sequence command, found by pressing 2nd [LIST] OPS **5:seq(**, is a convenient way to enter these whole numbers. Enter the command in the form **seq(***formula, variable, start, end, increment***)**. For example, define list L1 with the expression **seq(x,x,1,150,1)**.

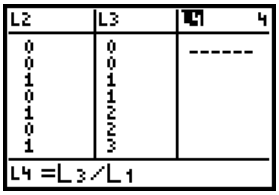
b. Enter the outcomes of the flips into list L2: 1 = heads or 0 = tails. To simulate flipping fair coin that has .5 probability of heads, use the random integer generator **randInt(0,1,150)**. You find the **randInt(** command by pressing MATH **PRB 5:randInt(**. The command's syntax is **rantInt(***lower integer, upper integer, number of trials***)**. That is, **randInt(0,1,150)** randomly selects 0 or 1 one hundred fifty times with equally likely results.

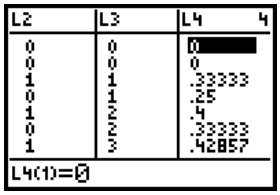
To simulate a coin that has a different probability of heads, for example .4, use the random binomial generator **randBin(1,.4,150)**. You find the **randBin(** command by pressing MATH **PRB 7:randBin(**. The command's syntax is **randBin(***number of trials, probability of success, number of simulations***)**. Because you want the individual results from 150 flips, *number of trials* equals 1 and number of simulations equals 150. That is, **randBin(1,.4,150)** randomly selects 0 or 1 one hundred fifty times where the probability of success (1 = heads) is .4. You'll learn more about binomial probability in Chapter 7 of the *Statistics in Action* student text, and you'll learn more about the **randBin(** command in Chapter 8 of this Calculator Guide.

c. Define list L3 as the cumulative number of heads, **cumSum**(L2). Find the **cumSum**(command by pressing 2nd [LIST] **OPS 6:cumSum(**.

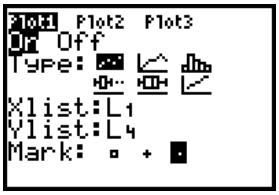


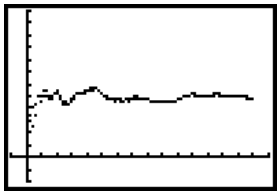
d. Define list L4 as the proportion of heads accumulated after each flip, or L3 divided by L1.



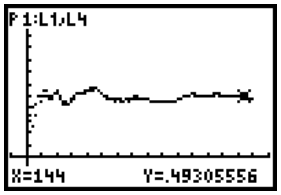


e. Make a scatterplot of the proportion of heads accumulated after each flip (L4) versus the number of the flip (L1). Tracing the plot supports the law of large numbers. For this simulation, as the sample size gets larger, the sample proportion approaches the population proportion of .5.





[−10, 160, 10, −0.2, 1.2, 0.1]



[−10, 160, 10, −0.2, 1.2, 0.1]