Appendix A

Simulating Randomness in Technology Tools

Technology tools can help tremendously when you want to simulate a probability experiment. Using a coin gives students a tangible way to visualize a repeatable process, which is an important part of understanding a simulation. As stated earlier, even for a given physical object, it is impossible to really know the true probability of an event happening. Thus, in the activity in Section 1, our simulation using a real coin toss had some assumptions about the approximate regularity of the coin and the way we were tossing it so that we could estimate the probability of landing on a head as 50%.

Some assumptions also need to be made when we use technology tools to simulate probability experiments. All operations with electronic computing tools are based on deterministic algorithms. That is, the outcome of every process in the machine is determinable if you know the algorithm used. Most electronic computing tools (calculators, computers) have built-in functions for generating numbers between 0 and 1. Also, many have built-in functions to generate numbers from a set of integers. For example, there are functions that can be used to choose an integer between 1 and 6 for simulating a die toss. The initial input for a particular function, called a **seed value**, is selected from a long list of numbers. This tells the computer where in the list of numbers to begin its computation. Thus, if you know the input seed value and the algorithm used, you should be able to determine the output value. The term **pseudo-random number generator** is used to describe this process. The process is not truly random and is deterministic if you know the seed value and algorithm. However, if you do not know the seed value or the algorithm used, it is not likely that you can predict the output of a computer's random function.

FOCUS ON PEDAGOGY

Q8. Would you prefer to discuss the importance of a seed value with students or to set all the graphing calculators with different seed values yourself and not discuss the issue with students? Explain your choice.

Q9. How could you use the fact that many calculators and computers generate the same list of pseudo-random numbers given the same initial seed value to generate discussions with students about randomness in general and the use of computers to simulate probability experiments?