

## A Chance at Monte Carlo Activity — Post-Quiz Assessment – **Answers**

1. What is the significance of a geometrical constant? Give an example.

**This is a “number” that is defined by underlying geometrical relationships. Its value is special, but does not correctly identify the meaning of the constant.  $\pi$  is the most famous example, defined by the ratio of a circle’s circumference to its diameter. This is true for any circle.**

2. Quantities are often approximated in experimental science?  True OR False (please circle)

3. Explain the idea of using simulated models for experiments:

**We can “mock up” the relevant parts of a physical scenario to conduct an experiment and make observations.**

4. Suppose you want to automatically assign numbers to baseball players by randomly drawing 9 numbers with replacement from a large range of numbers. Each team needs 9 numbers, and within a team, all the numbers must be unique. If the range is too small (say 1 through 30), then there is a large chance that you will get repeated numbers within a team.

Can you think of a way of testing to see what range of numbers almost never yields repeated player assignments?

**Calculating the probability of a repeated number for a given range can be done explicitly, but is a little tedious. However, testing for a given range can also be set up as a Monte Carlo simulation. For a given range, draw 9 random numbers and check for repeats. Repeat this draw many times (1000, 10000, etc.) to get an empirical frequency of repeats for this range. The appropriate range of numbers is found when the empirical frequency of repeats is "almost never" (1%, 0.1%, etc.).**

5. The phrase “uniformly random” means:
- a. scattered everywhere
  - b. occurring with equal probability anywhere
  - c. scattered with equal spacing
6. A simulation is
- a. thinking of how an event will happen
  - b. conducting an experiment
  - c. artificially modeling and enacting an event

7. The number  $\pi$  is
- a. 3.141592.....
  - b. the naturally occurring constant relating any circle's radius to other geometrical features (circle length, area, etc.)
  - c. cannot be written as a simple fraction
  - d. all of the above**

How do you agree with these statements:	Strongly Agree	Agree	Don't Know	Disagree	Strongly Disagree
Computers are useful for numerical calculation.	<b>X</b>				
Any mathematical problem can be solved with the right formula.					<b>X</b>
We can use random sampling for insight into complex problems.	<b>X</b>				