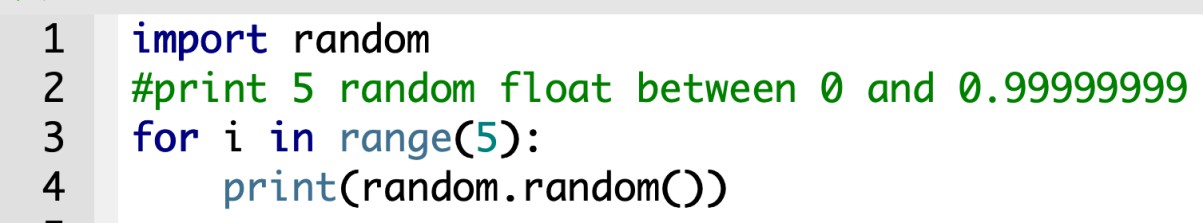
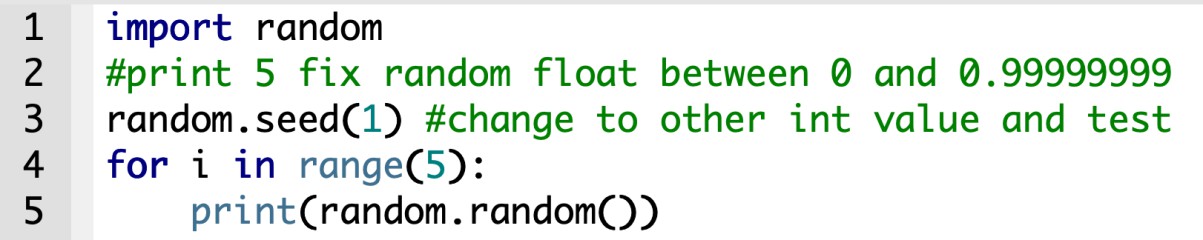
Lesson 2c worksheets

1. Generating random numbers

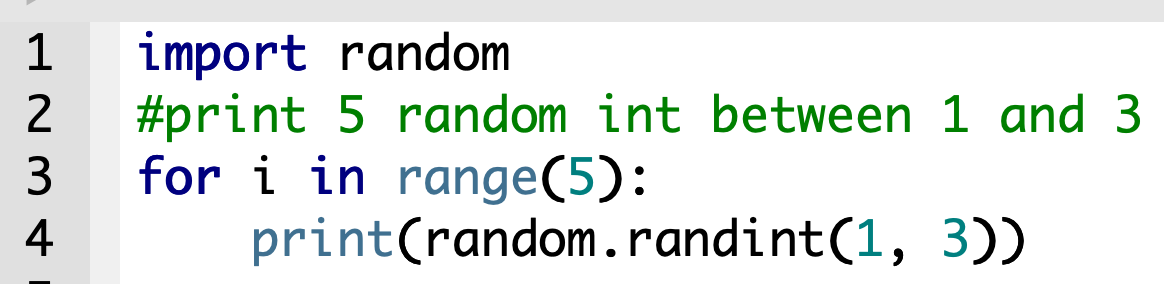
* The random module provides random number generation for python
* Calling the random() function returns the next random floating point value from the generated sequence
* All of the returned values fall within the range 0 <= n < 1.0



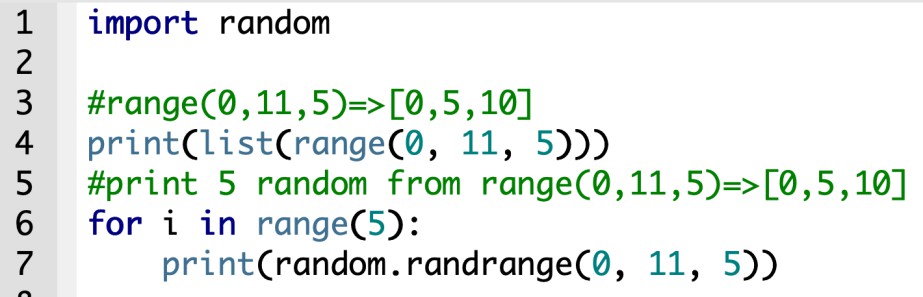
1. Seeding

* random() produces different values each time it is called
* There is a long period before it repeats any numbers
* If you want to be able to repeat your experiment, you can use a seed value
* The same values will come up every time you run the code.

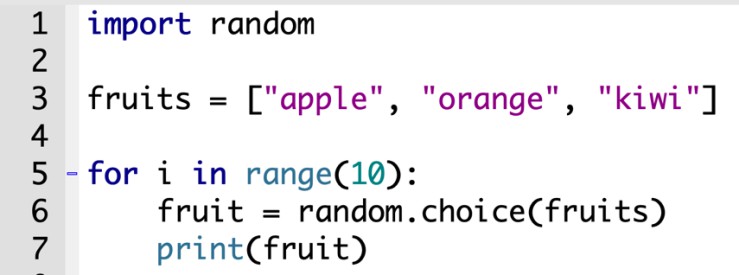
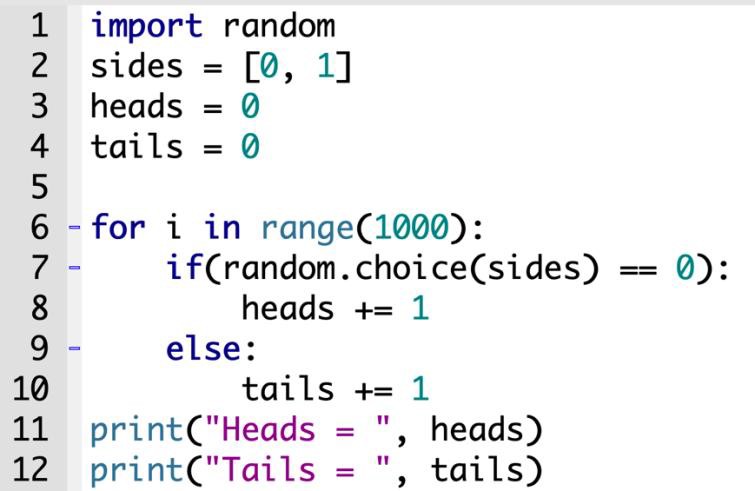
1. Random integer

* random() generates floating point numbers.
* The best way to generate integers is with randint()
* The arguments to randint() are the inclusive range for the values:

1. Random integer range()

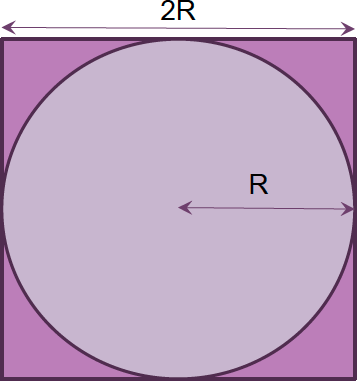
* randrange() gives the option for a step argument (start, stop, step):

1. Picking random items

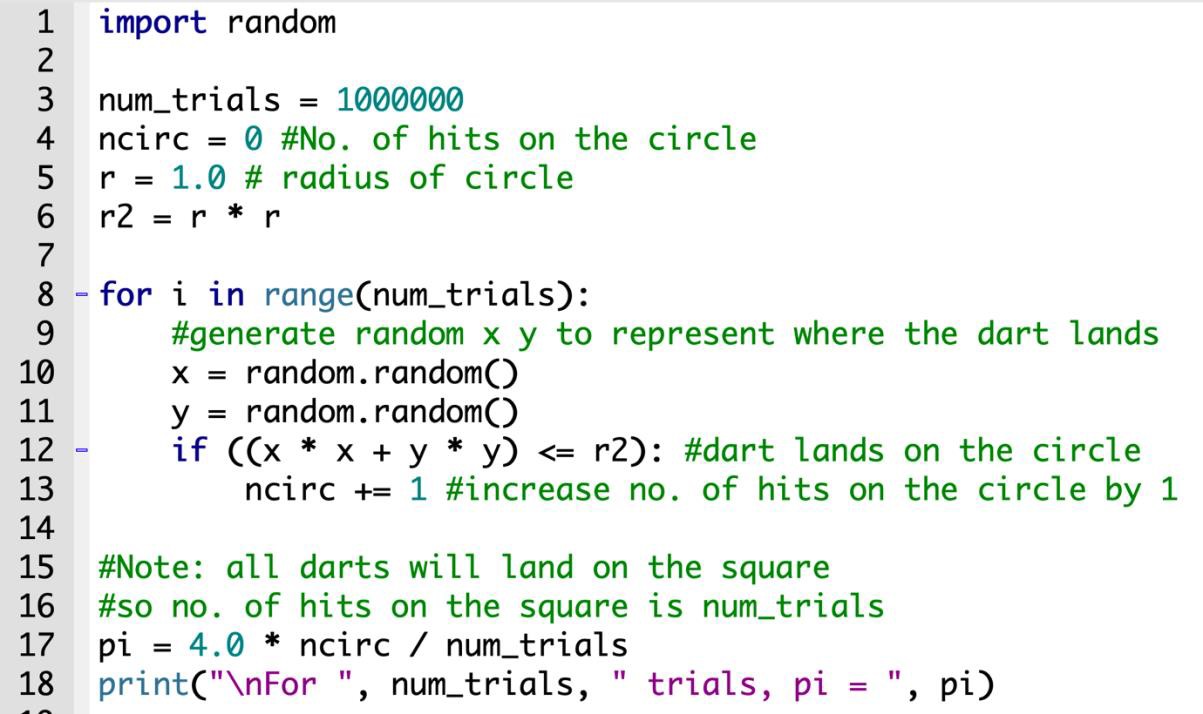
* The choice() function makes a random selection from a sequence
* In this case, the sequence is 0 and 1 representing heads or tails.

1. Monte Carlo Techniques

* The core idea of Monte Carlo (MC) is to learn about a system by simulating it with random sampling.
* It is powerful, flexible, and very direct.
* MC is often the simplest way to solve a problem, and sometimes the only feasible way.
* The Monte Carlo method is used in almost every quantitative subject of study:
* physical sciences, engineering, statistics, finance, and computing, including machine learning and graphics.
* Method of Darts
  + Assume a dartboard with a circle of radius R inside a square
  + Area of circle = πR2
  + Area of square (2R)2 = 4R2
  + Rearrange the above equation we get:



* How to find area of circle and square?
* Suppose we threw darts (completely randomly) at the dartboard.
* Count:
  + Number of darts landing in circle (i.e. the area of circle)
  + Number of darts landing in square (i.e. the area of square)
* Ratio of these numbers \*4 gives approximation to the value of pi.
* Quality of approximation increases with number of darts thrown.



* Increase the num\_trials and observe that the value of pi becomes more accurate.
* Note: this is a highly inefficient approach for calculating pi