

## 22C:16 Homework 5

Due via ICON on Wednesday, March 2nd, 4:59 pm

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1. Consider the following function definition.

```
def test(a = 10, b = 15, c = 20):  
    return (a/b)*c
```

For each of the function calls below, write down (i) the values that the parameters of `test` take on and (ii) the value that is returned by the function.

- (a) `test()`
  - (b) `test(10.0)`
  - (c) `test(30)`
  - (d) `test(40, 40)`
  - (e) `test(c = 50)`
  - (f) `test(c = 50, a = 15)`
  - (g) `test(30, c = 50, b = 10)`
  - (h) `test(40, 40, 40)`
  - (i) `test(len("hello"), 1)`
  - (j) `test(round(-8.678))`
2. These problems go together and you should submit a single Python file corresponding to Parts (a)-(c) of this problem.
- (a) Write a function that simulates the roll of two  $n$ -sided dice and returns the sum of the outcomes of the two dice rolls. The function should take  $n$  as a parameter with a default value of 6.
  - (b) Write a function that simulates the roll of two  $n$ -sided dice  $m$  times and returns the number of times  $p$  appears as the sum of the outcomes of the two dice rolls. The function should take  $n$ ,  $m$ , and  $p$  as parameters with a default value of 6 for  $n$  and 1000 for  $m$ . This function should repeatedly call the function you wrote for Part (a).
  - (c) Write a program that prints out, for each integer  $i$ ,  $2 \leq i \leq 12$ , the number of times (out of 1000 trials) that  $i$  appears as the sum of the rolls of two 6-sided dice. In other words, your program should roll two 6-sided dice 1000 times and report the number of times 2 shows up. It should then roll two 6-sided dice 1000 times and report the number of times 3 shows up. It should repeat this process for each  $i = 2, 3, 4, \dots, 12$ . Your program should call the function you wrote for Part (b) repeatedly.
  - (d) Examine the numbers you got in Part (c) for each  $i = 2, 3, 4, \dots, 12$ . Are they all roughly equal, i.e., is each number 2 through 12 equally likely to appear as the sum of the two dice rolls? In 2-3 sentences can you describe and explain the trend you see in this data.

3. Write a function called `twoDRandomWalk` that simulates a 2-dimensional random walk. This function starts off a “robot” at point  $(0, 0)$  and then in each step of the random walk the robot moves 1 step in one of 4 directions (north, south, east, west) chosen at random with equal probability. Imagine that there is a  $2n \times 2n$  square “barrier” centered around point  $(0, 0)$  and the random walk ends when the robot reaches any point on this barrier. More precisely, for any given positive integer  $n$ , the barrier is defined by the lines  $x = n$ ,  $x = -n$ ,  $y = n$ , and  $y = -n$ . The function should return the number of steps the robot took before ending the random walk. The function should have the following header:

```
def twoDRandomWalk(n = 100, printOn = False):
```

where the first parameter `n` specifies the barrier, while the second argument `printOn` tells the function whether it should do its work quietly or whether it should print the locations of the robot and it travels. In other words, if `printOn` is `True` then the function prints the robot locations as it moves. This is in addition to returning the length of the random walk. If `printOn` is `False` then the function prints nothing and simply returns the length of the random walk.

4. **Extra Credit: 10 points.** The 2011 University of Iowa Computing Conference is being held on Feb 25th (starting at 6 pm on Friday) and Feb 26th. For details visit <http://www.acm.uiowa.edu/uicc/>. The keynote speech is by Prof. Ron Vetter, who will talk about developing mobile phone applications. This is in Room 1505 Seamans Center at 6 pm. Attend this talk and write a 1 paragraph (5-7 sentences) summary of the talk.
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