6.00 Quiz 2, Practice Questions

This quiz is open book and open notes, but do not use a computer (or cell phone!). You have 90 minutes.

Please **write your name on the top of each page**. Answer all questions in the boxes provided.

1) Are each of the following True or False?

1.1. In Python, a subclass can override methods of its superclass.

1.2. Standard deviation and coefficient of variation are different names for the same thing.

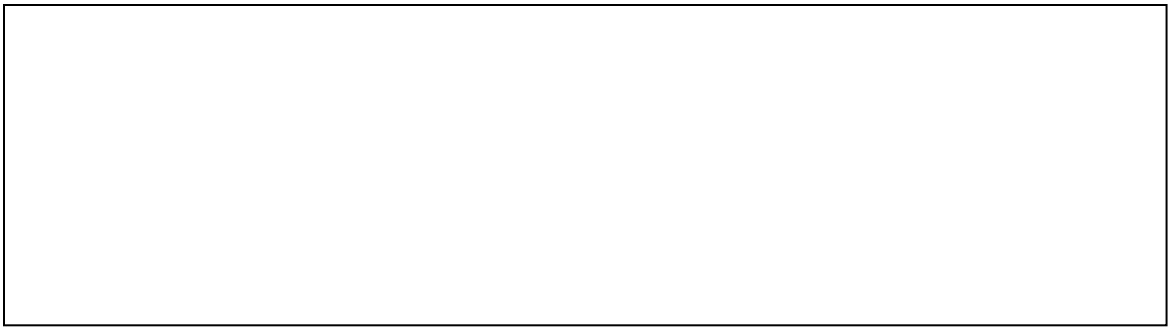
1.3. Unit testing is useful for debugging.

1.4. In Python, functions **cannot** be used as actual parameters.

1.5. Increasing the size of a hash table typically **increases** the amount of time needed to locate a value in the table.

2) What does the following code print?

```
x = '11010'
y = 0
for i in range(len(x)):
    y += int(x[i])*(2**i)
print y
```



3) Consider the code:

```
import random
g1 = 0
g2 = 0
mean = 100.0
stdDev1 = 0.0
stdDev2 = 20.0
for i in range(1000):
    g1 += random.gauss(mean, stdDev1)
    g2 += random.gauss(mean, stdDev2)
```

3.1) What is the expected value of g1? (4 points)

3.2) What is the expected value of g2? (4 points)

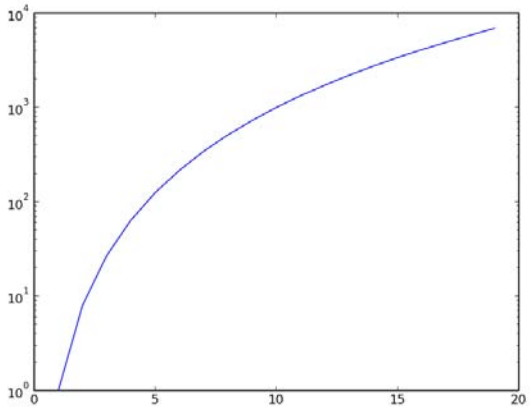
4) Consider the code:

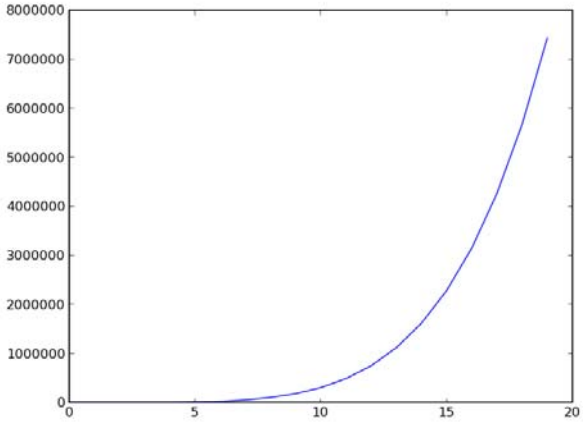
```
num6 = 0
for test in range(10):
    d = random.choice(range(10))
    if d == 6:
        num6 += 1
```

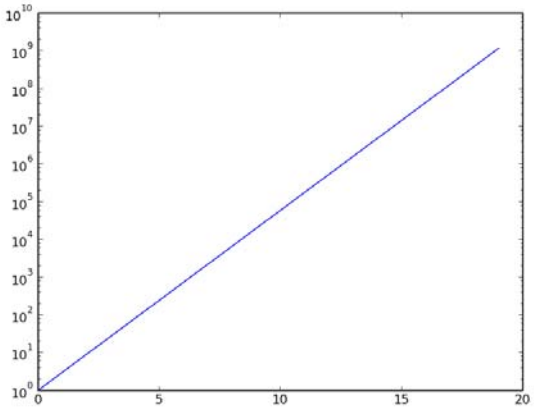
What is the probability of the final value of `num6` being `0`? (10 points)

5) The code below produces three plots. Match each of the plots on the next page with the appropriate figure (Figure 1, Figure 2, or Figure 3). (15 points)

```
y1 = []
y2 = []
y3 = []
for i in range(20):
    y1.append(3*i**5)
    y2.append(i**3)
    y3.append(3**i)
pylab.figure(1)
pylab.plot(y1)
pylab.figure(2)
pylab.plot(y2)
pylab.semilogy()
pylab.figure(3)
pylab.plot(y3)
pylab.semilogy()
pylab.show()
```


10^4
10^3
10^2
10^1
10^0
0
5
10
15
20


8000000
7000000
6000000
5000000
4000000
3000000
2000000
1000000
0
0
5
10
15
20


10^{10}
10^9
10^8
10^7
10^6
10^5
10^4
10^3
10^2
10^1
10^0
0
5
10
15
20

6) What does the following code print?

```
class Shape(object):
    def __eq__(s1, s2):
        return s1.area() == s2.area()
    def __ge__(s1, s2):
        return s1.area() >= s2.area()

class Square(Shape):
    def __init__(self, h):
        self.side = float(h)
    def area(self):
        return self.side**2
    def __str__(self):
        return 'Square with side ' + str(self.side)

class Circle(Shape):
    def __init__(self, radius):
        self.radius = radius
    def area(self):
        return 3.14159*(self.radius**2)
    def __str__(self):
        return 'Circle with radius ' + str(self.radius)

def f(L):
    if len(L) == 0: return None
    x = L[0]
    for s in L:
        if s >= x:
            x = s
    return x

s = Square(4)
print s.area()
L = []
shapes = {0:Circle, 1: Square}
for i in range(10):
    L.append(shapes[i%2](i))
print L[4]
print f(L)
```

7) Consider the two functions specified below that are used to play a "guess a number game."

```
def cmpGuess(guess, maxVal):
     """Assumes that guess is an integer in range(maxVal).  returns
-1 if guess is < than the magic number, 0 if it is equal to the
magic number and 1 if it is greater than the magic number.  The
magic number is in range(maxVal)."""

def findNumber(maxVal):
     """Assumes that maxVal is a positive integer.  Returns a
number, num, such that cmpGuess(num, maxVal) == 0."""
```

Write a Python implementation of `findNumber` that guesses the magic number defined by `cmpGuess`. Your program should run `in O(log maxVal)` time.

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