Randomness & Classes

CS 177 - Recitation 10
Announcements

• Project 3 is posted (due 11/09 at 23:59 PM)

• Read files (balance.txt, transaction.txt) fetch a web-page, parse and process data
Outline

• Randomness
• Introduction to Classes
Randomness
random.random()

random.random() -> x in the interval [0, 1).
random.randint()  

Return random integer in range \([a, b]\), including both end points.

```python
>>> import random
>>> random.randint(5, 10)
7
>>> random.randint(5, 10)
9
>>> random.randint(5, 10)
10
>>> random.randint(5, 10)
8
>>> random.randint(5, 10)
5
```
random.randrange()

Choose a random item from range(start, stop[, step]).

This fixes the problem with randint() which includes the endpoint; in Python this is usually not what you want.
random.shuffle()

Shuffle list x in place, and return None.

>>> import random
>>> a = [1,2,3,4,5]
>>> random.shuffle(a)
>>> a
[2, 1, 3, 5, 4]
bar graph using matplotlib

```python
import matplotlib.pyplot as plt

pos = [1,2,3,4,5]
data = [10,16,20,30,40]

bar1 = plt.bar(pos, data, width=1, 
               color='yellow', align='center')

plt.savefig('test.png')
```
import matplotlib.pyplot as plt

pos = [1,2,3,4,5]
data = [10,16,20,30,40]

bar1 = plt.bar(pos, data, width=1,
color='yellow', align='center')

plt.savefig('test.png')
bar graph using matplotlib
generate random numbers

# Pseudocode

do 100000 times:
    a = pick a random number between [1, 10]
plot the histogram of a's
generate random numbers

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How to do this in Python?
generate random numbers

Pseudocode:

```python
# Pseudocode
do 100000 times:
a = pick a random number between [1, 10]
plot the histogram of a's
```

How to do this in Python?

No, please…
Somebody actually tell me how to do this in Python.
generate random numbers

```python
import random
import matplotlib.pyplot as plt

pos = range(1,11)
data = [0] * 10

for i in range(100000):
    ...?
    ...?

bar1 = plt.bar(pos, data, width=1, \
    color='yellow', align='center')

plt.savefig('test.png')
```
generate random numbers

```python
import random
import matplotlib.pyplot as plt

pos = range(1,11)
data = [0] * 10

for i in range(100000):
    a = random.randrange(1,11)
    data[a-1] += 1

bar1 = plt.bar(pos, data, width=1, \
               color='yellow', align='center')

plt.savefig('test.png')
```
generate random numbers
generate random numbers

```do 100000 times:
a = pick a random number between [1, 10]
b = pick a random number between [1, 10]
c = a + b
plot the histogram of c's```
generate random numbers

```python
import random
import matplotlib.pyplot as plt

pos = ?
data = ?

for i in range(100000):
    a = random.randint(1,11)
    b = random.randint(1,11)
    data[ i ] += 1

bar1 = plt.bar(pos, data, width=1, \
               color='yellow', align='center')

plt.savefig('test.png')
```
generate random numbers

```python
import random
import matplotlib.pyplot as plt

pos = range(2, 21)
data = [0] * 19

for i in range(100000):
    a = random.randrange(1, 11)
    b = random.randrange(1, 11)
    data[a+b-2] += 1

bar1 = plt.bar(pos, data, width=1, color='yellow', align='center')

plt.savefig('test.png')
```
generate random numbers
generate random numbers

do 100000 times:
    a = pick a random number between [1, 10]
    b = pick a random number between [1, 10]
    c = pick a random number between [1, 10]
    d = pick a random number between [1, 10]
    e = pick a random number between [1, 10]
    f = a + b + c + d + e
plot the histogram of f's

How to do this in Python?
generate random numbers

```python
import random
import matplotlib.pyplot as plt

pos = ?
data = ?

for i in range(100000):
    a = random.randrange(1,11)
    b = random.randrange(1,11)
    c = random.randrange(1,11)
    d = random.randrange(1,11)
    e = random.randrange(1,11)
    data[ ? ] += 1

bar1 = plt.bar(pos, data, width=1, \color='yellow', align='center')

plt.savefig('test.png')
```
generate random numbers

```python
import random
import matplotlib.pyplot as plt

pos = range(5, 51)
data = [0] * 46

for i in range(100000):
    a = random.randrange(1, 11)
    b = random.randrange(1, 11)
    c = random.randrange(1, 11)
    d = random.randrange(1, 11)
    e = random.randrange(1, 11)
    data[a+b+c+d+e-5] += 1

bar1 = plt.bar(pos, data, width=1, \
               color='yellow', align='center')

plt.savefig('test.png')
```
generate random numbers
generate random numbers

• Is this Magic?

• Any Statistics majors in the class?
Introduction to Classes
We know how to define functions

Define a function:

```python
def function(value):
    temp = value * value
    return temp
```

Call a function:

```python
def main():
    result = function(10)
    print(result)
main()
```
We also used some other classes and objects

But we did not define any classes yet.

We will learn how to define classes today.
Define & use a class

How to define a class:

class Point:
    def __init__(self, x, y):
        self.x = x
        self.y = y

    def printPoint(self):
        print('(', self.x, ',', self.y, ')')

How to use the class:

def main():
    p = Point(10, 50)
    p.printPoint()

    main()
Define & use a class

How to define a class:

```python
class Point:
    def __init__(self, x, y):
        self.x = x
        self.y = y

    def printPoint(self):
        print('(', self.x, ',', self.y, ')')

def main():
    p = Point(10, 50)
    p.printPoint()

main()
```

How to use the class:

constructor function
Define & use a class

How to define a class:

```python
class Point:
    def __init__(self, x, y):
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    def printPoint(self):
        print('(', self.x, ',', self.y, ')')
```

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```python
def main():
    p = Point(10, 50)
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main()
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Define & use a class

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class Point:
    def __init__(self, x, y):
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How to use the class:

def main():
    p = Point(10, 50)
    p.printPoint()

main()
Define & use a class

How to define a class:

```python
class Point:
    def __init__(self, x, y):
        self.x = x
        self.y = y
    def printPoint(self):
        print('(' + str(self.x) + ', ' + str(self.y) + ')')
```

How to use the class:

```python
def main():
    p = Point(10, 50)
    p.printPoint()
main()
```
Define & use a class

How to define a class:

```python
class Point:
    def __init__(self, x, y):
        self.x = x
        self.y = y

    def printPoint(self):
        print('(' + str(self.x) + ', ' + str(self.y) + ')
```

How to use the class:

```python
def main():
    p = Point(10, 50)
    p.printPoint()
main()
```

Prints:

```
(10, 50)
```
Questions

Thanks