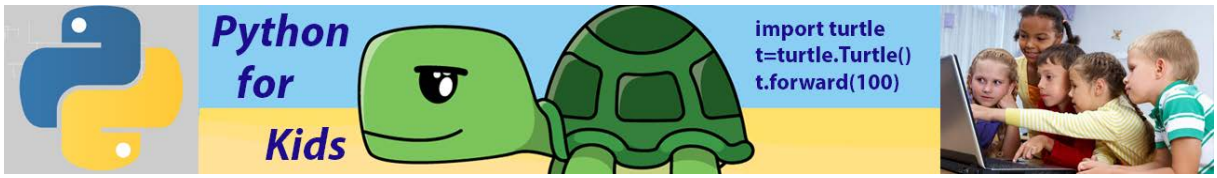


Lesson 10: Random Numbers

Summary:

Code Instruction	What it does
import random	Specifies random number library module
random.randint(a,b)	Return (specifies) a random integer number n such that a<=n<=b.
random.uniform(a,b)	Return (specifies) a random number n (**not necessary integer**) such that a<=n<=b.
random.randrange(a,b,c) random.randrange(a,b) random.randrange(b)	Return (specifies) a random integer number n in range a<=n<=b with step c. If c is not specified returns random integer number in a range between a and b. If a is not specified returns random integer number in a range between 0 and b.
random.shuffle(list)	The shuffle function shuffles a list, mixing up the items of the list.
random.choice(list)	If you want to pick a random item from a list instead of a random number from a given range, you can use choice.

Python comes with a “Standard Library” that has lots of useful bits of code ready to use. Stand-alone sections of a library called “modules” can be added to Python to make it more powerful. For example, Turtle module is used to draw different shapes on the screen. Random mule can pick a random number, or shuffle a list into a random order.

Simple examples with random functions:

1. **Example #1**

Code:

```
import random

for i in range (5):
    n=random.randint(1,10)
    print('i=',i,'n=',n)
```

Result:

```
====== RESTART: C:/
i= 0 n= 2
i= 1 n= 10
i= 2 n= 8
i= 3 n= 7
i= 4 n= 7
>>>
```

2. Example #2

Code:

```
import random

for i in range (5):
    n=random.uniform(1,10)
    print('i=',i,'n=',n)
```

Result:

```
====== RESTART: C:\Users\Vic
i= 0 n= 3.82008576377915
i= 1 n= 5.314758699405314
i= 2 n= 2.1598116940137446
i= 3 n= 4.789807314517651
i= 4 n= 5.289299766714907
>>>
```

3. Example #3

Code:

```
import random

for i in range (5):
    n=random.randrange(1,10)
    print('i=',i,'n=',n)
```

Result:

```
====== RESTART:
i= 0 n= 8
i= 1 n= 6
i= 2 n= 4
i= 3 n= 1
i= 4 n= 1
>>>
```

4. Example #4

Code

```
import random

for i in range (10):
    n=random.randrange(1,10,2)
    print('i=',i,'n=',n)
```

Result:

```
i= 0 n= 9
i= 1 n= 1
i= 2 n= 5
i= 3 n= 9
i= 4 n= 9
i= 5 n= 1
i= 6 n= 7
i= 7 n= 1
i= 8 n= 7
i= 9 n= 5
>>>
```

5. **Example #5**

Code:

```
import random
list=[1,2,3,4,5,6,7,8,9,10]
random.shuffle(list)
print('list=',list)
```

Result:

```
====== RESTART: C:\Users\Victor\Google Drive\E
list= [9, 4, 5, 10, 3, 6, 7, 8, 2, 1]
>>>
```

As you can see list items are shuffled randomly.

6. **Example #6**

Code:

```
import random
list=['red','yellow','green','blue','black','gray','gold']
random.shuffle(list)
print('list=',list)
```

Result:

```
list= ['black', 'gold', 'green', 'yellow', 'red', 'gray', 'blue']
>>>
```

7. **Example #7**

Code:

```
import random
list=['red','yellow','green','blue','black','gray','gold']
a=random.choice(list)
print('a=',a)
```

Result:

```
====== RESTART:
a= blue
>>>
```

8. Example #8

a. Code:

```
import random
list=['red','yellow','green','blue','black','gray','gold']

for i in range (10):
    a=random.choice(list)
    print('a=',a)
```

Result:

```
a= red
a= gold
a= black
a= gold
a= red
a= yellow
a= red
a= yellow
a= blue
a= gray
>>>
```

b. Code:

```
import random
list=['red','yellow','green','blue','black','gray','gold']
for i in range (10):
    a=random.choice(list)
    print(' a=',a,end="")
```

Result:

```
 a= yellow a= yellow a= green a= yellow a= black a= gray a= gold a= green a= yel
low a= blue
>>>
```

Code b allows to output all results in one line.

9. **Example #9** (Guess a number 1 or 2)

```
import random
S0=0
S1=0
print('Hello!')
print('You need to choose number 1 or 2, Total tries = 20')
print('Based on your answers code calculates the\
probability of right and wrong answers')

for i in range(10):
    number=random.randint(1,2)
    #print(number)
    guess=input('Guess number between 1 or 2=\n')
    guess=int(guess)
    if guess==number:
        S0=S0+1
        print('Good Job')
    else:
        print('Wrong')
        S1=S1+1

print('Number of right Answers=',S1)
print('Number of wrong Answers=',S0)
```

Result:

```
====== RESTART: C:\Users\Victor\Google Drive\Python Projects\Test174.py ======
Hello!
You need to choose number 1 or 2, Total tries = 20
Based on your answers code calculates theprobability of right and wrong answers
Guess number between 1 or 2=
1
Wrong
Guess number between 1 or 2=
2
Wrong
Guess number between 1 or 2=
2
Good Job
Guess number between 1 or 2=
1
Good Job
Guess number between 1 or 2=
2
Good Job
Guess number between 1 or 2=
1
Wrong
Guess number between 1 or 2=
2
Good Job
Guess number between 1 or 2=
1
Good Job
Guess number between 1 or 2=
1
Good Job
Guess number between 1 or 2=
2
Good Job
Number of right Answers= 3
Number of wrong Answers= 7
>>>
```

10. Example #10 (Guess random number)

Code:

```
import random
n = random.randint(1, 99)
guess = int(input("Enter an integer from 1 to 99:\n "))
while n != "guess":
    print
    if guess < n:
        print("guess is low")
        guess = int(input("Enter an integer from 1 to 99:\n "))
    elif guess > n:
        print ("guess is high")
        guess = int(input("Enter an integer from 1 to 99:\n "))
    else:
        print ("you guessed it!")
        break
    print
```

Result:

```
Enter an integer from 1 to 99:
 50
guess is high
Enter an integer from 1 to 99:
 25
guess is high
Enter an integer from 1 to 99:
 10
guess is high
Enter an integer from 1 to 99:
 5
guess is low
Enter an integer from 1 to 99:
 7
guess is low
Enter an integer from 1 to 99:
 8
you guessed it!
>>>
```

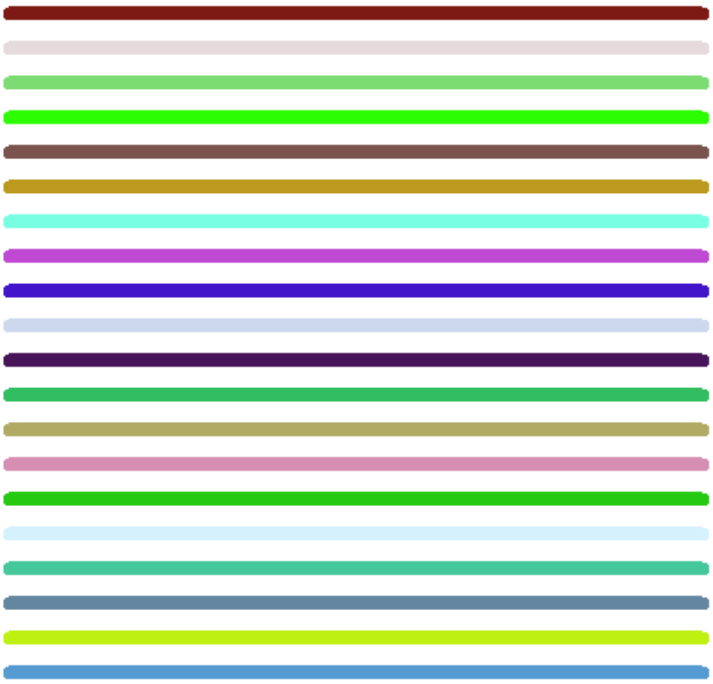
Examples below use Turtle and Random modules

11.Example # 11 (Random colour lines)

To draw random colour lines we will use turtle.coloremode function instead of regular colours, such as red, blue,green e.t.c. One of the most common way to represent colour is to use three 8-bit integers (values of 0-255) to characterize the intensity of the red, green and blue channels. With colormode color components are specified using a number between 0 and 255, so red would be (255, 0, 0), blue would be (0,0,255), for yellow (255,255,0). In our example we

generate colour with three integer random numbers, each of them in a range (0,255), as shown below.

```
import turtle
import random
t=turtle.Turtle()
t.hideturtle()
turtle.colormode(255)
t.pensize(8)
t.penup()

for i in range (20):
    a=random.randint(0,255)
    b=random.randint(0,255)
    c=random.randint(0,255)
    t.goto(-200,-250+20*i)
    t.pendown()
    t.pencolor(a,b,c)
    t.fd(400)
    t.penup()
    t.goto(-200,-250+20*i)
```

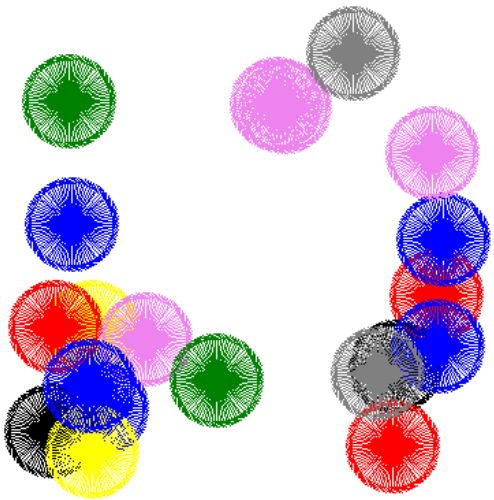


12.Example # 12 (Random colour lines)

```
import turtle
import random
t=turtle.Turtle()
wn=turtle.Screen()
wn.tracer(2,5)
turtle.colormode(255)
t.pensize(8)
t.penup()
R=100

for i in range (15):
    a=random.randint(0,255)
    b=random.randint(0,255)
    c=random.randint(0,255)
    print(a,b,c)
    t.goto(0,-250+20*i)
    t.pendown()
    t.pencolor(a,b,c)
    t.circle(R)
    t.penup()
    t.goto(0,-250+20*i)
```

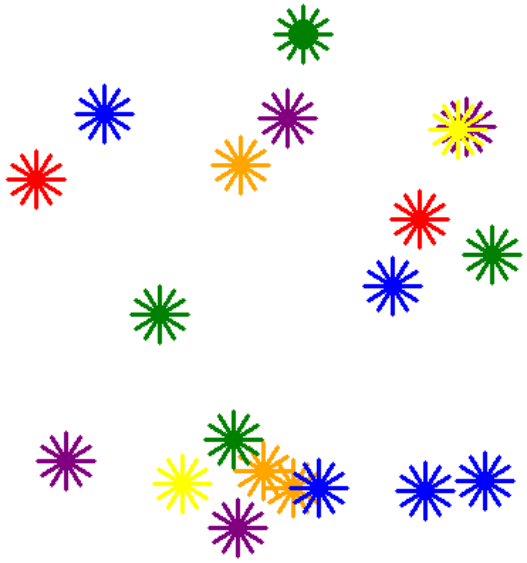
13. Example #13 (Random Spiral)

```
import turtle
import random
t = turtle.Turtle()
turtle.tracer(2,5)
t.pensize(1)
t.speed(10)
t.color('red')

clr=['red','blue','yellow','green','gray','violet','black']
#clr=['red','black']
for j in range (20):
  a=random.randint(-150,150)
  b=random.randint(-150,150)
  t.penup()

  t.color(random.choice(clr))
  print(a)
  print(j)
  for i in range(100):

      t.forward(30)
      t.left(70)
      t.forward(10)
      t.right(40)

      t.penup()
      t.setposition(a,b)
      t.pendown()

      t.right(2)
```



14. Example #14 (Snowflakes)

```
import turtle
import random
t=turtle.Turtle()
t.shape('circle')
t.speed(11)
#pencolor('white')
colors=['red','green','blue','yellow','orange','purple']
t.pensize(3)

k=0
for n in range(20):
    k=k+1
    t.penup()
    a1=random.randint(-200,200)
    a2=random.randint(-200,200)


    print(a1,a2)
    t.goto(a1,a2)
    t.pendown()
    clr = random.choice(colors)
    t.color(clr)


    for i in range(12):

        t.right(30)
        t.forward(20)
        t.backward(20)
```



15. Example #15 (Random motion)

In this example shown below we use third code line turtle.bgcolor('blue') which specifies colour of the screen in turtle module.

```
import random
import turtle
turtle.bgcolor('blue')
t = turtle.Turtle()
t.pensize(5)
t.shape('turtle')
t.speed(0)


for i in range (20):
    t.color('red')
    t.fd(random.randint(40,120))
    a=random.randint(0,1000)
    b=a%2
    if a%2==0:
        t.left(90)
    else:

        t.left(-90)
```