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Introduction to Programming using Python

Microsoft

Susan Ibach | Technical Evangelist
Christopher Harrison | Content Developer

Meet Susan Ibach| @hockeygeekgirl

Technical Evangelist

- Helping developers understand Visual Studio, app building
- Microsoft Certified Trainer
- My first program was written in basic on a computer with 64K of memory

Will not admit how many years coding experience

- Basic, Fortran, COBOL, VB, C#, HTML, Python
- Frequent blogger and presenter
- marathoner, wife, and mother of two awesome boys!

Meet Christopher Harrison | @geektrainer

Content Developer

- Focused on ASP.NET and Office 365 development
- Microsoft Certified Trainer
- Still misses his Commodore 64

Long time geek

- Regular presenter at TechEd
- Periodic blogger
- Certification advocate
- Marathoner, husband, father of one four legged child

Course Topics

Introduction to Programming using Python - Day One	
01 | Getting started	05 | Working with dates and times
02 | Displaying text	06 | Making decisions with code
03 | String variables	07 | Complex decisions with code
04 | Storing numbers	

Course Topics

Introduction to Programming using Python - Day Two	
08 | Repeating events	12 | Reading from files
09 | Repeating events until done	13 | Functions
10 | Remembering lists	14 | Handling errors
11 | How to save information in files	

Setting Expectations

- Target Audience
  - People new to programming
  - Students
  - Career changers
  - IT Pros
  - Anyone with an interest in learning to code
- If you want to follow along…
  - Install Visual Studio Express
  - Install the Python tools
    - Instructions coming soon…

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- Microsoft Virtual Academy
  - Free online learning tailored for IT Pros and Developers
  - Over 2M registered users
  - Up-to-date, relevant training on variety of Microsoft products
- "Earn while you learn!"
  - Get 50 MVA Points for this event!
  - Visit http://aka.ms/MVA-Voucher
  - Enter this code: IntProgPython (expires 27 Oct 14)

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Repeating events

for loops

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Christopher Harrison | Content Developer

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Sometimes we need to perform an action more than once

- Pour a cup of coffee for each guest
- Wash the dishes until they are all clean
- Make a name card for each guest attending a party

In code, we use loops to repeat a task

- We are going to have some fun in this module by drawing objects
- We will use loops to draw some of our objects

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Hello, turtle

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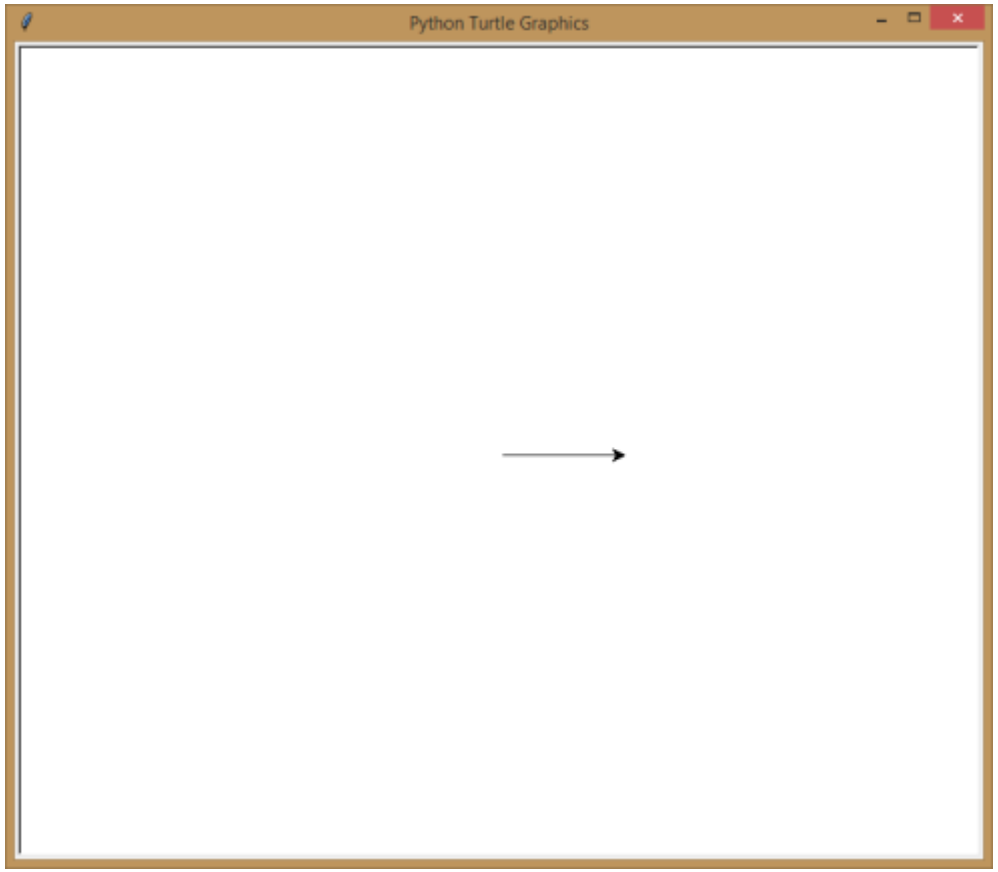
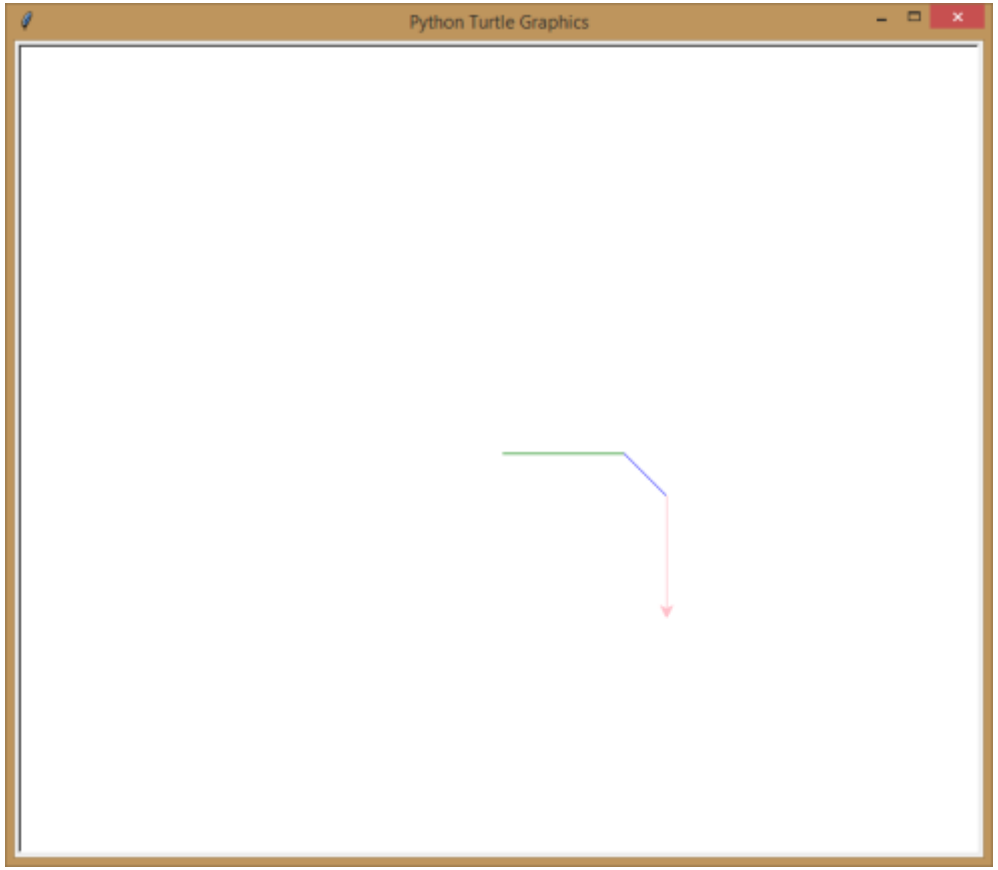
Did you know Python can draw?

```
import turtle
turtle.forward(100)
```



turtle is a library that lets you draw

```
import turtle
turtle.color('green')
turtle.forward(100)
turtle.right(45)
turtle.color('blue')
turtle.forward(50)
turtle.right(45)
turtle.color('pink')
turtle.forward(100)
```



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Drawing with turtle

You can probably guess what some of the turtle commands do

Command	Action
`right(x)`	Rotate right x degrees
`left(x)`	Rotate left x degrees
`color('x')`	Change pen color to x
`forward(x)`	Move forward x
`backward(x)`	Move backward x

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For loops

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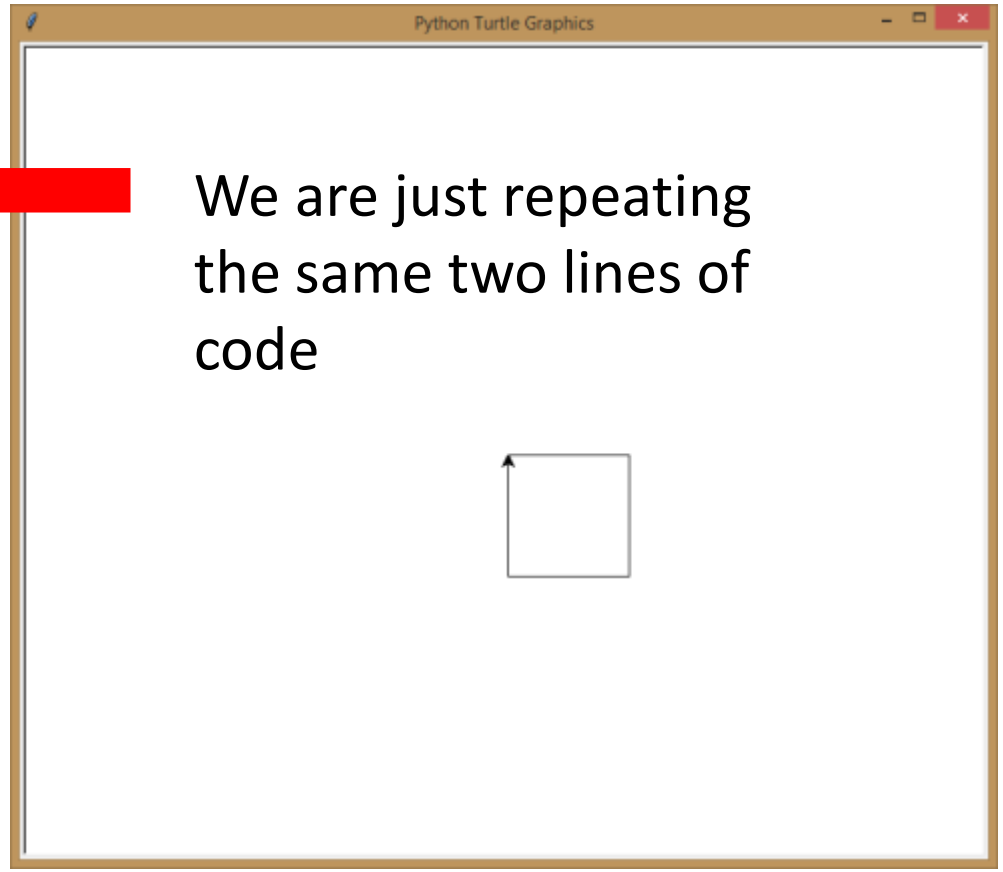
How would we get turtle do draw a square?

```
import turtle
turtle.forward(100)
turtle.right(90)
turtle.forward(100)
turtle.right(90)
turtle.forward(100)
turtle.right(90)
turtle.forward(100)
```

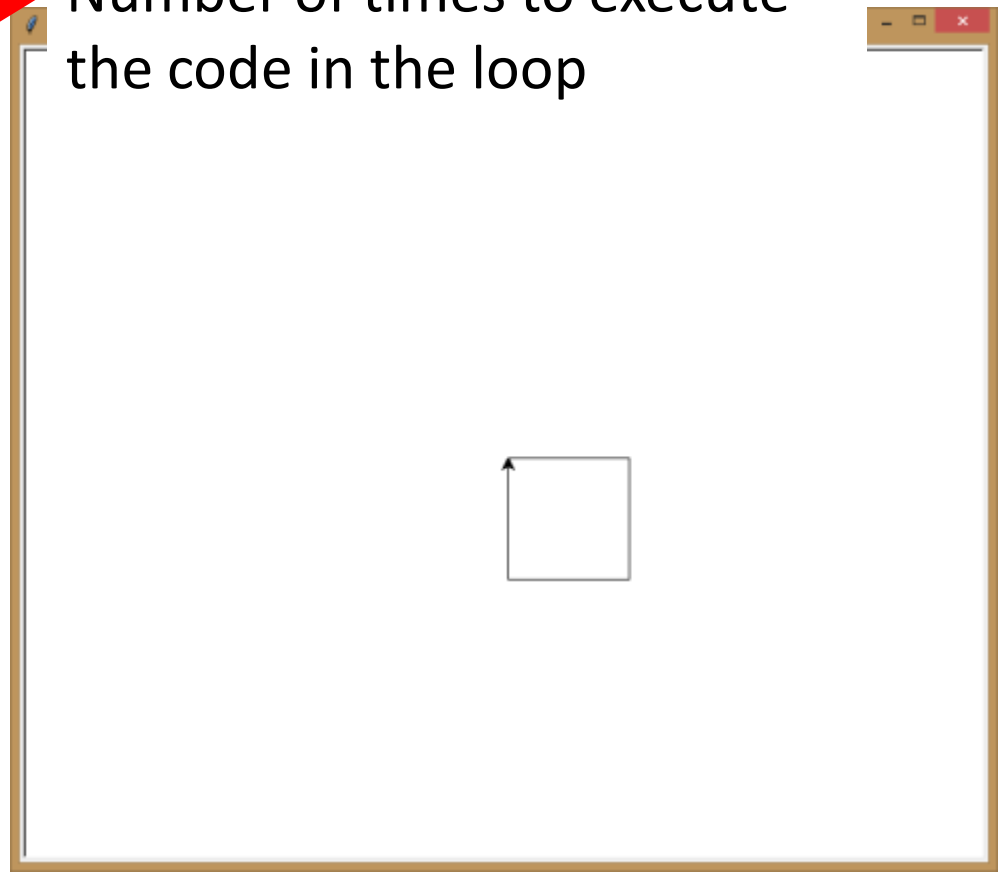


We are just repeating the same two lines of code

Loops allow us to repeat the same line of code as often as we want

```
import turtle
for steps in range(4):
    turtle.forward(100)
    turtle.right(90)
```

Number of times to execute the code in the loop

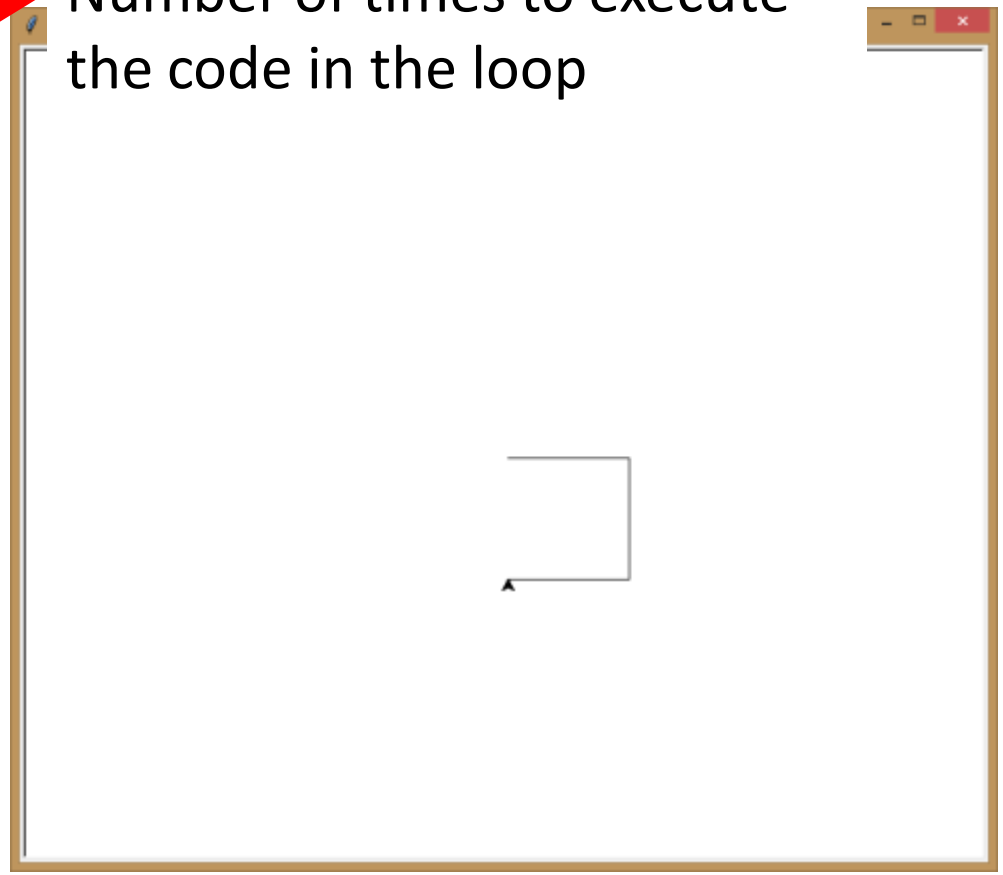


You MUST indent the code you want repeated

When you change the range, you change the number of times the code executes

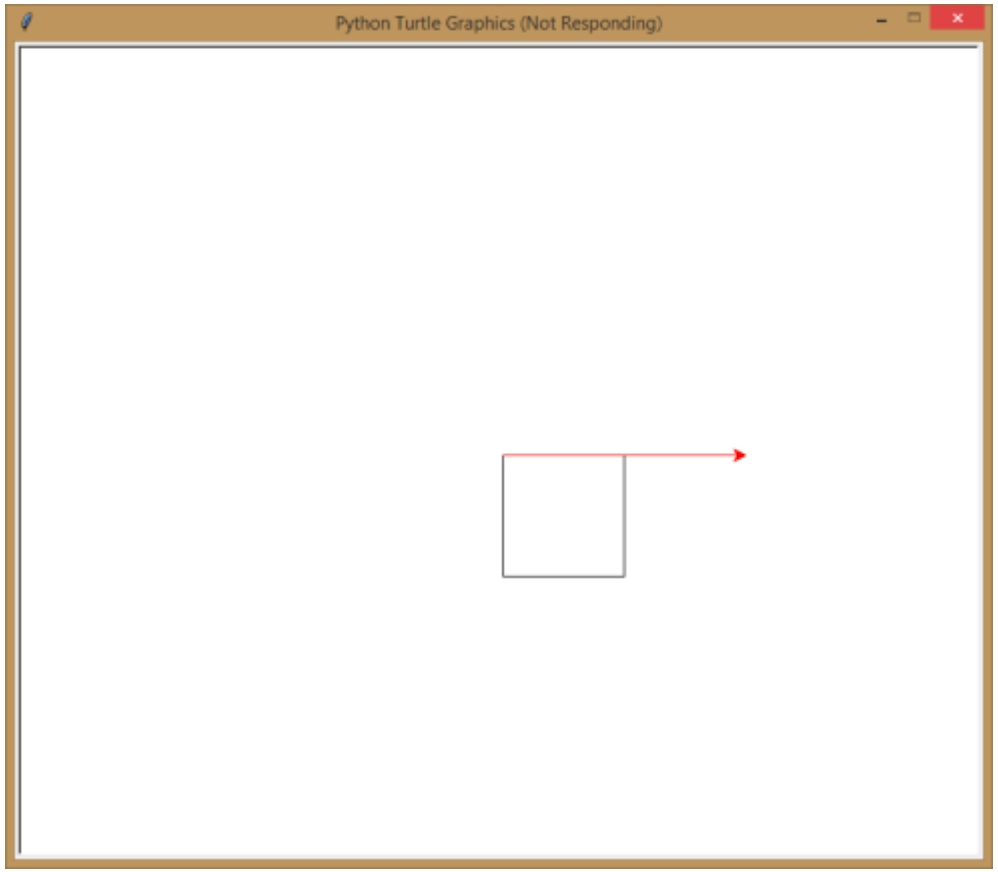
```
import turtle
for steps in range(3):
    turtle.forward(100)
    turtle.right(90)
```

Number of times to execute the code in the loop



Only the indented code is repeated!

```
import turtle
for steps in range(4):
    turtle.forward(100)
    turtle.right(90)
turtle.color('red')
turtle.forward(200)
```



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Using loops to draw shapes

Now we can make new typing mistakes!

Can you find three mistakes in this code?

```
improt turtle
for steps in range(4)
     turtle.forward(100)
turtle.right(90)
```

```
import turtle
for steps in range(4):
     turtle.forward(100)
     turtle.right(90)
```

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Nested loops

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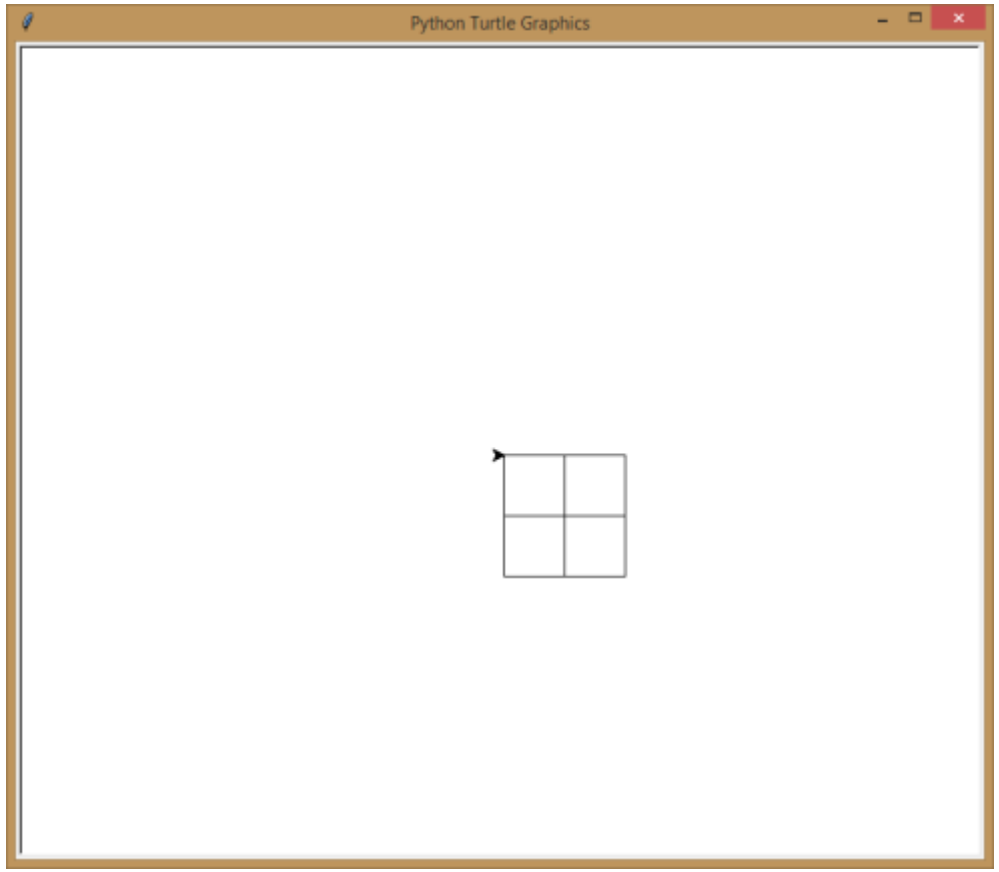
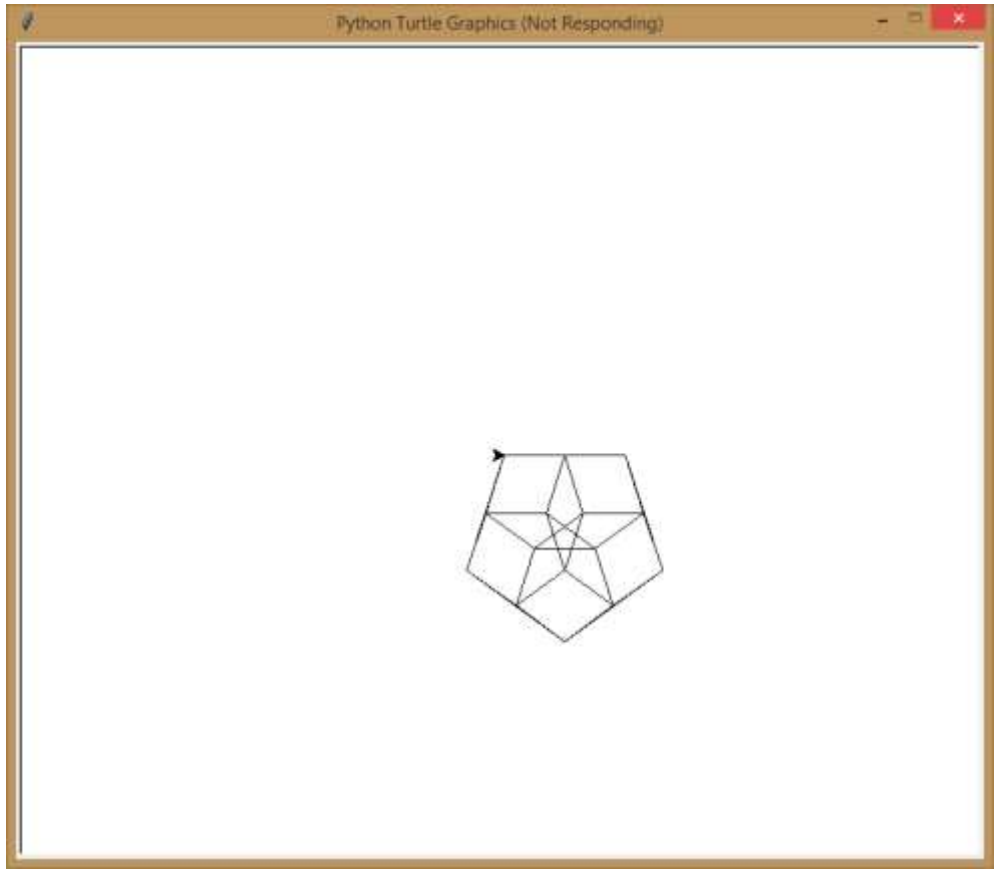
You can have lots of fun when you put a loop inside another loop!

```
import turtle
for steps in range(4):
    turtle.forward(100)
    turtle.right(90)
    for moresteps in range(4):
        turtle.forward(50)
        turtle.right(90)
```



Just for fun

```
import turtle
for steps in range(5):
    turtle.forward(100)
    turtle.right(360/5)
    for moresteps in range(5):
        turtle.forward(50)
        turtle.right(360/5)
```



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Nested loops

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Variables in loops

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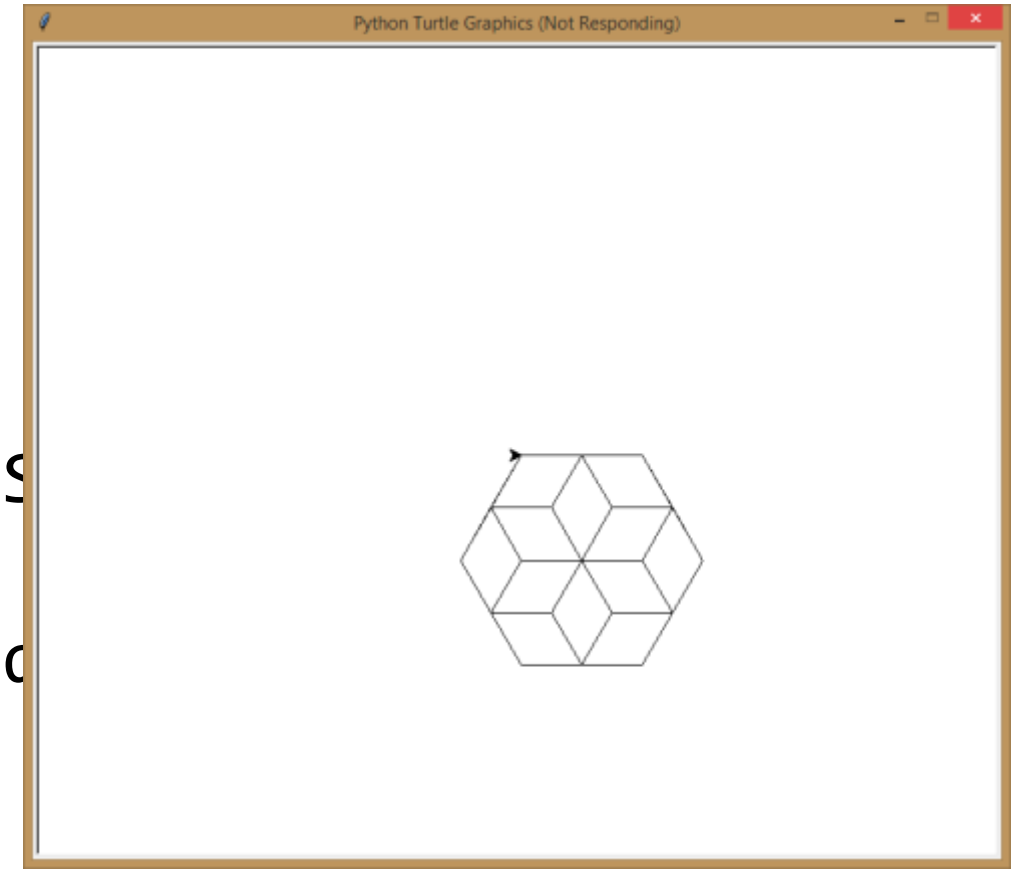
We could use a variable to decide the number of sides our object will have

```
import turtle
nbrSides = 6
for steps in range(nbrSides):
    turtle.forward(100)
    turtle.right(360/nbrSides)
    for moresteps in range(nbrS
        turtle.forward(50)
        turtle.right(360/nbrSid
```



What's the advantage of using a variable here instead of just typing in the number?

```
import turtle
nbrSides = 6
for steps in range(nbrSides):
    turtle.forward(100)
    turtle.right(360/nbrSides)
    for moresteps in range(nbrSides):
        turtle.forward(50)
        turtle.right(360/nbrSides)
```

When we use a variable and we want to change a value that appears in many places, we only have to update one line of code!

```
import turtle
nbrSides = 6
for steps in range(nbrSides):
    turtle.forward(100)
    turtle.right(360/nbrSides)
    for moresteps in range(nbrSides):
        turtle.forward(50)
        turtle.right(360/nbrSides)
```

Now when we have to change our code,
we are less likely to make a mistake by forgetting to change one of the values

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Using a variable in our loop

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Accessing the loop value

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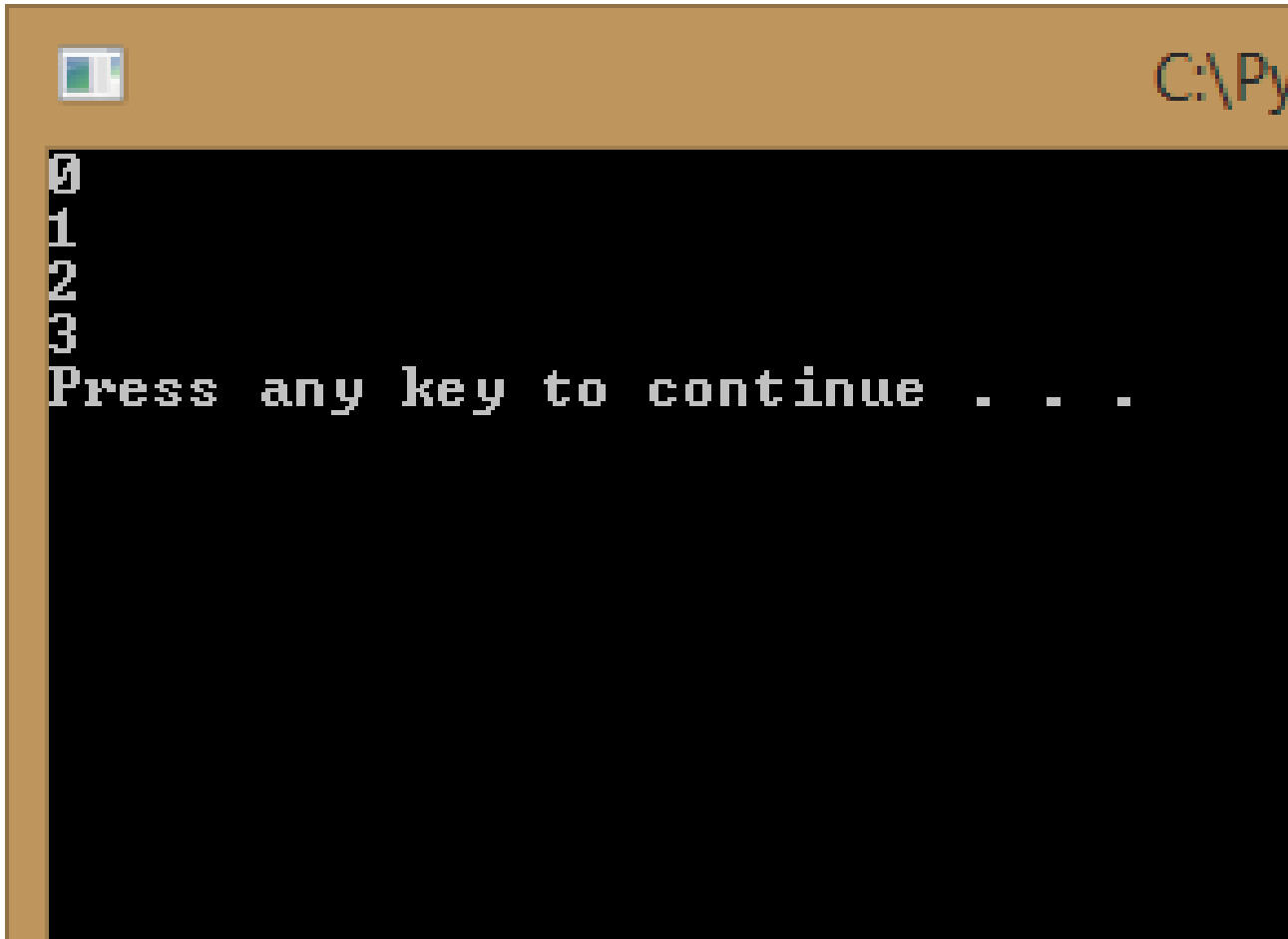
You can look at the loop values within the loop

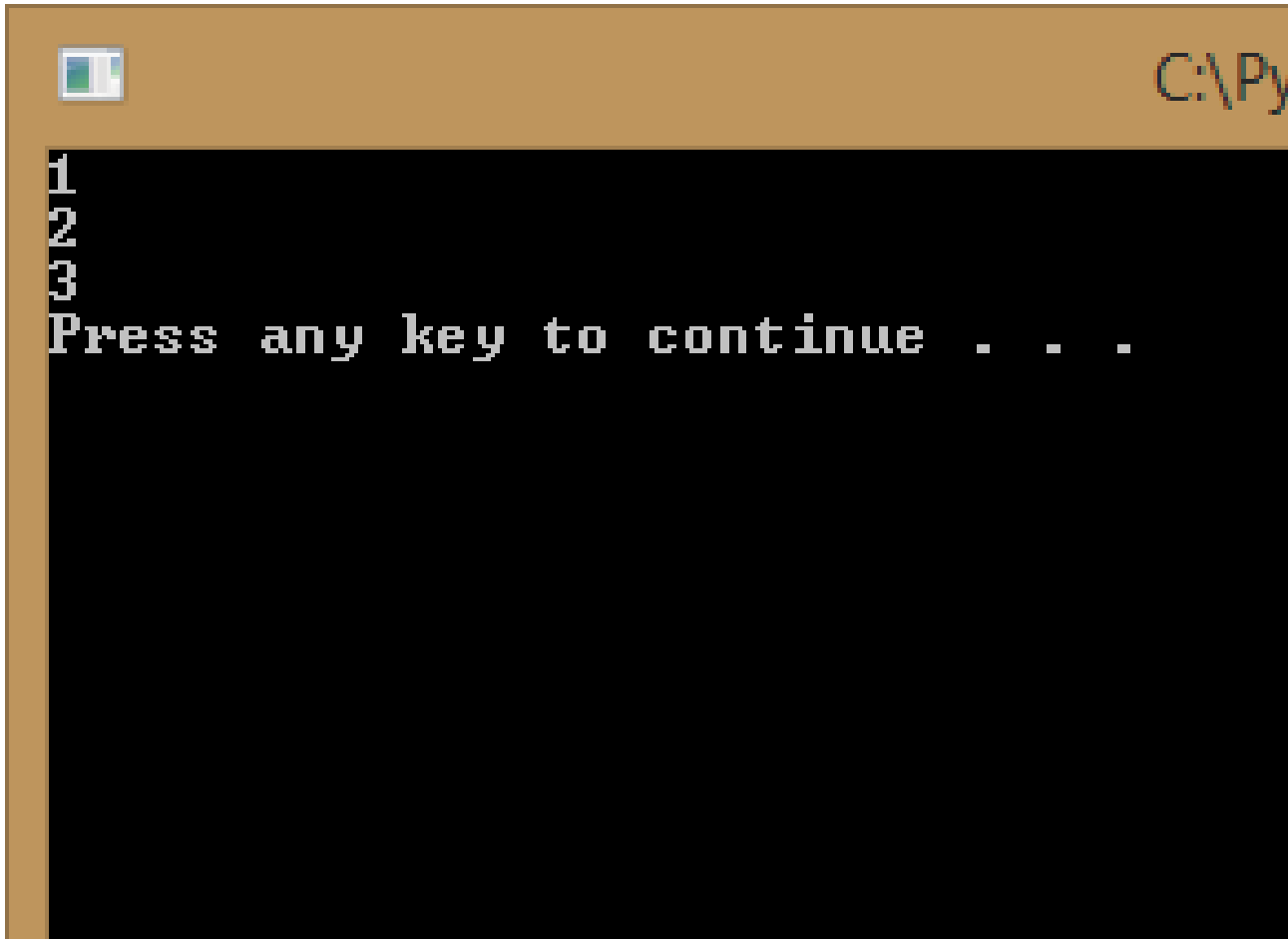
```
for steps in range(4) :
    print(steps)
```

Yes, counting starts at zero in for loops, that's pretty common in programming



If you need to start counting from “1” you can specify numbers to count to and from

```
for steps in range(1,4) :
    print(steps)
```



Did you notice this time the loop only executed three times?

You can also tell the loop to skip values by specifying a step

```
for steps in range(1,10,2) :
    print(steps)
```

```
1
3
5
7
9
Press any key to continue . . .
```

One of the cool things about Python is the way you can tell it exactly what values you want to use in the loop

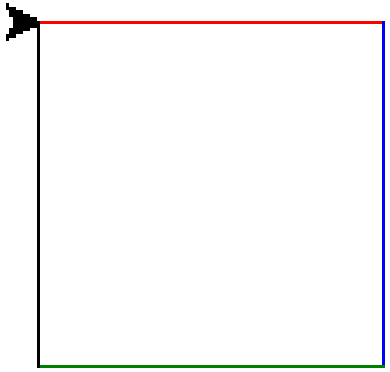
```
for steps in [1,2,3,4,5]:
    print(steps)
```

This requires using [ ] brackets instead of ( ) and you don't use the "range" keyword

```
1
2
3
4
5
Press any key to continue . . .
```

And you don’t have to use numbers!

```
import turtle
for steps in ['red','blue','green','black'] :
     turtle.color(steps)
     turtle.forward(100)
     turtle.right(90)
```



What do you think this code will do?

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Using an explicit list of values in your loop

You can even mix up different datatypes (e.g. numbers and strings) but…

```
import turtle
for steps in ['red','blue','green','black',8] :
      turtle.color(steps)
      turtle.forward(100)
      turtle.right(90)
```

C:\Python34\python.exe

```
Traceback (most recent call last):
  File "C:\Program Files (x86)\Microsoft Visual Studi
ns\Microsoft\Python Tools for Visual Studio\2.0\visua
6, in exec_file
    exec(code_obj, global_variables)
  File "c:\users\sibach\documents\visual studio 2013\
\PythonApplication4\PythonApplication4.py", line 4, i
    turtle.color(steps)
  File "<string>", line 1, in color
  File "C:\Python34\lib\turtle.py", line 2215, in col
    pcolor = self._colorstr(pcolor)
  File "C:\Python34\lib\turtle.py", line 2695, in _co
    return self.screen._colorstr(args)
  File "C:\Python34\lib\turtle.py", line 1151, in _co
    if len(color) == 1:
TypeError: object of type 'int' has no len()
Press any key to continue . . .
```

You had better make sure any code using that value can handle the different datatypes!

You can’t set the color to a number so the code crashed, but print can accept strings or numbers

```
for steps in ['red','blue','green','black‘,8] :
     print (steps)
```

C:\Python34\python.exe

```
red
blue
green
black
8
Press any key to continue . . .
```

Your challenge

- Get turtle to draw an octagon
- Hint: to calculate the angle, you take 360 degrees and divide it by the number of sides of the shape you are drawing
- Extra challenge: Let the user specify how many sides the object will have and draw whatever they ask
- Double bonus challenge, add a nested loop to draw a smaller version of the object inside!

Congratulations

- You can manage problems which require repeating the same task over and over a fixed number of times