

Lecture 4: Modules

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Review: Programming in Python

- Values

- 47
- "hello, world!\n"

- Types

- str
- bool

- Variables

- `dist_in_miles = 3.1`
- `a_string = "hello"`

- Operations

- `1 * 2 * 3`
- `a_string + " world"`

- Functions

- ```
def example(x):
 y = 2*x
 return y
```

- `z = example(25)`
- `print("hello, world!")`

- Conditionals

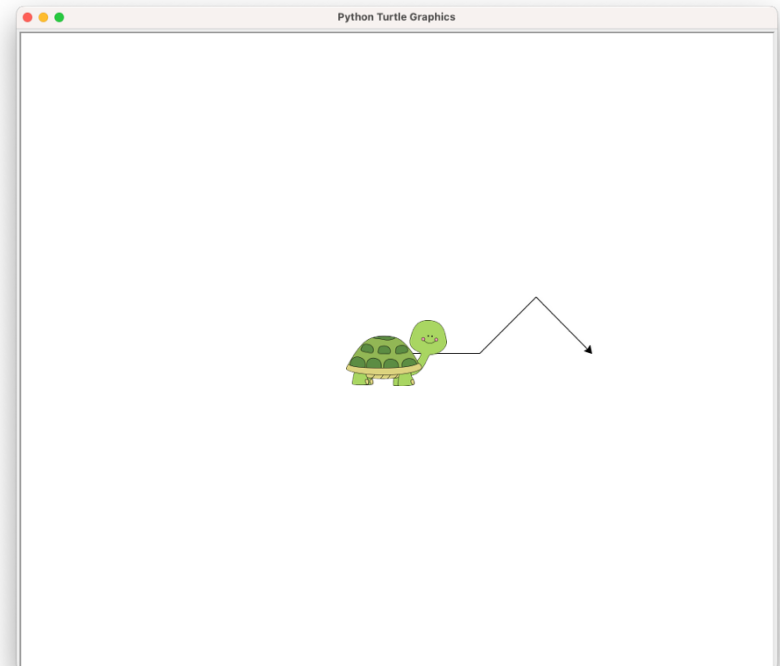
- if
- if-else
- if-elif-else
- ```
if x > 5:  
    x = x - 5  
else:  
    x = x + 5
```

Modules

- extra pre-defined functions that you can add to Python
- Examples:
 - math: defines lots of useful math functions
 - random: generate random numbers
 - turtle: draw stuff!
- To use functions defined in a module:
 - `from <module> import <functions>`
 - `from math import sqrt`
 - `from math import *`

Turtle Module

```
from turtle import *  
  
def zig_zag():  
    forward(100)  
    left(45)  
    forward(100)  
    right(90)  
    forward(100)  
  
zig_zag()  
done()
```



Turtle starts at the center of the screen (0, 0) facing right

Useful Turtle Functions

- Movement

- forward(int)
- backward(int)
- left(int)
- right(int)
- circle(int)
- setposition(int, int)
- setheading(int)

- Start/stop drawing

- penup()
- pendown()

- Appearance

- pensize(int)
- pencolor(str)
- fillcolor(str)
- showturtle()
- hideturtle()

- Info

- window_width()
- window_height()
- position()
- heading()
- pensize()
- pencolor()

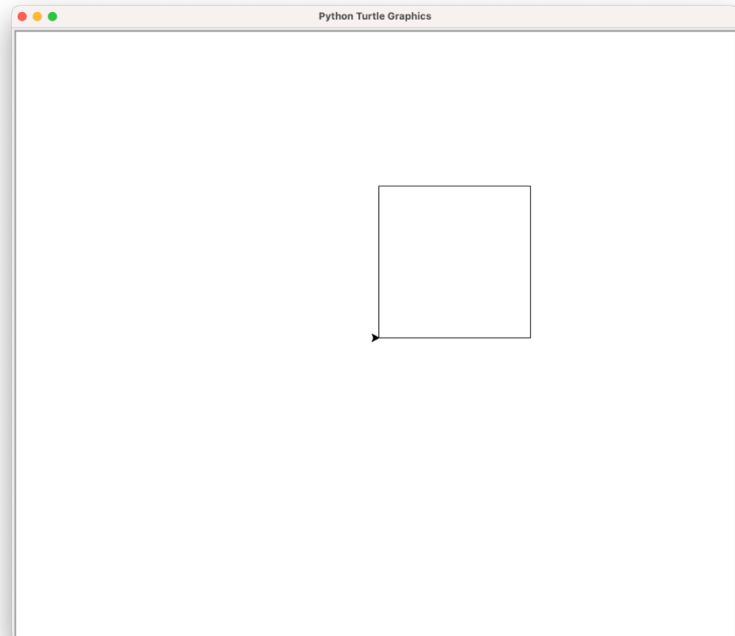
Named colors in Python

Named Color Chart											
snow	light blue	light salmon	LemonChiffon2	SkyBlue2	aquamarine4	gold2	brown2	LightPink2	thistle1	grey39	grey82
ghost white	powder blue	orange	LemonChiffon3	SkyBlue3	DarkSeaGreen1	gold3	brown3	LightPink3	thistle2	grey40	grey83
white smoke	pale turquoise	dark orange	LemonChiffon4	SkyBlue4	DarkSeaGreen2	gold4	brown4	LightPink4	thistle3	grey42	grey84
gainsboro	dark turquoise	coral	corusilk2	LightSkyBlue1	DarkSeaGreen3	goldenrod1	salmon1	PaleVioletRed1	thistle4	grey43	grey85
floral white	medium turquoise	light coral	corusilk3	LightSkyBlue2	DarkSeaGreen4	goldenrod2	salmon2	PaleVioletRed2	grey1	grey44	grey86
old lace	turquoise	tomato	corusilk4	LightSkyBlue3	SeaGreen1	goldenrod3	salmon3	PaleVioletRed3	grey2	grey45	grey87
linen	cyan	orange red	ivory2	LightSkyBlue4	SeaGreen2	goldenrod4	salmon4	PaleVioletRed4	grey3	grey46	grey88
antique white	light cyan	red	ivory3	Slategray1	SeaGreen3	DarkGoldenrod1	LightSalmon2	maroon1	grey4	grey47	grey89
papaya whip	cadet blue	hot pink	ivory4	Slategray2	PaleGreen1	DarkGoldenrod2	LightSalmon3	maroon2	grey5	grey48	grey90
blanched almond	medium aquamarine	deep pink	honeydew2	Slategray3	PaleGreen2	DarkGoldenrod3	LightSalmon4	maroon3	grey6	grey49	grey91
bisque	aquamarine	pink	honeydew3	Slategray4	PaleGreen3	DarkGoldenrod4	orange2	maroon4	grey7	grey50	grey92
peach puff	dark green	light pink	honeydew4	LightSteelBlue1	PaleGreen4	RosyBrown1	orange3	VioletRed1	grey8	grey51	grey93
navajo white	dark olive green	pale violet red	LavenderBlush2	LightSteelBlue2	SpringGreen2	RosyBrown2	orange4	VioletRed2	grey9	grey52	grey94
lemon chiffon	dark sea green	maroon	LavenderBlush3	LightSteelBlue3	SpringGreen3	RosyBrown3	DarkOrange1	VioletRed3	grey10	grey53	grey95
mint cream	sea green	medium violet red	LavenderBlush4	LightSteelBlue4	SpringGreen4	RosyBrown4	DarkOrange2	VioletRed4	grey11	grey54	grey97
azure	medium sea green	violet red	MistyRose2	LightBlue1	green2	IndianRed1	DarkOrange3	magenta2	grey12	grey55	grey98
alice blue	light sea green	medium orchid	MistyRose3	LightBlue2	green3	IndianRed2	DarkOrange4	magenta3	grey13	grey56	grey99
lavender	pale green	dark orchid	MistyRose4	LightBlue3	green4	IndianRed3	coral1	magenta4	grey14	grey57	
lavender blush	spring green	dark violet	azure2	LightBlue4	chartreuse2	IndianRed4	coral2	orchid1	grey15	grey58	
misty rose	law green	blue violet	azure3	LightCyan2	chartreuse3	sienna1	coral3	orchid2	grey16	grey59	
dark slate gray	medium spring green	purple	azure4	LightCyan3	chartreuse4	sienna2	coral4	orchid3	grey17	grey60	
dim gray	green yellow	medium purple	SlateBlue1	LightCyan4	OliveDrab1	sienna3	tomato2	orchid4	grey18	grey61	
slate gray	lime green	thistle	SlateBlue2	PaleTurquoise1	OliveDrab2	sienna4	tomato3	plum1	grey19	grey62	
light slate gray	yellow green	snow2	SlateBlue3	PaleTurquoise2	OliveDrab4	burlywood1	tomato4	plum2	grey20	grey63	
gray	forest green	snow3	SlateBlue4	PaleTurquoise3	DarkOliveGreen1	burlywood2	OrangeRed2	plum3	grey21	grey64	
light gray	olive drab	snow4	RoyalBlue1	PaleTurquoise4	DarkOliveGreen2	burlywood3	OrangeRed3	plum4	grey22	grey65	
midnight blue	dark khaki	seashell2	RoyalBlue2	CadetBlue1	DarkOliveGreen3	burlywood4	OrangeRed4	MediumOrchid1	grey23	grey66	
navy	khaki	seashell3	RoyalBlue3	CadetBlue2	DarkOliveGreen4	wheat1	red2	MediumOrchid2	grey24	grey67	
cornflower blue	pale goldenrod	seashell4	RoyalBlue4	CadetBlue3	khaki1	wheat2	red3	MediumOrchid3	grey25	grey68	
dark slate blue	light goldenrod yellow	AntiqueWhite1	blue2	CadetBlue4	khaki2	wheat3	red4	MediumOrchid4	grey26	grey69	
slate blue	light yellow	AntiqueWhite2	blue4	turquoise1	khaki3	wheat4	DeepPink2	DarkOrchid1	grey27	grey70	
medium slate blue	yellow	AntiqueWhite3	DodgerBlue2	turquoise2	khaki4	tan1	DeepPink3	DarkOrchid2	grey28	grey71	
light slate blue	gold	AntiqueWhite4	DodgerBlue3	turquoise3	LightGoldenrod1	tan2	DeepPink4	DarkOrchid3	grey29	grey72	
medium blue	light goldenrod	bisque2	DodgerBlue4	turquoise4	LightGoldenrod2	tan4	HotPink1	DarkOrchid4	grey30	grey73	
royal blue	goldenrod	bisque3	SteelBlue1	cyan2	LightGoldenrod3	chocolate1	HotPink2	purple1	grey31	grey74	
blue	dark goldenrod	bisque4	SteelBlue2	cyan3	LightGoldenrod4	chocolate2	HotPink3	purple2	grey32	grey75	
dodger blue	rosy brown	PeachPuff2	SteelBlue3	cyan4	LightYellow2	chocolate3	HotPink4	purple3	grey33	grey76	
deep sky blue	indian red	PeachPuff3	SteelBlue4	DarkSlategray1	LightYellow3	firebrick1	pink1	purple4	grey34	grey77	
sky blue	saddle brown	PeachPuff4	DeepSkyBlue2	DarkSlategray2	LightYellow4	firebrick2	pink2	MediumPurple1	grey35	grey78	
light sky blue	sandy brown	NavajoWhite2	DeepSkyBlue3	DarkSlategray3	yellow2	firebrick3	pink3	MediumPurple2	grey36	grey79	
steel blue	dark salmon	NavajoWhite3	DeepSkyBlue4	DarkSlategray4	yellow3	firebrick4	pink4	MediumPurple3	grey37	grey80	
light steel blue	salmon	NavajoWhite4	SkyBlue1	aquamarine2	yellow4	brown1	LightPink1	MediumPurple4	grey38	grey81	

Exercise 1

- Define a function `square` that takes one parameter `len` (an int), draws a square where each side is length `len`, and then returns the area of the square it drew. The turtle should finish pointing in the same direction as it started.

```
square(200)
```



Input and Output

- `print()` is a function that allows you to display text on the screen
- `input()` is a function that allows you to get a value from your user

```
string = input("Enter a word:\n\t")
num = input("Enter a positive integer: ")
print(string*num)
```

Warning: this code will throw an error. Why?

```
Enter a word:
    happy
Enter a positive integer: 3
happy! happy! happy!
```

Exercise 2

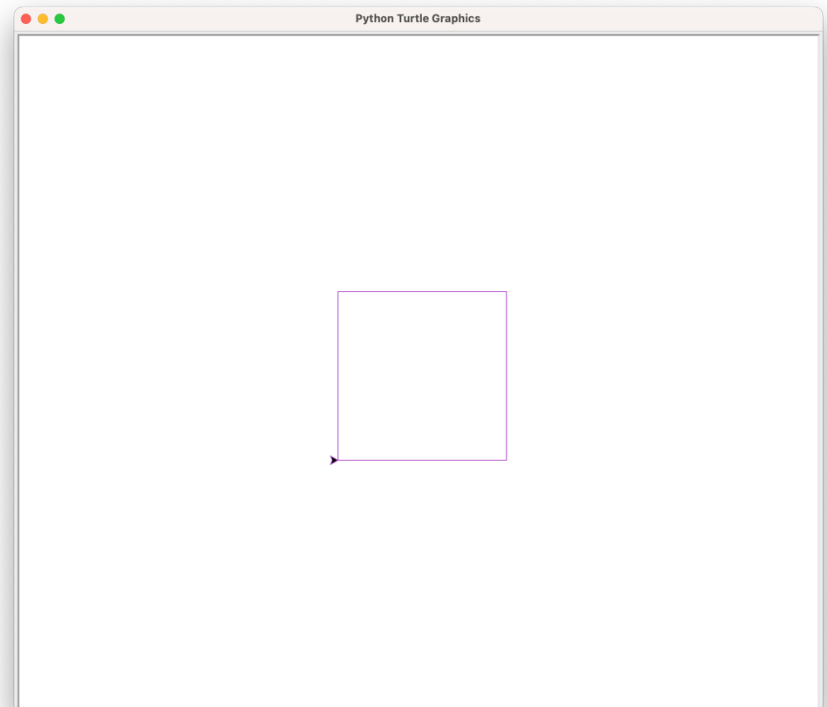
- Write a program that asks the user to enter an integer and to enter a color and then (using your square function) draws a square of that size centered in the middle of the screen.

```
Enter an integer:
```

```
    200
```

```
Enter a color:
```

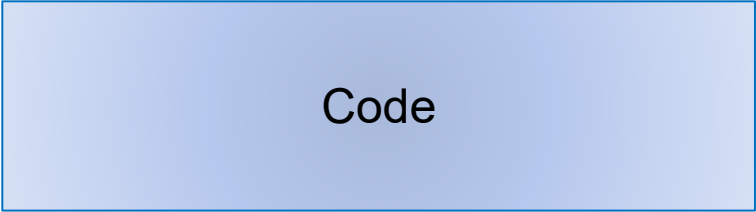
```
    MediumOrchid3
```



for loops

- When you want some set of statements to execute repeatedly

```
for <var> in <sequence>:
```



Code



whitespace
matters

Example: for loops

- When you want some set of statements to execute repeatedly

variable **number of times**

```
for x in range(5):  
    print("Hello!")
```

whitespace
matters

Exercise 3

- Re-write your `square` function using a for loop so it doesn't repeat the same lines of code.

The Index Variable

variable {0, 1, 2, 3, 4}

```
for x in range(5):  
    print(x)
```

```
0  
1  
2  
3  
4
```

Example

```
def spiral(num):  
    for len in range(num):  
        forward(len*50)  
        left(120)
```

```
spiral(10)
```

