

# Programming with Python

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# Outline

- Intro to Computer Science and Programming
- Python Installation
- Basics
- Graphics
- Challenge Problems

# What is Computer Science?

- Study of computers & how we can make them do what we want
- Has several branches of study, such as
  - Algorithms
  - Architecture
  - Artificial intelligence
  - Programming languages

# What is Programming?

- Giving instructions (“**program**”) to a computer to execute
- Requires a **programming language**, a set of commands/tools with a specific syntax through which you communicate with the computer
- Examples of programming languages: Python, Java, C++

# Python Installation

- Go to this website: <https://www.python.org/downloads/>
- Depending on whether you have a Mac or Windows, select the appropriate option to download
- If you are unable to download, you can use an online editor called Trinket by signing up for an account: <https://trinket.io/>

# Creating a Simple Program

- To create a program, open IDLE and select **File > New File**
- To save a program, select **File > Save** and enter a name
- To print messages on the screen, we use the `print` command

```
print("Hello World")
```

```
print("This is my first Python program")
```

# Variables and Math

- A **variable** is a way of storing things on a computer, such as numbers (think of it as a “container”)
- With our variables, we can do mathematical calculations, including addition (+), subtraction (-), multiplication (\*), and division (/)

```
x = 5  
y = 7  
z = x + y  
print(z)
```

# Data Types

- Data types are forms of data stored in a program
- There are many data types in Python, such as integers and strings
  - An **integer** is a number, such as 5, 17, and -1
  - A **string** is a sequence of characters, including letters, digits, punctuation, etc... An example of a string is “Hello World!”

```
x = 5
s = "Hello World!"
print(x)
print(s)
```



# Reading Input

- Sometimes, you may want to get information from the **user**, the person using your program
- For this, we use the `input` command, which gets a string from the user

```
name = input("What is your name?")  
print(name)
```

# Checking Conditions: Booleans

- Boolean data type is a form of data that stores two logical values: **True** or **False**
- Example: If we ask “Are apples fruits?” the answer is **True**. If we ask “Does a square have 3 sides?” the answer is **False**

```
b = False
```

# Checking Conditions: Comparisons

- **Comparisons** are operations (like addition and subtraction) which compare 2 quantities. The result of a comparison is a boolean (**True** or **False**)
- Types of Comparisons: equal to (`==`), less than (`<`), greater than (`>`), less than or equal to (`<=`), greater than or equal to (`>=`)

```
>>> 5 == 5  
True
```

```
>>> 1 == 6  
False
```

# Checking Conditions: If Statements

- An **if statement** is a statement that conditionally runs code
- Consists of two parts: (1) condition and (2) command
- Requires an INDENT!!

```
if (6 < 15):  
    print("Hello!")
```

# Repeating Commands: Loops

- A **loop** is a code structure that repeats a portion of code for a certain number of times
- One kind of loop in Python is the `for` loop.
- Requires an INDENT!!
- Note: the number 5 is not in the output

```
for i in range(0, 5):  
    print(i)
```



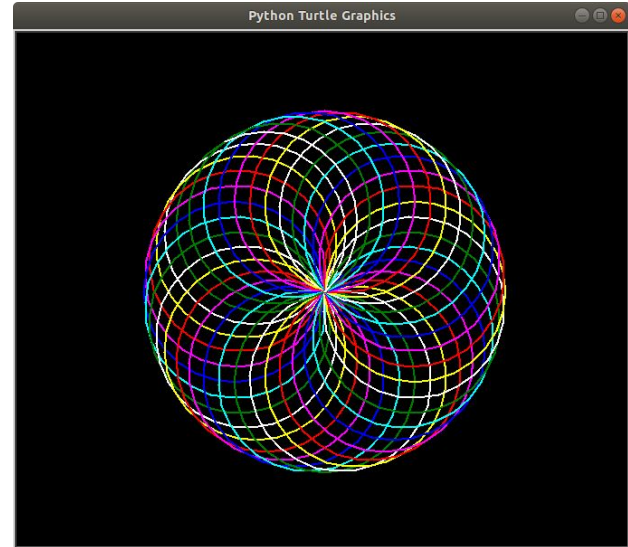
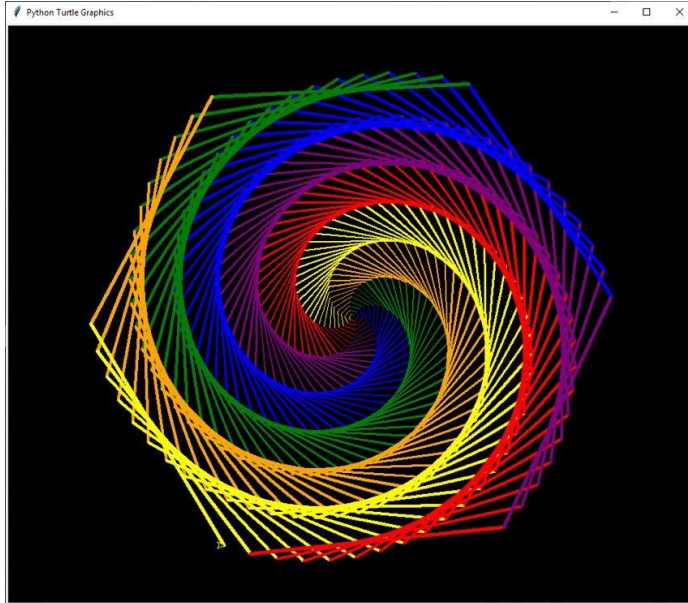
```
>>>  
0  
1  
2  
3  
4
```

# Challenge problems

1. Create a program that prompts the user to enter his/her name and then prints out the greeting “Hello, <name>.”
2. Create a program that asks the user for three numbers and then prints the greatest one.
3. Create a program that reads in  $n$  numbers and prints their average

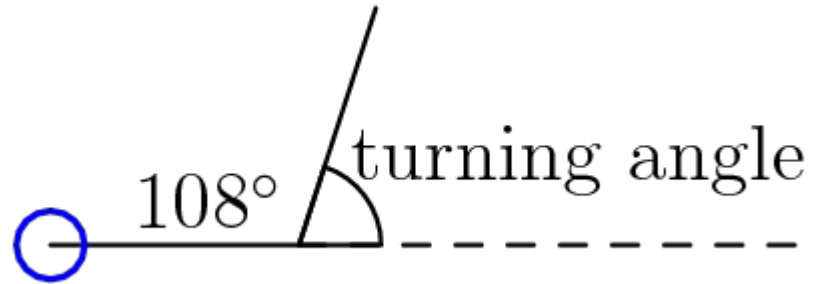
# Turtle Graphics

- The Turtle is a library in Python used for graphics, especially drawing



# Turtle Basics

- Making your own!
- `.forward()`, `.left()`, `.right()`
- `.write()`
- `.pencolor()`, `.fillcolor()`
- `.circle()`





## Challenge Problems

4. Can you use a turtle to draw a square with side lengths 100 units?
5. Can you use a turtle to draw a star? (Hard!)

Bonus: Draw anything of your choice using a turtle! Be artsy!