Lesson 1

Instructor

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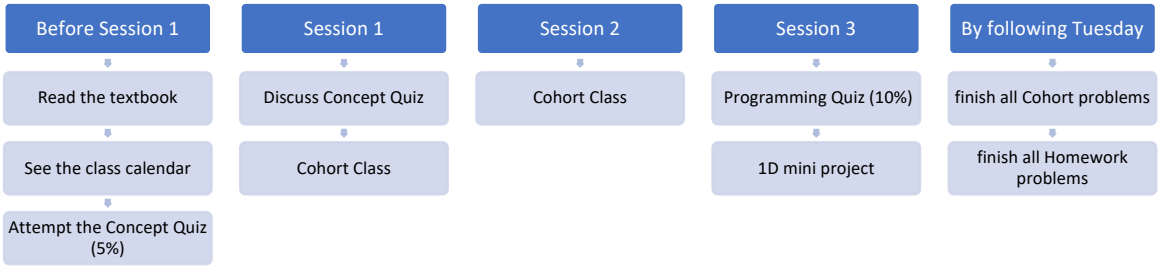
How it works every week (in general)



Expectations

Students must read materials before coming to class.

Students will come early for class.

Students will participate actively in class.

Students will submit their own works for all assignments.

If you have questions

Posting on Piazza is preferred as everyone will get to see your question

Click on Information->10.009 Piazza

Three sets of help session are available!

Why learn coding

> **"The spread of computers and the Internet will put jobs in two categories," Andreessen says. "People who tell computers what to do, and people who are told by computers what to do."**

Navigating Anaconda and Python

Via the GUI

Via the command line (if you are a bit more geeky …)

Introduction

The simplest python command ever

Type this in your console

```
print("Hello, world!")
```

if you get an error message … you either typed wrongly or installed the wrong version of python

What happens with the following command?

```
Print("Hello, world!")
```

python is your calculator

operators `+ - *`

There are two division operators:

- Division operator: `/`
- Integer Division operator `//`

Exponentiation: `**`

Modulo: `5%3`

These operators have **precedence**

You can use parentheses to force precedence `()`

Note that `{}` or `[]` are reserved for other **data types**

There are more operators but these will do for today!

TRY Problem Set 1 Question 6 & 7

Clicker Question

Arrange the output of the following in ascending order.

(1) `print(4//7)`
(2) `print(7/4)`
(3) `print(7//4)`

A. 1, 2, 3
B. 3, 2, 1
C. 1, 3, 2
D. 2, 3, 1

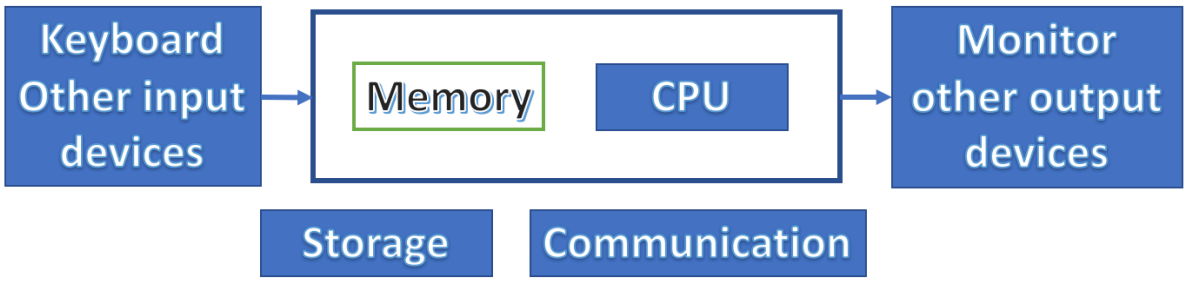
Clicker Question (try it without typing into your console)

In Python, what is the result of `(12 – 3)/(6 – 4)` ?

(a) 4
(b) 4.0
(c) 4.5
(d) 5
(e) 5.0

The Python Memory Story

Model of a computer



How does a computer store data

The computer stores data using 1 and 0 on your computer's memory (not your HDD), but it has different ways of using these binary information to store your data.

They are stored as **objects** in **memory** and can be of different **data types.**

You can think of objects as zones in your computer memory that store data.

Today you learn three basic data types

integer `17`

float (floating point number) `17.0`

string `"my string"`

Questions: How many ways can you specify a string?

check your python data types using the `type()` function

convert to integer `int()`

try `help( int )`

TRY Problem Set 1 Question 1 & 2

Variables

When you type an integer eg. 17 in python, python finds a space in the RAM to store it.

You can give this particular space a name by using **variable names**.

```
x = 17
```

means

assign the name x to the object of 17

This is not maths - it does not mean "Let x be 17"

Does the following make sense? `17 = x`

What would this mean? `x = x + 2`

The names of variables follow some rules

- Names are case sensitive
- The first character cannot be a digit
- Read the textbook
- Eg. Cannot be `for, yield, lambda` (32 of them)
- Cannot use operators e.g =/=
- Can you use O_O ?

You can update variables.

```
x = 17
x = x + 3
```

You must always give a new variable a value.

```
stray = stray + 3  #this won't work because?
```

Give variables meaningful names

Which one is better?

Sample A	Sample B

`pi = 3.14159`
`diameter = 10`
`circumference = pi*diameter`
	`x = 3.14159`
	`y = 10`
	`z = x*y`

Note that we often use variable names like x for brevity

TRY Problem Set 1 Question 3, 4 & 8

Some Extra Questions

Example 1. Write a python code for the following

$$x = \frac{9.5 \times 4.5 - 2.5 \times 3}{45.5 - 3.5} \tag{1}$$

Example 2. Write a python code for the following

$$x = \frac{9 \times 3 - 3 \times 4}{7 - 5} \tag{2}$$

Example 3. Write a python code for the following

$$\pi = 4 \times \left(1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \frac{1}{9} - \frac{1}{11}\right) \tag{3}$$

Clicker question

What is the value of y after the execution of this code?

```
x = 37
y = x - 2
x = 20
```

- A. 39
- B. 22
- C. 35
- D. 20
- E. 18

Open-ended question

How would you make Problem 2(d) error-free?

```
print( int( "9.81" ) )          #why doesn't it work?
print( int( float("9.81") ) ) #will it work now?
```

Clicker Questions

Lesson 1 – variable names

Which of the following is a valid variable name?

A. `O_o`
B. `Return`
C. `dy/dx`
D. `break`
E. none of the above

Lesson 1 – String Literals (open-ended)

In the console, how would you write the print statement
to get the output on the following line?

```
> print( ?? )
> '2.4'  #to get this output
```

Lesson 1 – Objects in memory

```
Line 1> a = '2.4'
Line 2> a = float(a)
```

At Line 2, the string object is converted to a float object. True/ False

More on the print statement

If no options are specified in the print function, a newline is attached to the end of what is printed i.e

```
print("Pokemon")
print("Pikachu")
```

In the following code, a second argument is given to tell the print function to put a blank space at the end of what is printed.

```
print("Pokemon",end=" ")
print("Pikachu")
```

Type out the code and see what happens. Try including the escape sequences `\n` and `\t`. You could experiment with the following and see what happens

```
print("Poke\nmon",end="*")
print("Pika\nchu")
```

Custom Data Types

TRY Problem Set 1 Question 5

Recall

Thus far, we have seen that **objects**

- Are data in memory
- Have different data types
- Can have a single variable name assigned to them

Objects can have more than one variable

Most of our items in real life have more than one piece of information e.g. coordinates in two dimensions have two numbers.

We are able to define objects containing more than one variable using the `class` keyword.

Explaining Question 5

Define a new "**custom data type**" called `Coordinate`.

With two **attributes** x and y

And give them a starting value (this is called **initialization**)

```
1 class Coordinate(object):
2     x = 3.2
3     y = -1.5
```

At this stage, you are merely creating a blueprint for your custom data type. You do not have any data in memory yet.

With the following lines, you are creating two new objects of the `Coordinate` data type and giving them names `p1` and `p2`.

```
4 p1 = Coordinate()
5 p2 = Coordinate()
```

You access the attributes x and y of each variable by using the dot operator.

```
print( p1.x, p1.y )
```

You can also assign different values to the attributes.

Assign 0.3 to the x attribute of p2 and assign 1.0 to the y attribute of p2.

```
6 p2.x = 0.3
7 p2.y = 1.0
```

And you can perform operations with them.

```
distance_squared = p2.x**2 +  p2.y**2
```

Problem Solving

Write a program that takes in the total cost of food,
then computes the service charge (10%) , the GST on the total bill (food + service charge). In this particular restaurant, the service charge is waived if the food order is less than $50. Print out the amount that customer has to pay.

Pseudocode & Flow Chart

Pseudocode are english statements that resemble code eg.

Read cost_of_food

If cost_of_food less than 50, then

    Assign service_charge the value of 0 (or simply, service_charge = 0)

else

    Assign service_charge the result of cost_of_food*0.10

final_Bill = (cost_of_food + service_charge)*1.07

print Final Bill

Admin Matters

1. Complete all submissions to eDimension by 2359 hours, Tuesday.
2. Read Week 2 materials before Session 1. Don't forget to attempt the Concept Quiz
3. Consider signing up for the extra sessions by the TAs.
4. Form your 1D project groups and enter your names in the link on Wikispaces.