CS101 - Data Abstraction

OOPS - Module 1

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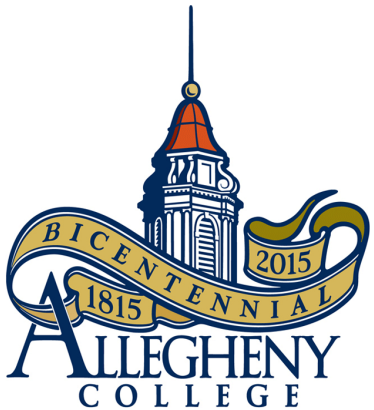
March 13, 2021



Last Week

- Data types
- Conditional contructs
- Iterative constructs
- Functions (methods)

Refer Week2 slides, video, and notes ...

Homework Follow up

Find if n is a multiple of m?!

```
def is_multiple(n,m):
    if (n%m == 0):
      return True
    else:
      return False
print(is_multiple(4,2))
print(is_multiple(5,2))
```

PS the question R1 on page 51.

Homework Follow up

Find the sum of squares?!

```
def sum_of_squares(n):
    total = 0
    for i in range(0,n):
      print(i)
      total += (i*i)
    return total
print(sum_of_squares(4))
```

PS the question R4 on page 51.

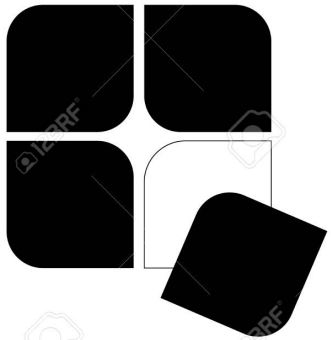
Discussion Based On ...

- GT (Goodrich Textbook) Chapter 01,02 [2.1,2.2,2.4]

Software Goals

Robustness - In addition to producing the correct output for anticipated inputs, we also want the software to handle unexpected inputs not known in advance.

Software Goals



ADAPTABILITY

Adaptability - Software should be able to evolve over time to changing conditions and environment.

Software Goals

Reusability - The same code should be usable as a component in different systems with varying applications.

Software Goals

- **Robustness**
- **Adaptability**
- **Reusability**

Can OOPS support these goals? ...

Classes and Objects

- A class defines behavior and data
- An object is an instance of a class
- Methods define behavior and variables store the data

GOAL: REUSABILITY

Constructor

- Definition: A special type of method called to create an object.
- This special method is called when a new object is created. Intialization happens in the constructor.

How does OOPS support these goals?

- Abstraction - Distill a complicated system down into fundamental parts. Specify what each operation does, and how it does it.
- Encapsulation - Different components of a software system should not reveal the internal details of their respective implementations. Data accessed through public interfaces.
- Modularity - Different components of a software system are divided into separate functional units, which later get integrated into a larger software system.

Object Oriented Programming (OOPs)

Display Student Report Card(OOPs way)!

```
class student:
  def __init__(self,id,name,gpa):
    self.id = id
    self.name = name
    self.gpa = gpa
  def report(self):
    print("-------------------------------")
    print("Student Id:", self.id)
    print("Student Name:", self.name)
    print("Student GPA:", self.gpa)
    print("-------------------------------")
```

PS student.py & stud-driver.py in the repo

Object Oriented Programming (OOPs)

Display Student Report Card (OOPs way)!

```
from student import student
s1 = student(101,"Alice",3.7)
s2 = student(102,"Bob",3.8)
s3 = student(103,"Cathy",3.9)
s1.report()
s2.report()
s3.report()
```

PS student.py & stud-driver.py in the repo

Can we store multiple values in one unit?

- Lists provide a structure to store any number of items.
- Items inside the list can be of different data type [Both Homogeneous and Heterogeneous].
- Indexing a list can lead to out of bound exception if not properly accessed.

An Implementation Of List

Display Places Visited!

```
visited = ['New York','London','India','China','Japan','Germany','S
print(visited)
```

PS places.py in the repo

Homework - Try Out Yourself

Coding challenge: Write a Python program that takes a list of exam scores and find the minimum, maximum, and average exam score.

Note: This is a very important problem in computer science and if one gets comfortable with this, then any future list related tasks may become easier.

Reading Assignment

- GT (Goodrich Textbook) Chapter 01,02 [2.1,2.2,2.4]

Questions?

Please ask if there are any Questions!