

**CSCI 3202: Introduction to Artificial Intelligence**  
Homework 1: due 4. September 11:59pm, to Moodle.

**Learning objective:** Introduction to Python, if you are not already familiar with the language; review of a few essential data structures.

**I recommend starting early, especially if you're new to Python or took data structures a long time ago.**

On Moodle there is a “quiz” called Assignment 1 that contains four programming questions and a few other conceptual data structures questions that you need to complete. By submitting your Python code to the quiz you will complete the assignment. You may submit your code as many times as you like before the deadline.

There is a tutorial at Learn Python the Hard Way for your reference. If you've never used Python, you should work through the exercises in the book to familiarize yourself with the language.

### Assignment 1 Questions

1. Implement a Stack class with the following methods:

- (a) `push(integer)`
- (b) `pop()`
- (c) `checkSize()`

2. Implement a Node class with the following properties and method:

- (a) `integer key`
- (b) `left child`
- (c) `right child`
- (d) `parent`
- (e) `getChildren()` #returns a list of left and right children for the node

3. A partial binary tree is provided in Assignment1.py. The binary tree uses the Node definition from Question 2. Add a method to the class to add a node to the tree with the following specifications. To test your code on CodeRunner, you will need to paste the entire class and the Node class from Question 2 into the answer box.

- (a) `add(value, parentValue)` — item `value` is the key value for the new node and `parentValue` is the key value of the parent. If the `parentValue` is found in the tree, then:
  - i. add the new node as the left child if the parent has no children.
  - ii. add the new node as the right child if the parent has a left child only.
  - iii. on't add the node if the parent already has two children. Print a message, “Parent has two children, node not added.”
  - iv. if `parentValue` is not found in the tree, then print a message, “Parent not found.”
- (b) Also in Assignment1.py is a partial `Graph` class implementation. The `addVertex` method already exists, but the graph is missing the functionality to add an edge or find a vertex. Modify the `Graph` class to include methods to add an edge and find a vertex by its value.
  - i. `addEdge(value1, value2)` — this method takes the key values of two vertices in the graph and adds an edge between them. If one or both of the vertices don't exist in the graph, the method should print a message, “One or more vertices not found.”

- ii. `findVertex(value)` — this method takes the key value of the vertex to search for, and if found in the graph, print the key values of its adjacent vertices.

**What to Submit** and other important information:

In CodeRunner, you have the option to click Check to run your code, and then modify it to fix bugs. You may want to verify that your code works first in your own IDE before submitting to CodeRunner.