

INTRODUCTION TO DATA STRUCTURE

Module 1

Module Outline:

- Data Structure Overview
- General Data Structure
- Python Specific Data Structures

Data Structure Overview

Overview

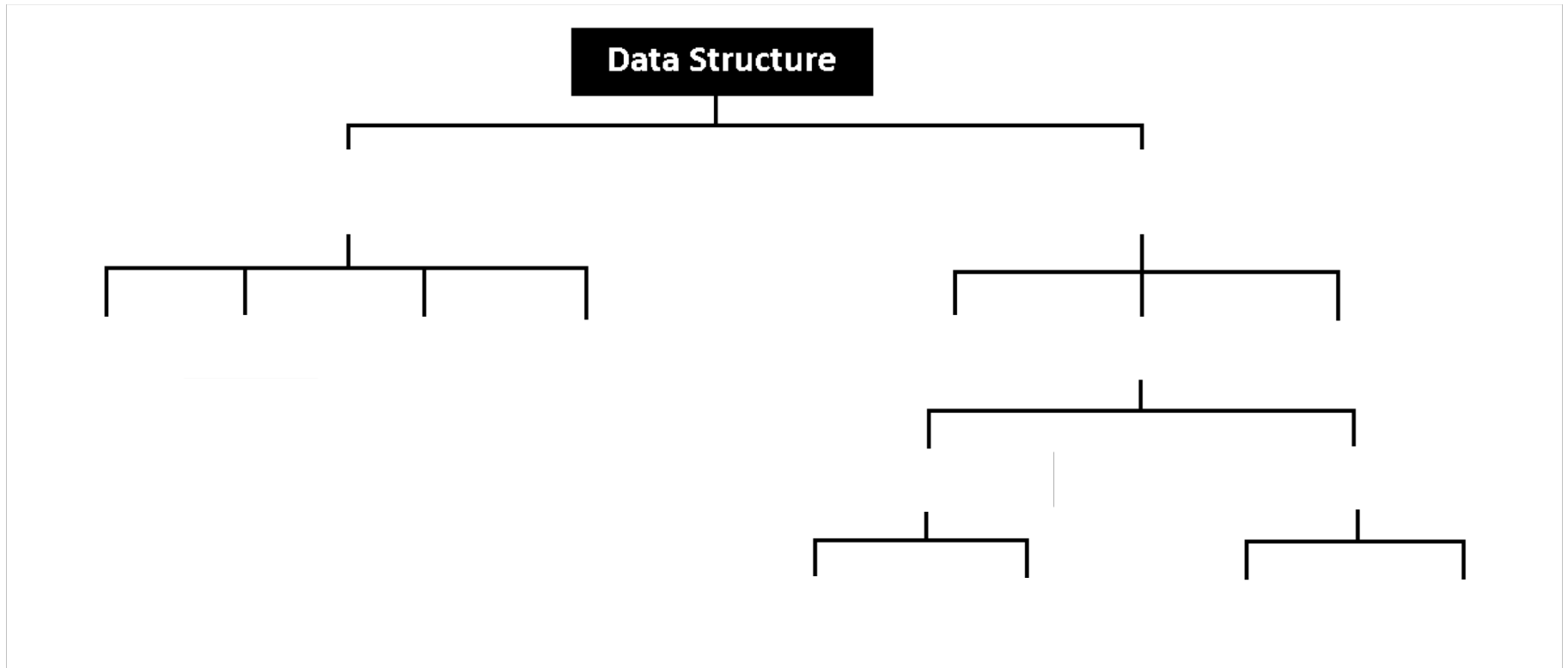
- Data structures are fundamental concepts of computer science which helps in writing **efficient** programs in any language.
- Data Structure is a particular way of organizing, processing, retrieving, storing data in a computer so that it can be used **effectively**.
 - Python is a high-level, interpreted, interactive and object-oriented scripting language using which we can study the fundamentals of data structure in a simpler way as compared to other programming languages.

Overview

- In this module the class is going to study a short overview of some frequently used data structures in general and how they are related to some specific python data types. There are also some data structures specific to python which is listed as another category.

General Data Structure

General Data Structures

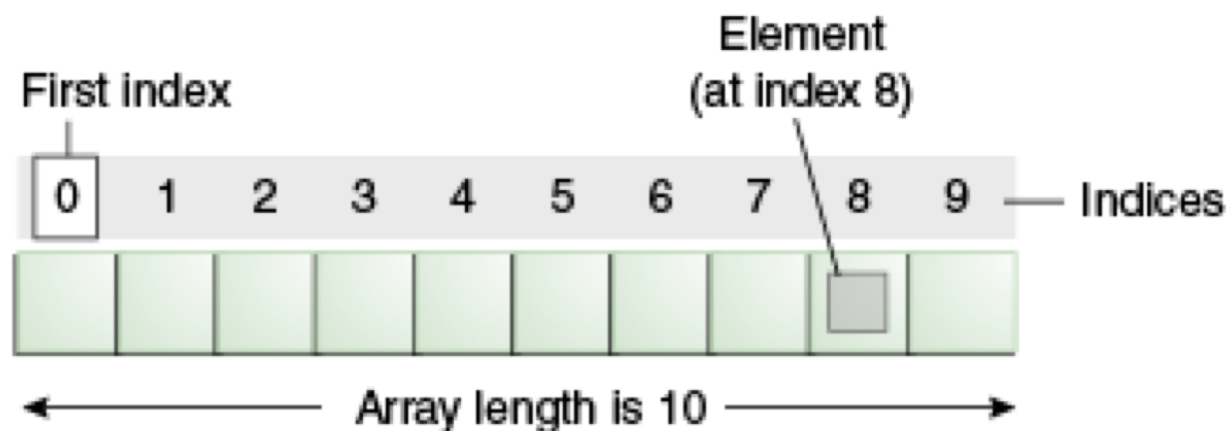


General Data Structures

Linear Data Structures

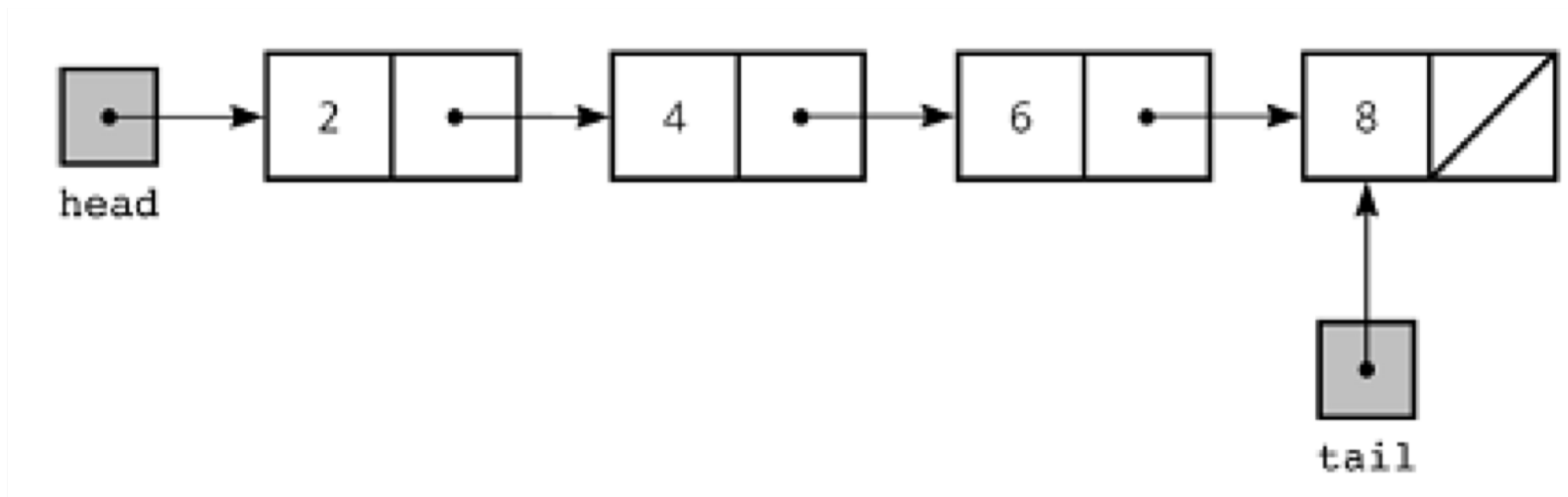
These are the data structures which store the data elements in a sequential manner.

- **Array:** It is a sequential arrangement of data elements paired with the index of the data element.



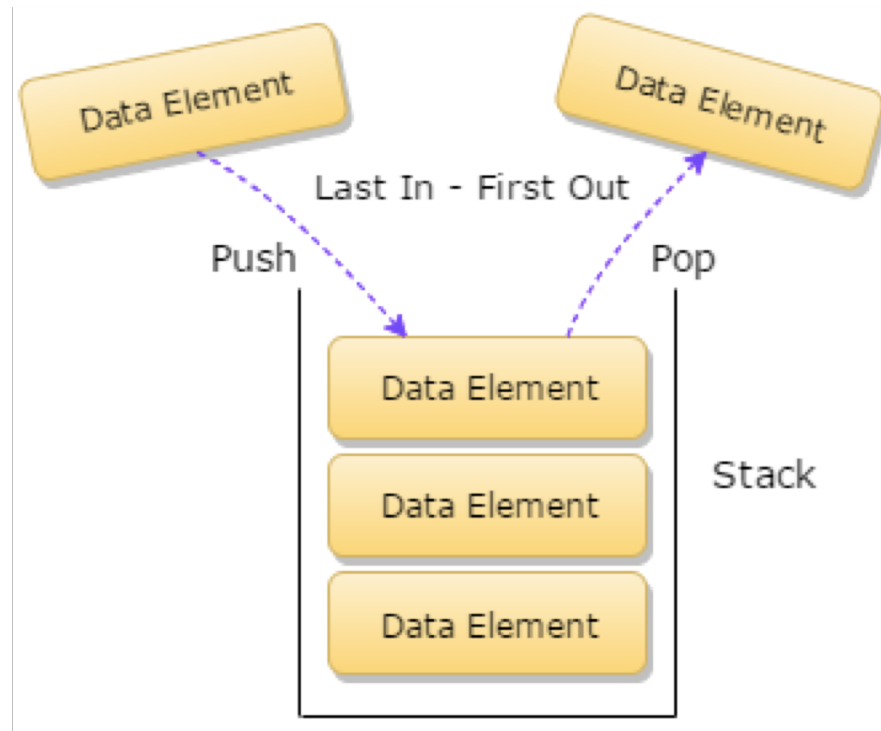
General Data Structures

- **Linked List:** Each data element contains a link to another element along with the data present in it.



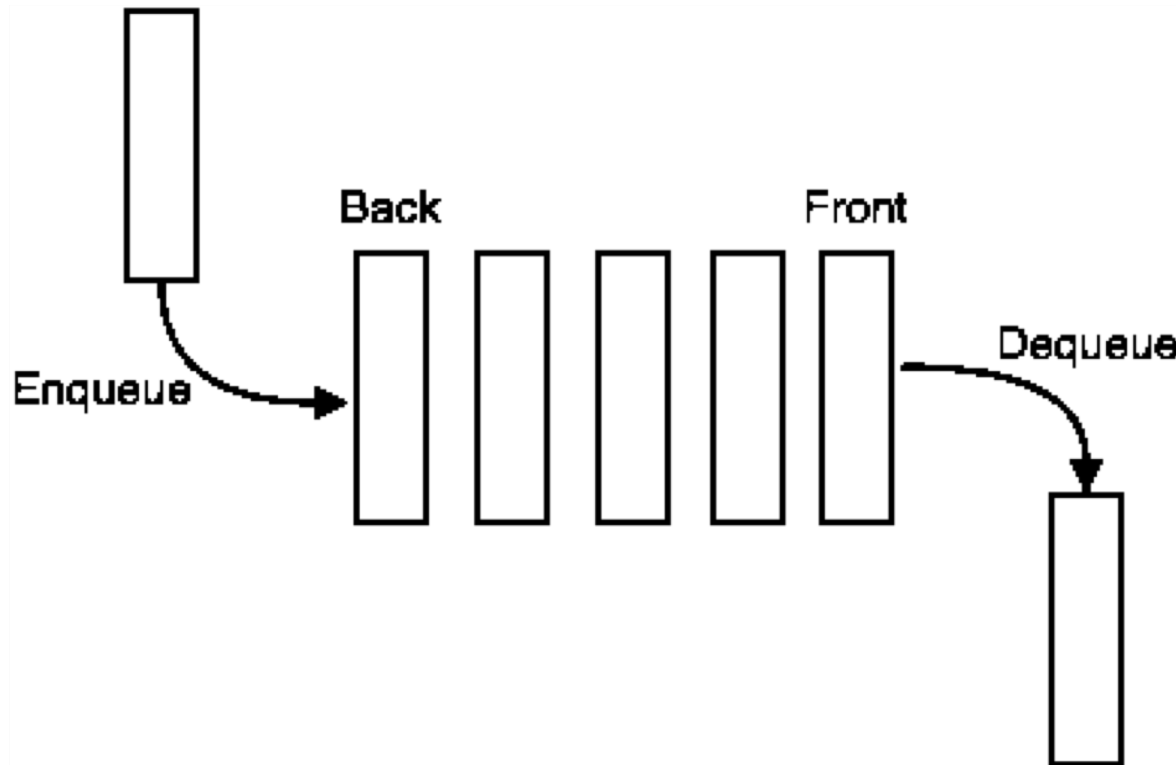
General Data Structures

- **Stack:** It is a data structure which follows only to specific order of operation. LIFO(last in First Out) or FILO(First in Last Out).



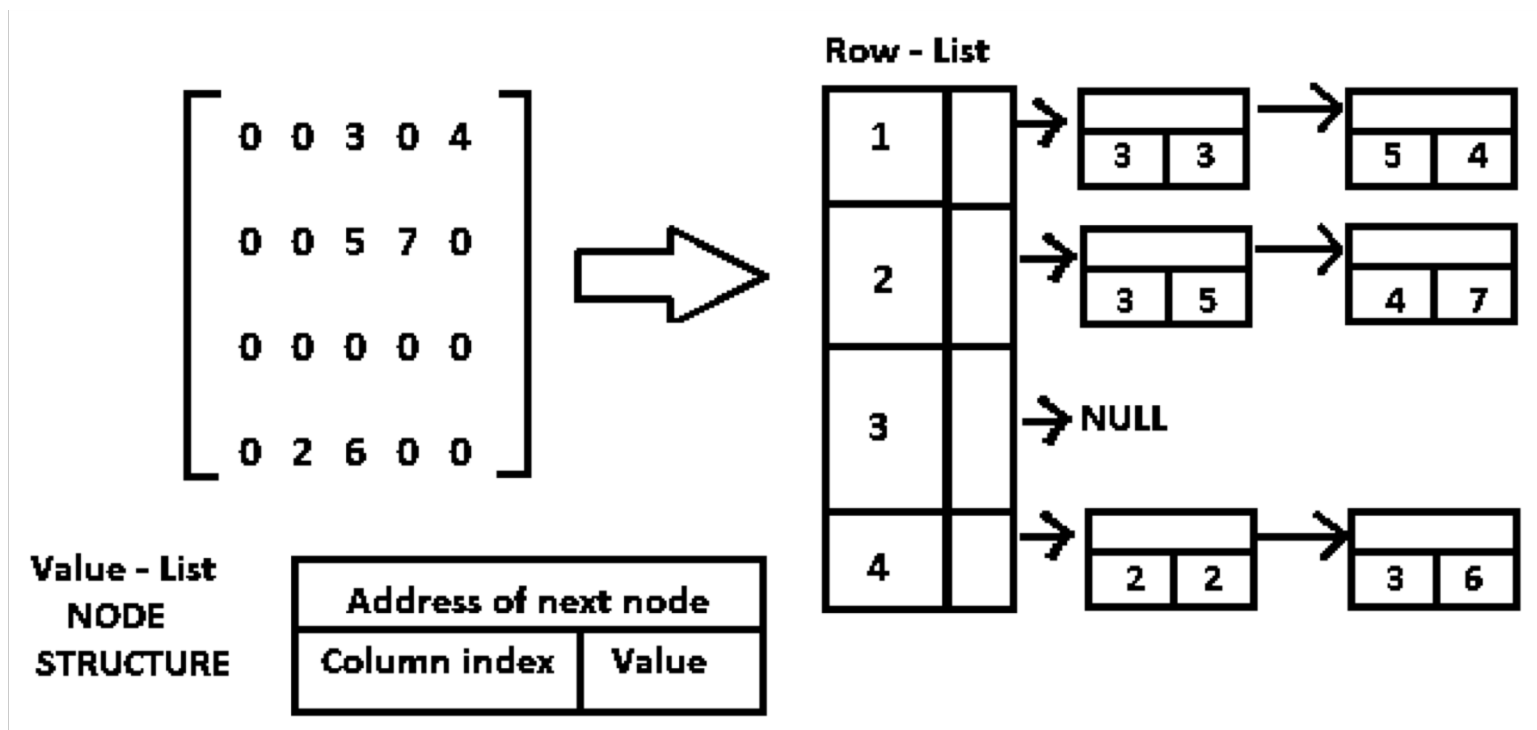
General Data Structures

- **Queue:** It is similar to Stack but the order of operation is only FIFO(First In First Out).



General Data Structures

- **Matrix:** It is two dimensional data structure in which the data element is referred by a pair of indices.



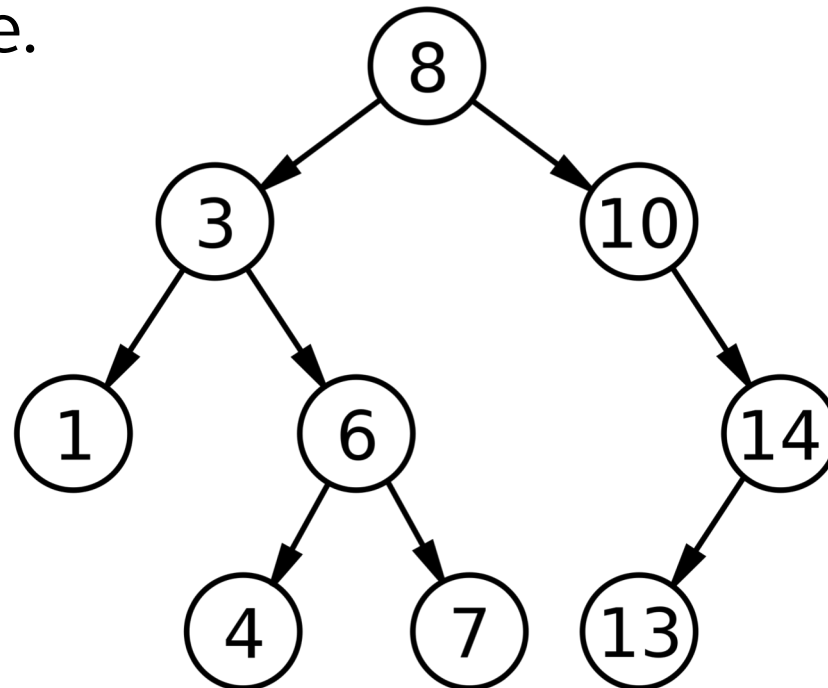
General Data Structure

Non-Linear Data Structure

These are the data structures in which there is no sequential linking of data elements. Any pair or group of data elements can be linked to each other and can be accessed without a strict sequence.

General Data Structure

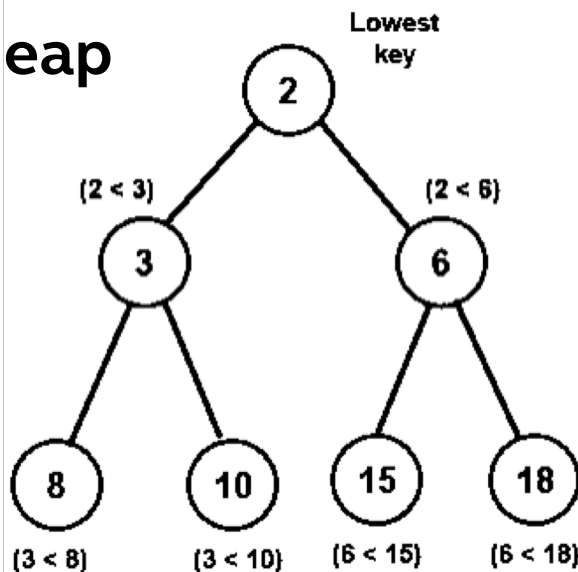
- **Binary Tree:** It is a data structure where each data element can be connected to maximum two other data elements and it starts with a root node.



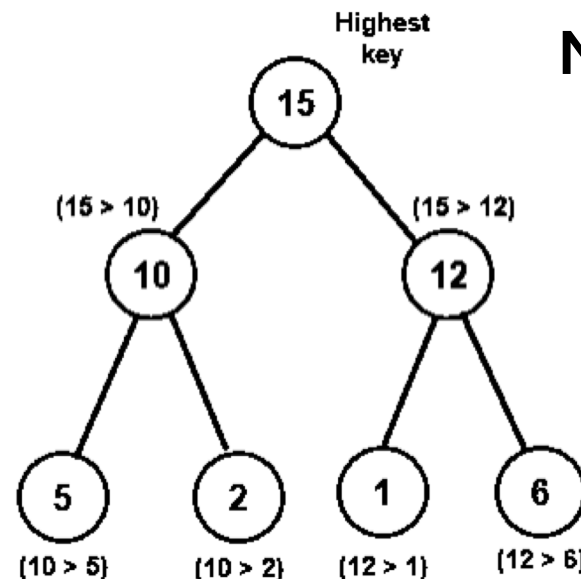
General Data Structure

- **Heap:** It is a special case of Tree data structure where the data in the parent node is either strictly greater than/ equal to the child nodes or strictly less than it's child nodes.

Min Heap

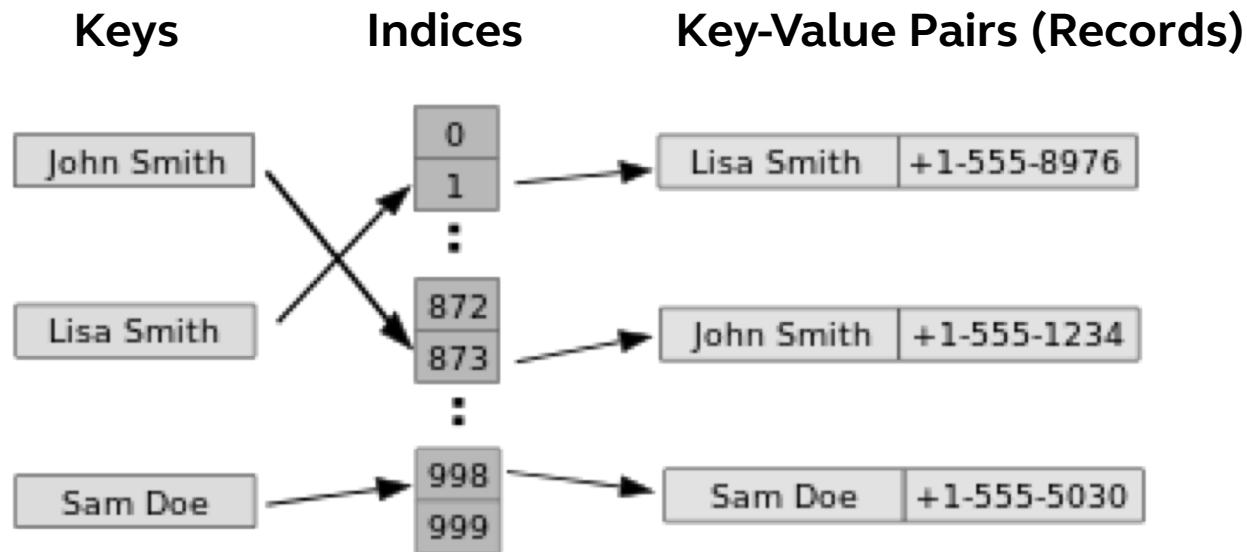


Max Heap



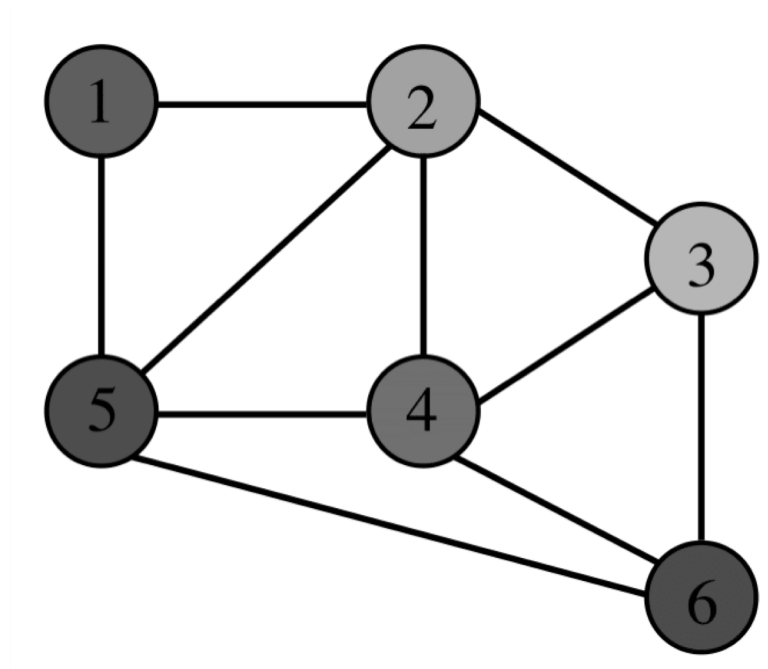
General Data Structure

- **Hash Table:** It is a data structure which is made of arrays associated with each other using a hash function. It retrieves values using keys rather than index from a data element.



General Data Structure

- **Graph:** It is an arrangement of vertices and nodes where some of the nodes are connected to each other through links.



Python Specific Data Structures

- These data structures are specific to python language and they give greater flexibility in storing different types of data and faster processing in python environment.

Python-Specific Data Structure

Python Specific Data Structures

- **List:** It is similar to array with the exception that the data elements can be of different data types. You can have both numeric and string data in a python list.

```
z = [3, 7, 4, 2]
```

```
z[1] = "fish"
```

```
print(z)
```

```
[3, 'fish', 4, 2]
```

Python Specific Data Structures

- **Tuple:** Tuples are similar to lists but they are immutable which means the values in a tuple cannot be modified they can only be read.

Tuple 1

0	1	2	3
---	---	---	---

Tuple 2

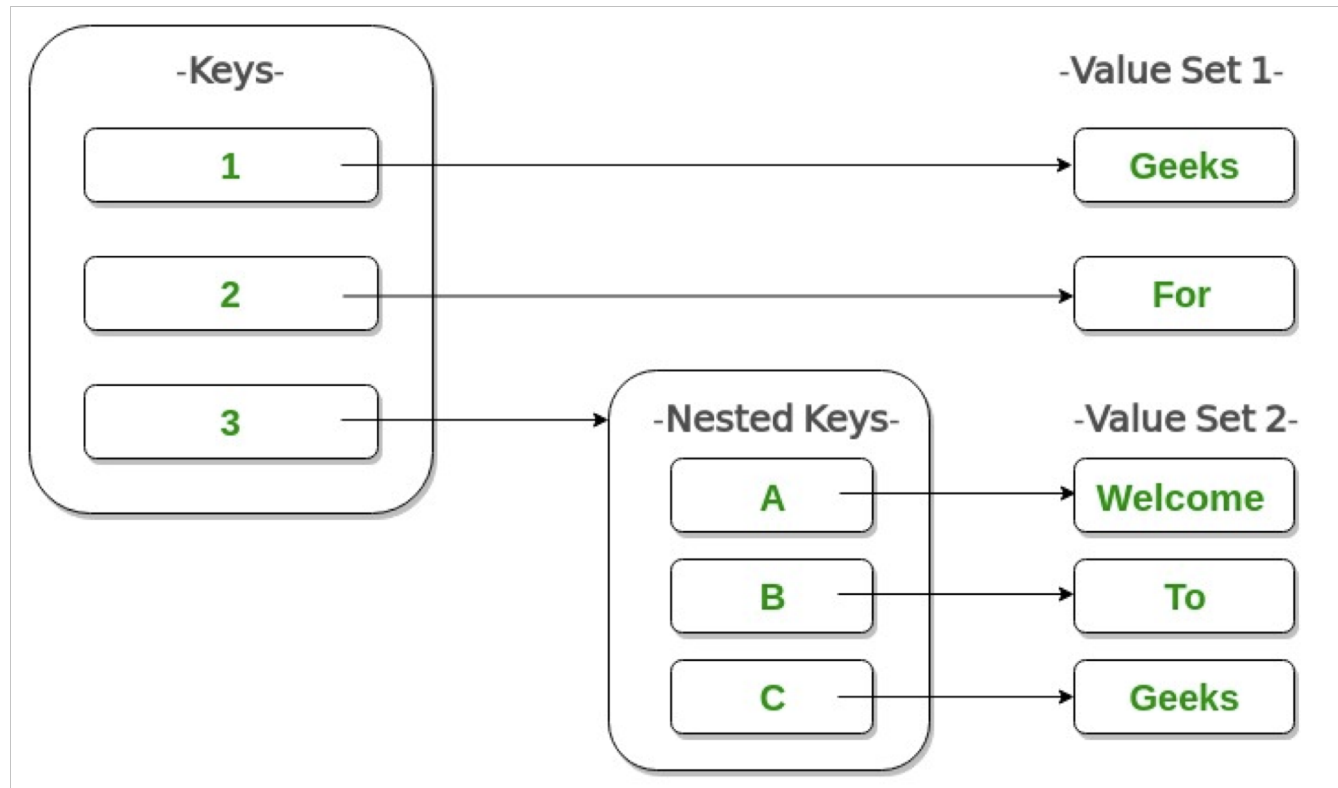
Geeks	For	Geeks
-------	-----	-------

Concatenated Tuple

0	1	2	3	Geeks	For	Geeks
---	---	---	---	-------	-----	-------

Python Specific Data Structures

- **Dictionary:** The dictionary contains Key-value pairs as its data elements.



Reference:

The instructor does not take the credits on the contents of this presentation.

https://www.tutorialspoint.com/python_data_structure/