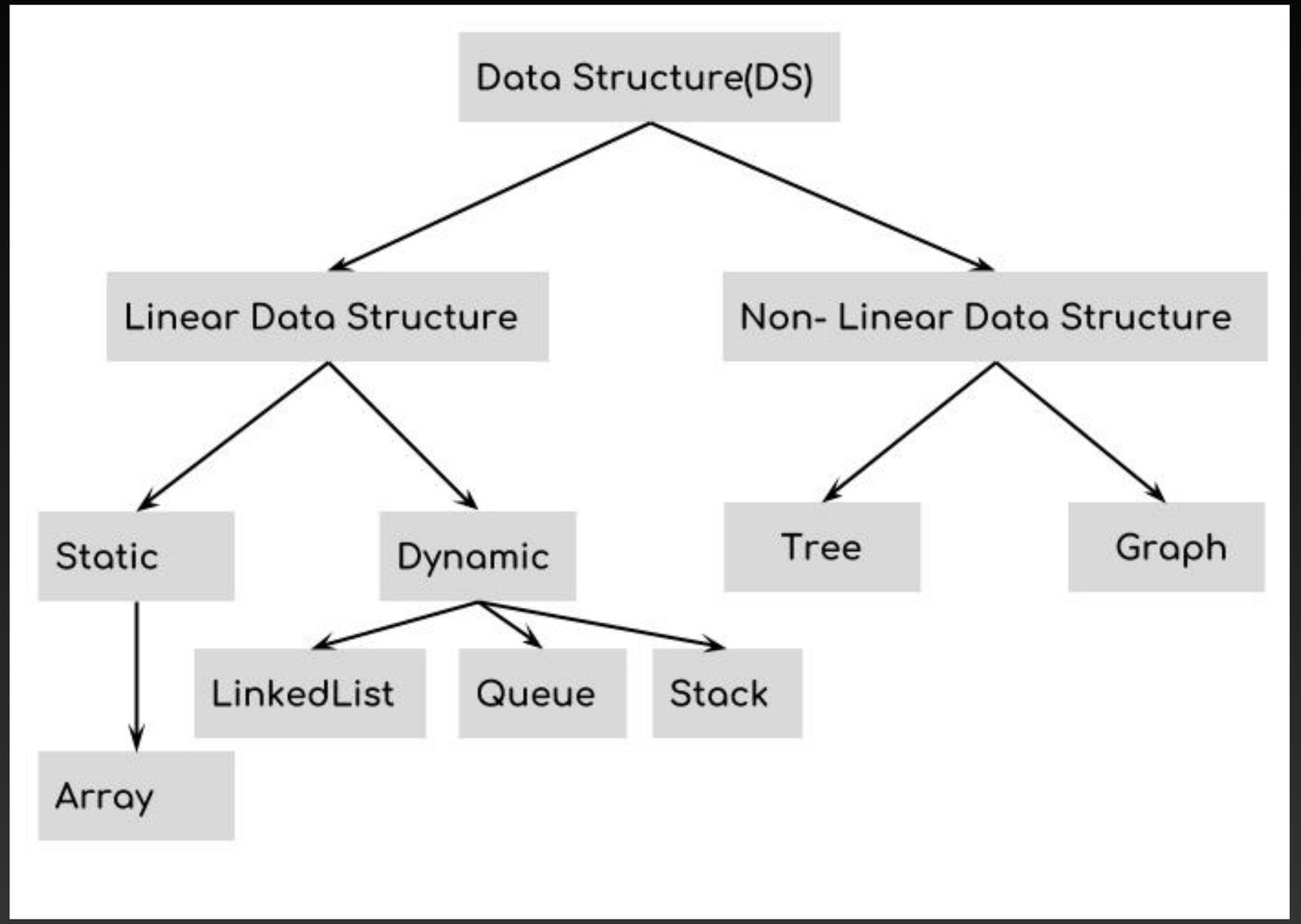
Data Structures

How to properly store your data in java

Logan Hylton 6-01-2020


Data Structure(DS)
Linear Data Structure
Non- Linear Data Structure
Static
Dynamic
Tree
Graph
LinkedList
Queue
Stack
Array

Linear Data Structures

Static -> Arrays

- Arrays are a way of storing a list of data in code. They also are typed, meaning you must specify what type of data they will hold when you create them. They can use any of the previous basic data types that we have already learned about (int, double, string, boolean, etc.).
- Arrays cannot grow or shrink, they are **static**, so we have to also specify the size of the array when we create it (you will likely hear me say **instantiate** a lot more now, that just means you are creating an object or variable. If I write int x = 3, I instantiated x with a value of 3).

```
int[] firstArray = new int[5];
```

Linear Data Structures

Array indexing

- In order to access and modify the data stored in an array, you will need to use an index number which you will give to the array so it knows which item you want to use.

```
System.out.println(firstArray[0]);
```

- Here I use the first index, 0, to print out what is stored in the first position of the Array. Can you guess what will be printed since I haven't added any data yet?
- There are a couple different ways you can add data to an array.
  - Setting each value explicitly after you have created the array.
  - Supplying all of the data when the array is created.

Initializing an Array with values

```
int[] secondArray = new int[] { 1, 2, 3, 4, 5 };

System.out.println(secondArray[2]);
```

What do you think will be printed to the console if I were to run this program?

Iterating through arrays

```
for (int i = 0; i < secondArray.length; i++) {
    System.out.println(secondArray[i]);
}
```

What do you think will be printed to the console if I were to run this program?

Updating the value of an array element

```
secondArray[0] = 0;
System.out.println(secondArray[0]);
```

What do you think will be printed to the console if I were to run this program?

Dynamic Linear Data Structures

ArrayLists

- An ArrayList in java is very similar to a normal array but the size of an array list can be changed, this is why it is called a ‘dynamic’ data structure. Remember that arrays are called ‘static’ because they don’t change length.
- When creating any dynamic data structure, you must specify what type it will hold, just like when creating any other variable. However, there is one small difference, you won’t use ‘int’, but ‘Integer’ or ‘Double’ instead. ‘String’ will stay the same.

Lets Create an ArrayList

```
ArrayList<Integer> myFirstArrayList = new ArrayList<Integer>();
```

Lets add some values to the list using a for loop

```
for (int i = 0; i < 5; i++) {
    myFirstArrayList.add(i);
}
```

Retrieving data from an array

What if we know what element we want to get?

```
var thirdElement = myFirstArrayList.get(2);
```

What if we want to get a specific item out of the list but we don’t know its index?

```
var indexOfElement = myFirstArrayList.indexOf(5);
var five = myFirstArrayList.get(indexOfElement);
```

How would we print out every element of an ArrayList?

```
for (int i = 0; i < myFirstArrayList.size(); i++) {
    System.out.println(myFirstArrayList.get(i));
}


for (int x : myFirstArrayList) {
    System.out.println(x);
}
```

Removing an element

```
var firstElement = myFirstArrayList.remove(0);
```

You can also remove an item directly without know the position in the list

```
ArrayList<String> stringList = new ArrayList<String>(
    Arrays.asList(
        "First Element",
        "Second Element",
        "Third Element")
);

boolean removed = stringList.remove("Second Element");
```