Welcome to CS2030S Lab 5!

8 October 2021 [16A]

Please login to your pe node once it's 4pm.

PA1

- Please submit your final changes by **Sunday 2359**.
- A sample solution will be uploaded onto LumiNUS for your reference **after** the submission deadline.

PA2

- In lieu of the current COVID-19 situation, PA2 may be conducted online.
- We will need everyone to test their screen recording software to ensure that it's working well.

PA2 Admin - Screen Recording

- We recommend using FFMPEG
- You may find instructions on installing and using FFMPEG here: https://mysoc.nus.edu.sg/academic/e-exam-sop-for-students/
- You may also use any other screen recording of your choice Please upload a sample recording onto LumiNUS after your lab for us to verify that your screen recording software is working as intendedYou should upload the recording under Multimedia -> Lab 5 (<Your lab group>)

Submission Statistics

Labs	Submitted	Not Submitted	A
1🟢	17	0	17🤩
2🟡	17	0	16
3🟡	16	1	12
4🟡	17	0	15
PA1🔴	17	0	6
Project😂	1	16	0

Java Generics

Generics enable you to detect errors at compile time rather than at runtime.

```java
public class Box<T> {
    private T item;
    public Box(T item) {
        this.item = item;
    }
}
```

T is a generic type.

Declaring `Box<Integer>` replaces all instances of T in your code with `Integer`.

Java Generics

- Every instance of `Box` can have a different type that is assigned to T.
- Therefore, T belongs to an **instance** of `Box`.
- How do we insert a generic type into a static method or variable?

Java Generics

```java
public class Box<T> {
    private T item;
    public static <T> Box<T> empty() {
        // Pink T replaces all the Ts in this method
    }
}
```

- Solution: Declare <T> in front of a static method.
- Pink T is different from red T, even though we use the same letter for both of them.
- Pink T only exists within the scope of the static method; red T exists in all other instance attributes of `Box`.

Map

- A map is a data structure which maps a key to a value.
- One key can only be mapped to one value.
- Mapping a an existing key to another value will replace the current mapping in the map.
- Think of it as a dictionary (for students familiar with Python/ JavaScript).

HashMap

- HashMaps are Maps which are backed by a hash table (you will learn more about this in CS2040/C/S).
- They require the use of two generic types (one for the key and one for the value).
- To declare a HashMap with keys of type A and values of type B:

  -
    ```
    java
    HashMap<A, B> map = new HashMap<A, B>();
    ```

Method	**Description**
.put(YourClass key, YourClass value)	Adds *key* to the HashMap with the value *value*
.clear()	Clears the HashMap
.containsKey(Object o)	Checks if key *o* is in the HashMap, based off the object’s equals() method
.containsValue(Object o)	Checks if value *o* is in the HashMap, based off the object’s equals() method
.get(Object o)	Gets the value corresponding to the key *o*
.isEmpty()	Checks if the HashMap is empty

Method	Description
.remove(Object o)	Removes the entry with key *o* if it is in the HashMap, based off the object’s equals() method
.size()	Returns the number of elements in the HashMap
.entrySet()	Returns a set of all entries in the HashMap
.keySet()	Returns a set of all keys in the HashMap
.values()	Returns a collection of all values in the HashMap