



INFO1113/COMP9003

Week 2 Tutorial

Loops and Arrays

Loops

As with any programming language, there is some form of iteration. Within the java language we have access to the `for` and `while` keywords which allow you to create loops.

while loop

A while loop requires a condition to be true for it to commence and continue iterating. The while loop structure follows `while (condition)`, after this component is defined, the following code block will continue to be executed.

```
boolean b = true
while(b) {
    System.out.println("This is true!");
}
```

for loop

For loops within the java language have two prolific uses. The common C-like method of defining variables, condition and update. This is represented in the form:

`for (variables; condition; update)`

```
for(int i = 0; i < 10; i++) {
    System.out.println(i);
}
```

The alternative method is an iterator based method which will allow the programmer to express a loop using a binding and collection. This is represented in the following form:

`for (binding: collection)`

```
String[] array = { "Hello", "Loops!" }
for(String s : array) {
    System.out.println(s);
}
```

Question 1: Counting Numbers

Write a program that will take in two integers from the command line and outputs every integer between the two, including the two given.

Example:

```
java CountingNumbers.java 2 5
2
3
4
5
```

Question 2: Counting Vowels

Write a method that will take in a string and return the number of vowels that exist in the given string.

Note: Remember to use a static method for this and make sure you specify the types for your argument and return.

```
static int countVowels(String s)

String s = "astronaut";
int count = countVowels(s);
System.out.println("Number of count: " + count); //4
```

Arrays

Arrays are defined as contiguous blocks of memory that contain a number of elements. Memory is allocated based on the size of the type and the number of elements defined. When using primitive typed arrays, all elements are aligned next to each other while reference typed arrays will contain a memory reference. The size of a memory reference is the size of the address space size of the CPU on your computer. This is commonly referred to as the pointer size.

```
int[] array = new int[10]; //By default, initialised to 0
```

Elements of primitive typed arrays will always contain a value. Previous instances of Java (<= Java 6), did not guarantee elements to be initialised to 0.

```
String[] array = new String[10]; //By default, initialised to null
```

Elements of reference typed arrays will by default be initialised to null. By default, each element within the array is a memory reference and does not have any usable data. To set an element within a referenced typed array, you are able to set an element to null or to an object (either directly initialising it with new or through aliasing).

Discussion

- What is the purpose of the `new` keyword? When do we use `new`?
- What are some other ways we can initialise an array? Can you write out what the code would look like for a static initialisation?

Question 3: Contains

Write a method that will check if an element exists within an array.

```
static boolean contains(int[] a, int element);
```

Example:

```
int[] array = {1, 1, 5, 5, 5, 3, 8, 1};  
  
boolean result = contains(array, 5); //true
```

Question 4: Count

Extend your previous question to return the number of times an element exists in an array.

```
static int count(int[] a, int element);
```

Example:

```
int[] array = {1, 1, 5, 6, 5, 3, 8, 1, 9, 2, 8};  
  
int result = count(array, 1); //3
```

Question 5: Count duplicates

Given an array, count the number of duplicates that exist in a given array.

```
static int countDuplicates(int[] a)
```

Example:

```
int[] dups = {1, 1, 5, 6, 5, 3, 8, 1, 9, 2, 8};  
  
int result = countDuplicates(dups);  
//3
```

Question 6: Array Union

Given two integer arrays, return an array that is the union of the two arrays. If an integer is repeated, make sure to only return it once in your new array.

```
static int[] union(int[] x, int[] y)
```

Example:

```
int[] x = {3, 2, 7};  
int[] y = {3, 8, 9};  
  
int[] result = union(x, y);  
//{3, 2, 7, 8, 9}, it is not necessary to sort the array
```

Extension: Writing and executing a bash script

In a bash script you can put all of your commands to execute your java program. To simply compile and run your java program, do the following:

- Create a file with the extension .sh (let's say run.sh)
- In the .sh file, write the commands to compile and execute your java code like

```
javac <FileName>.java  
java <FileName>
```

- Then type the following in the terminal to execute your sh file

```
bash run.sh
```

Question 7: Assessed Task: Online Task 1

Remember you are required to complete a Online Task within the due date. Go to EdStem for this unit and click on Lessons to find out the task and the due date. This is a marked task. Note that you are allowed to submit multiple times but only the last one will be marked.
