**Algorithms & Data Structures**

**Lab1 : Week beginning 16th January, 2023**

**N.B. For all the following problems, write pseudocode, unless the code is very straightforward. You can use pen and paper!**

Q. 1. Write the following methods. **All the methods should be static like those in Math.java**.

Put all methods in a class MyMath.java

Test the methods in main() in a class TestMyMath.java.

1. find the smallest of three numbers

public static int smallest(int num1, int num2, int num3)

1. calculate ab where b is a positive integer i.e. write code equivalent to pow() method in Math.java
2. find the sum of the numbers 1 to n where n >=1
3. calculate n! where n >=0

n! = 1\*2\*3\*4\*…\*n if n>=1

= 1 if n = 0

1. test if a number n is a prime number

Q.2 Enter some numbers between 1 and 100. A number less than 1 indicates end of input. Count how many of each number entered. I.e. how many 1s, 2s, etc.

Write the code in main() method.

Q.3. Write and test a method that asks the user to enter their name and returns their initials: e.g. initials of Ann Murphy would be A. M.

What would be the header of this method?

Q.4. Write and test a method

public static int countWords(String str) that returns a count of all the words in the string str. Words are separated by spaces. E.g countWords(“A Star Is Born”) should return 4. Use whatever methods of String class you wish (but do **not** use not regular expressions).

Q.5 Validate a new password as follows:

It must be at least 8 characters long

It must have at least one uppercase and one lowercase letter

It must have at least one digit

Write a method that asks the user to enter a new password. Ask again until the input conforms to the rules. The method should return the new password and has the following header:

public static String inputNewPassword()

Use a method with the following header to check if a password is valid:

public static boolean isValid(String password)