CS Lab 100

**Single Loops and Arrays**

# Part 1:

**Filename**: DontLeaveMe.java

Collect a String from the user, and repeat back whatever it says. The program should continue to do this until the user enters the String “Exit”. Ignore capitalization in “Exit”. You *may not* use a break or System.exit statement. The loop should naturally end when the user types “Exit”. Here is a sample run:

What should I say? *Hello, World!*  
Hello, World!

What should I say? *I rule the world with my iron first! And my hot-pink wand!*  
I rule the world with my iron first! And my hot-pink wand!

What should I say? *exit*  
Exiting...

# Part 2:

**Filename**: GetE.java

This program is meant to be run from a console. The irrational number e, also called Euler’s number, is approximately 2.71828. Euler proved that this number was irrational by showing that it was equal to the infinitely expanding series 1 + 1/1 + 1/(2!) + 1/(3!) + 1/(4!)…

getE should take a command-line argument of a single number n. It should then perform the number of calculations from the list above specified by n, and output the result to the screen. So,

> java getE 1

1.0

> java getE 2

2.0

> java getE 3

2.5

> java getE 4

2.666666667

> java getE 5

2.708333333

**HINT**: use Integer.parseInt(args[0]) to turn the first String argument passed in into an int.

**NOTE**: While there is an obvious solution to this problem that involves a nested loop, the best solution involves only a *single* loop. See if you can figure out the single-loop solution!

# Part 3:

**Filename**: SpreadLines.java

This program is meant to be run from a console. SpreadLines will take a series of arguments at the command line and print them, one to a line. For instance:

> java SpreadLines Hello there discombobulated friend

Hello

there

discombobulated

friend

> java SpreadLines

> java SpreadLines 34

34

# Part 4: Sorting into 3 groups

**Filename**: SortThree.java

This is actually a famous problem in Computer Science that I am deliberately not giving you the name of. (The intention here is for you to puzzle this out without reference to any of the many known solutions.)

The problem goes like this: there is an array full of the numbers 1, 2, and 3. For instance:

{1, 1, 1, 3, 1, 3, 1, 3, 2}, or {2, 2, 3, 3, 1, 3, 1, 3}

Your algorithm will ask the user for an array size, and you will fill the bucket with appropriate random numbers (using Math.random(), arithmetic, and int casting). You will then print that randomized array to the screen.

When then follows is a sorting of the array, *which must be done* *in a single loop*.

Then print out the array. Our two examples above would print:

{1, 1, 1, 1, 1, 2, 3, 3, 3} or {1, 1, 2, 2, 3, 3, 3, 3}

**EXTRA CREDIT: SortFour.java**

Do the same thing with the numbers 1-4. Again, the work must be done in a single loop.

**OPTIONAL CONTEST FOR THE UNAFRAID:**

**SortFive.java** is not for the faint of heart. Same for **SortSix**, **SortSeven**, etc. The contest is to see how far you can go with a single loop. Winner will either get accolades (or possibly a trophy if the contest gets heated enough!)

# Part 5:

**Filename**: EncryptionV2.java

The goal here is to take your work from the previous encryption lab and extend it to be really useful. We’re going to allow it to take all of the standard characters from a space to a tilde, including all of the standard punctuation and capital and lowercase letters. We’re also going to allow arbitrarily long Strings.

Here’s what you need to know:

The standard range of characters goes from 32 (a space) to 126 (a tilde), giving us 95 possible characters.

You can use your basic logic from before, but you will now need a loop to go through your String. The methods are:

public String encrypt(int key, String text)

public String decrypt(int key, String text)

*Here are some values you can use to test your methods:*

encrypt (7, "a") should become h.

encrypt (1, "Hi there, friend!") should return

ISs)28KQ}>EXbhw|>

so decrypt (1, "ISs)28KQ}>EXbhw|>") should return

Hi there, friend!

Encrypt with 16 and the String:

Four score and seven years ago our fathers brought forth on this continent, a new nation, conceived in Liberty, and dedicated to the proposition that all men are created equal.

Should get you:

Vf|0Pdhx,2RTch)=CZ`o0JPRey:<DTt%;Nnuw-6<Oc$':J`hq'GN^q'0P`o0ENXl-1APeo~%4Iu68Xgm&FUWlv'6b#'7FJPZqw|=GVvcmpv\*?Y&FHW\|"(-7;=RX]}3Ccx"(HYl|.>R\q{,;[py{1QS`m.<BQqs'-MQdjl"(-MSe{}+Y

(Please note that both the original text and the resulting encrypted text are on 1 line. Any wrapping is a result of line endings and Word.)