

CSC 161 LAB 7-1 OPERATIONS ON LISTS

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In this lab, you will get used to various methods of the `List` interface by writing code that manipulates a list of objects in various ways.

1. CREATING AND PRINTING A LIST

Create a console application that asks a user to enter a positive number N for the size of a list. Create an array list `myList` of integers and add N random integers from the range 0..99. Print out the list of numbers by using the call `System.out.print(myList)`. Here is a sample run

```
Enter a positive integer: 8
Here is a random list of 8 numbers: [66, 71, 42, 64, 3, 76, 64, 62]
```

And here is another sample run:

```
Enter a positive integer: 6
Here is a random list of 6 numbers: [5, 10, 71, 19, 37, 19]
```

2. ITERATING A LIST USING A REGULAR LOOP

Now add code that uses a regular for loop to step through the list and print the squares of all the numbers in the list:

```
Enter a positive integer: 5
Here is a random list of 5 numbers: [77, 54, 52, 34, 70]

Squares using a regular loop: 5929 2916 2704 1156 4900
```

3. ITERATING THROUGH A LIST USING AN ENHANCED FOR LOOP

Add code to step through the list and print the doubles (each number multiplied by 2) of the numbers in the list:

```
Enter a positive integer: 4
Here is a random list of 4 numbers: [85, 48, 85, 68]

Squares using a regular loop: 7225 2304 7225 4624

Doubles using an enhanced for loop: 170 96 170 136
```

4. ITERATING THROUGH A LIST USING AN ITERATOR

Add code to step through the list and print the triples of the members of the list using an iterator.

```

Enter a positive integer: 6
Here is a random list of 6 numbers: [33, 99, 84, 81, 45, 54]

Squares using a regular loop: 1089 9801 7056 6561 2025 2916

Doubles using an enhanced for loop: 66 198 168 162 90 108

Triples using an iterator: 99 297 252 243 135 162

```

5. ITERATING USING FOREACH

Finally, add some code to use the `forEach` method to print the quadruples of the members of the list(the numbers multiplied by 4).

```

Enter a positive integer: 5
Here is a random list of 5 numbers: [5, 66, 21, 27, 3]

Squares using a regular loop: 25 4356 441 729 9

Doubles using an enhanced for loop: 10 132 42 54 6

Triples using an iterator: 15 198 63 81 9

Quadruples using forEach: 20 264 84 108 12

```

6. DISPLAYING THE MAXIMUM

Add code that prints both the position and the value of the maximum member of the list:

```

Enter a positive integer: 8
Here is a random list of 8 numbers: [63, 24, 29, 25, 58, 83, 43, 62]

Squares using a regular loop: 3969 576 841 625 3364 6889 1849 3844

Doubles using an enhanced for loop: 126 48 58 50 116 166 86 124

Triples using an iterator: 189 72 87 75 174 249 129 186

Quadruples using forEach: 252 96 116 100 232 332 172 248

Max value is 83 at 5

```

7. MOVING THE MAXIMUM TO THE END

Now that we have found the maximum value, we want to remove it from its position and insert it at the end of the list. Assuming the variable that gives the position of the maximum is `pos`, we can use

```
E remove(int index)
```

to remove the value. Next, we can use

```
void add(int index, E element)
```

to place the value at another position. Use the size of the list for the position at the end of the list.

```

Enter a positive integer: 10
Here is a random list of 10 numbers: [36, 27, 91, 71, 23, 24, 53, 79, 59, 52]

Squares using a regular loop: 1296 729 8281 5041 529 576 2809 6241 3481 2704

Doubles using an enhanced for loop: 72 54 182 142 46 48 106 158 118 104

Triples using an iterator: 108 81 273 213 69 72 159 237 177 156

Quadruples using forEach: 144 108 364 284 92 96 212 316 236 208

Max value is 91 at 2

After moving maximum to the end: [36, 27, 71, 23, 24, 53, 79, 59, 52, 91]

```

8. SORTING THE LIST

We can sort the list by repeatedly finding the maximum value in the unsorted part of the list and moving it to the end of the unsorted part.

Begin by setting a variable

```
int upperBound = myList.size()-1;
```

Next find the position `pos` of the maximum value in the part of the list `0..upperBound`. Remove the value at `pos` and add it at `upperBound`. Decrement `upperBound` by 1, and repeat. Print the list after each iteration, and stop when the entire list is sorted.

```

Enter a positive integer: 10
Here is a random list of 10 numbers: [11, 53, 31, 55, 54, 87, 64, 9, 82, 52]

Squares using a regular loop: 121 2809 961 3025 2916 7569 4096 81 6724 2704

Doubles using an enhanced for loop: 22 106 62 110 108 174 128 18 164 104

Triples using an iterator: 33 159 93 165 162 261 192 27 246 156

Quadruples using forEach: 44 212 124 220 216 348 256 36 328 208

Max value is 87 at 5

After moving maximum to the end: [11, 53, 31, 55, 54, 64, 9, 82, 52, 87]

Here is the process of sorting:
[11, 53, 31, 55, 54, 64, 9, 82, 52, 87]
[11, 53, 31, 55, 54, 64, 9, 52, 82, 87]
[11, 53, 31, 55, 54, 9, 52, 64, 82, 87]
[11, 53, 31, 54, 9, 52, 55, 64, 82, 87]
[11, 53, 31, 9, 52, 54, 55, 64, 82, 87]
[11, 31, 9, 52, 53, 54, 55, 64, 82, 87]

```

[11, 31, 9, 52, 53, 54, 55, 64, 82, 87]
[11, 9, 31, 52, 53, 54, 55, 64, 82, 87]
[9, 11, 31, 52, 53, 54, 55, 64, 82, 87]

9. DUE DATE

This is due Wednesday of Week 7.