

CSC 1310 LAB 10

MINIMUM HEAP

MINIMUM HEAP OF CREATURES



Write an **ArrayMinHeap** class that implements a minimum heap of creatures where the minimum is based on the creature's name. You are given the **Creatures** class, **CreatureBinaryTree** class, and the **Zoo** (driver) source file. The logic of the **Zoo.cpp** source file should not be changed.

Your program should not use the CreatureBinaryTree class at all – I only provide it because the current version of Zoo uses this class. Your program should use the ArrayMinHeap class instead.

ARRAYMINHEAP

Refer to the sample **ArrayMinHeap** class demonstrated in class to help you write your own class.

Private attributes:

- ☐ Creature *heapArray;
- ☐ int capacity;
- ☐ int heap_size;

Private functions:

- ☐ swap
- ☐ parent
- ☐ left
- ☐ right

Public functions:

- ☐ constructor (accepts an integer capacity & creates heapArray based on this capacity)
- ☐ destructor (releases heapArray memory)
- ☐ minHeapify (recursive method to adjust the heap to make sure all nodes follow the min-heap rule)
- ☐ peek (returns root creature)
- ☐ remove (remove minimum element (or root) from min heap)

Note – you will need to return a Boolean from this function to indicate if a creature was removed (none will be removed if there are no nodes). Also, you will need to return the creature removed. I suggest passing the creature to be removed by reference and returning the Boolean.

```
C:\Users\acrockett\Desktop\CSC\CSC Fall 2018\CSC1310-001\LABS\LAB 11 - heap\solution>a

what would you like to do?
1. Enter Magical Creature
2. List/Print Creatures.
3. Remove Next Creature.
4. End Program.
Enter 1, 2, 3, or 4.
CHOICE: 3

Error: there are no nodes in the heap.

No creatures were removed.

what would you like to do?
1. Enter Magical Creature
2. List/Print Creatures.
3. Remove Next Creature.
4. End Program.
```

- ☐ insert (insert new creature in heap – Creature is sent to this function)
- ☐ resizeArray (make an array 2 times as big as original)
- ☐ isEmpty (returns true if heap_size is zero and false otherwise)
- ☐ getNumberOfNodes (returns heap_size)
- ☐ getHeight (returns the ceiling of log base 2 of heap_size plus 1)
- ☐ display (traverses the array starting at 1st element and prints out the name of each creature – one per line)
- ☐ saveToFile (traverses the array starting at 1st element and calls the printCreatureToFile function sending "savedCreatures.txt" to this function.

ZOO.CPP

Modify the given **Zoo.cpp** to create a heap of creatures instead of a binary tree. You will create a minimum heap that has a capacity of **100** creatures.

Add an additional option (option 3) to remove the next creature. Remember that when you remove from the heap you always remove the root – which is the creature that comes first in the alphabet in this program.

Refer to the sample output below to see how your program should work.

SAMPLE OUTPUT

User input is highlighted in **yellow**.

```
What would you like to do?
```

1. Enter Magical Creature
2. List/Print Creatures.
3. Remove Next Creature.
4. End Program.

```
Enter 1, 2, 3, or 4.
```

```
CHOICE: 1
```

```
Do you want to enter the creature(s)
```

1. Manually?
2. From a file?

```
ENTER 1 or 2: 2
```

```
What is the name of the file you want to read from?
```

```
FILENAME: creatureFile.txt
```

```
6 creatures from creatureFile.txt have been read from the file.
```

```
What would you like to do?
```

1. Enter Magical Creature
2. List/Print Creatures.
3. Remove Next Creature.
4. End Program.

```
Enter 1, 2, 3, or 4.
```

```
CHOICE: 2
```

```
Banshee
```

```
Beholder
```

```
Mike Wazowski
```

```
Sasquatch
```

```
Troll
```

```
Unicorn
```

```
What would you like to do?
```

1. Enter Magical Creature
2. List/Print Creatures.
3. Remove Next Creature.

```
4. End Program.
Enter 1, 2, 3, or 4.
CHOICE: 3

You have removed Banshee

What would you like to do?
1. Enter Magical Creature
2. List/Print Creatures.
3. Remove Next Creature.
4. End Program.
Enter 1, 2, 3, or 4.
CHOICE: 2

Beholder
Sasquatch
Mike Wazowski
Unicorn
Troll

What would you like to do?
1. Enter Magical Creature
2. List/Print Creatures.
3. Remove Next Creature.
4. End Program.
Enter 1, 2, 3, or 4.
CHOICE: 8

Your choice was invalid. Choose a number 1 through 4.
CHOICE: 4

Would you like to save your creature list to a file? (y or n) y
Beholder was printed to savedCreatures.txt
Sasquatch was printed to savedCreatures.txt
Mike Wazowski was printed to savedCreatures.txt
Unicorn was printed to savedCreatures.txt
Troll was printed to savedCreatures.txt

GOODBYE!
```

WHAT TO TURN IN

Please put the files below in a zipped folder and upload to ilearn submission folder.

- ☐ **ArrayMinHeap.h**
- ☐ **Creature.cpp**
- ☐ **Creature.h**
- ☐ **creatureFile.txt**
- ☐ **Zoo.cpp**