

Computer Science I – Exercise Heaps (Solutions)

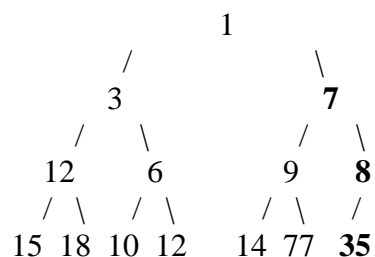
1) In an array-based implementation of a Heap, the left-child of the left-child of the node at index i , if it exists, can be found at what array location?

It will be found at array position $4i$

2) In an array-based implementation of a Heap, the right-child of the right-child of the node at index i , if it exists, can be found at what array location?

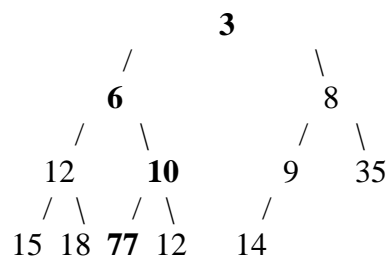
It will be found at array position $4i + 3$

3) Show the result of inserting the item 7 into the heap shown below:



(Changes are marked in bold.)

4) Show the result of removing the minimum element from the original heap in question #2 (without 7) from above.

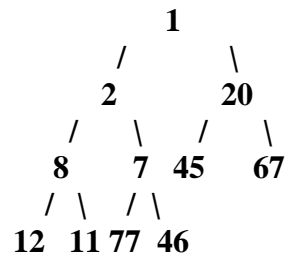
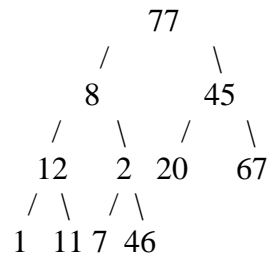


(Changes are marked in bold.)

5) Show the array representation of the original heap from question #2.

Index	0	1	2	3	4	5	6	7	8	9	10	11	12	13
value		1	3	8	12	6	9	35	15	18	10	12	14	77

6) Run the whole Make Heap /aka heapify function on the following random values:



7) Explain each step shown in the code below, for the percolateDown function:

```

void percolateDown(struct heapStruct *h, int index) {

    int min;

    if ((2*index+1) <= h->size) {

        min = minimum(h->heaparray[2*index], 2*index, h->heaparray[2*index+1], 2*index+1);

        if (h->heaparray[index] > h->heaparray[min]) {
            swap(h, index, min);
            percolateDown(h, min);
        }
    }
    else if (h->size == 2*index) {
        if (h->heaparray[index] > h->heaparray[2*index])
            swap(h, index, 2*index);
    }
}
  
```

(Note: Please reference heap.c *without looking at this function*, if necessary.)

Please see the comments in the uploaded heap.c file