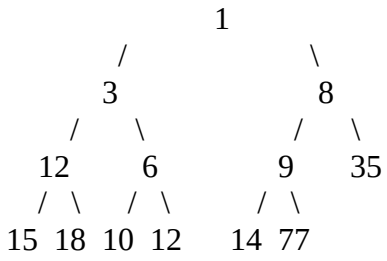
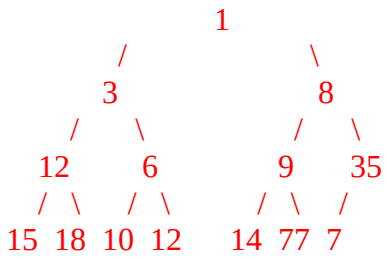
COP 3502 Study Group Sheet: Heaps, Hash Tables Solutions

Directions: Work together as a group to try to solve these problems. Talk through issues and see if you can convince yourselves of the right path to move forward.

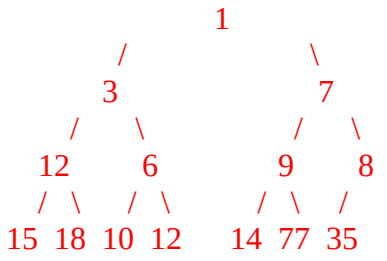
1) Show the result of inserting the item 7 into the heap shown below:



Here is where 7 is first placed:

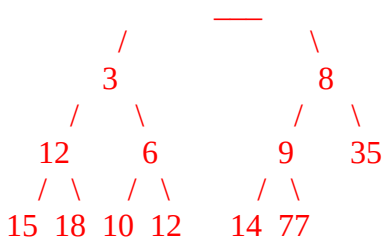


When we run percolate up on 7, it swaps with 35 and then 8 to yield:

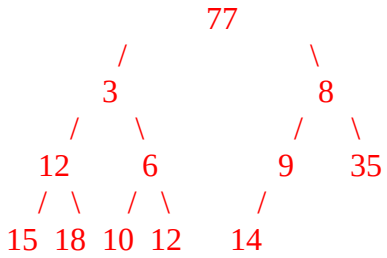


2) Show the result of removing the minimum element from the original heap in question #1 (without 7) from above.

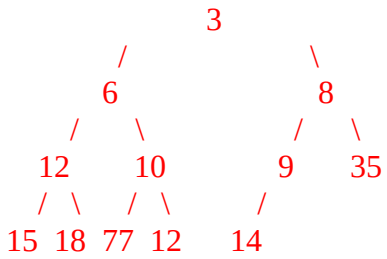
First, just remove the minimum (1) to get:



Next, place the last element in the heap into the top position:



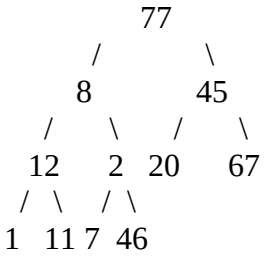
Then, run percolate down on 77, which will result in swaps with 3, 6 and 10, respectively:



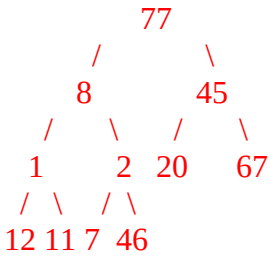
3) Show the array representation of the original heap from question #1. Here it is:

Index	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

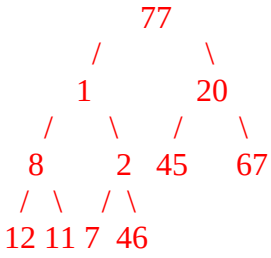
4) Run the whole Make Heap function on the following random values:



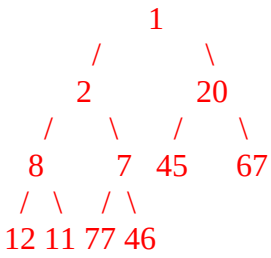
We run percolateDown on 2, then 12, to get:



Next run it on 45, then 8:



Finally, run percolateDown on 77, swapping with 1, 2 and 7:



5) Consider a hash table that uses the linear probing technique with the following hash function f(x) = (5x+4)%11. (The hash table is of size 11.) If we insert the values 3, 9, 2, 1, 14, 6 and 25 into the table, in that order, show where these values would end up in the table?

index	0	1	2	3	4	5	6	7	8	9	10
value	25	6		2		9			3	1	14

6) Do the same question as above, but this time use the quadratic probing strategy.

index	0	1	2	3	4	5	6	7	8	9	10
value		14	6	2		9	25		3	1	

7) Do the question above, but draw a picture of what the hash table would look like if linear chaining hashing was used.

0
1 → 6
2
3 → 2
4
5 → 9
6
7
8 → 25, 14, 3
9 → 1
10

Numbers on the left are the array indexes, the values in the corresponding linked lists are to the right of the arrows.