

# CMSC 441: Homework #5 Solutions(partial)

Monday, March 5, 2008

Parag Namjoshi

## Exercise 2.1–2

Change  $A[i] > key$  to  $A[i] < key$  on line 5 of the algorithm.

## Exercise 2.3–5

Function BINARYSEARCH

**Require:** array  $x$  and search element  $t$

**Ensure:**  $l$  = index of search element if it is in  $x$ , -1 otherwise

```
 $l \leftarrow 0; u \leftarrow n - 1;$ 
while true do
  if  $l > u$  then
     $l \leftarrow -1$ 
    print( "Not found.")
    break;
  end if
   $m \leftarrow (l + u)/2$ 
  if  $x[m] < t$ , then
     $l \leftarrow m + 1;$ 
  else if  $x[m] = t$ , then
     $l \leftarrow m$ 
    print( "Found.")
    break;
  else
    {  $x[m] > t$  }
     $l \leftarrow m + 1$ 
  end if
end while
```

## Exercise 6.1–2

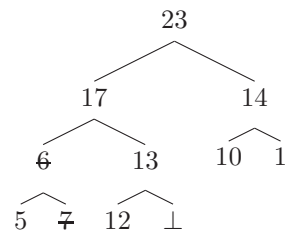
Show  $n$  element heap has height  $\lfloor \lg n \rfloor$ .

**Solution:**

A heap is a nearly complete binary tree. All the levels, except the lowest, are completely full. So the heap has at least  $2^h$  element and at most elements.  $2^h \leq n \leq 2^{h+1} - 1$ . Thus  $h \leq \lg n \leq h + 1$ . Since  $h$  is integer,  $h = \lfloor \lg n \rfloor$ .

## Exercise 6.1–6

The given sequence is not a max-heap as 6,7 violate the max-heap order.



## Exercise 6.2–2

Change all  $>$  to  $<$  and rename “largest” to “smallest”. Running time is the same as MAX-HEAPIFY.