Hw5
Heapsort problem

Part A. Programming (50%)

Implement a Heapsort algorithm.

Input: input.txt
Output: output.txt
The program should be named as studentID.c/.cpp

Input format:
6
15 19 10 7 17 16
5

Description:
There are three rows and one end line(“\n”) in the input file.
The first row contains one number, n which indicates the size of the array and $1 < n \leq 2^{20}$.
The second row contains n numbers which constructs the input array and the size of each number will not exceed 2^{31}- 1.
The third row contains one number, m and $1 \leq m \leq n$.

Output format:
17

Output contains one number and one end line(“\n”). Please output the m^{th} smallest number of the array.

Part B. Report (50%)

- Compare the running time of Heapsort with merge sort and insertion sort.
- Show and explain the best-case and the worst-case running times for Heapsort.
- Why is the following for loop begins from $\lfloor A.length/2 \rfloor$?

```
BUILD-MAX-HEAP(A)
1   A.heap-size = A.length
2   for i = ⌊A.length/2⌋ downto 1
3       MAX-HEAPIFY(A, i)
```

The report should be named as studentID.docx

The more detail you report, the more scores you can get.