CMPUT 204 Quiz 3-1, Version B

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1. Trace heapsort (using a max-heap) on the array A[1,...,6] = [33 66 88 55 22 77], by showing the array after each interchange of elements.

Build Maxheap

Since A[3]>A[6] (88>77), $\therefore$ no interchange.

Since A[2]>max(A[4], A[5]) (66>max(55,22)), $\therefore$ no interchange.

Since A[1]<max(A[2], A[3]) (33<max(66,88)), interchange A[1] with A[3].
$\therefore$ now A[1,...,6] = [88 66 33 55 22 77].

Since A[3]<A[6] (33<77), interchange A[3] with A[6].
$\therefore$ now A[1,...,6] = [88 66 77 55 22 33].

Maxheap has been constructed. Now interchange A[1] with A[6].
Array becomes A[1,...,6] = [33 66 77 55 22 **88**].

Maxheapify(A[1,..5],1)

Since A[1]<max(A[2],A[3]) (33<max(66, 77)), interchange A[1] with A[3].
$\therefore$ now A[1,...,6] = [77 66 33 55 22 **88**].

Since A[3] has no child, we are done with Maxheapify. Now interchange A[1] with A[5].
Array becomes A[1,...,6] = [22 66 33 55 **77 88**].

Maxheapify(A[1,..4],1)

Since A[1]<max(A[2],A[3]) (22<max(66, 33)), interchange A[1] with A[2].
$\therefore$ now A[1,...,6] = [66 22 33 55 **77 88**].

Since A[2]<A[4] (22<55), interchange A[2] with A[4].
$\therefore$ now A[1,...,6] = [66 55 33 22 **77 88**]

We are done with Maxheapify. Now interchange A[1] with A[4].
Array becomes A[1,...,6] = [22 55 33 **66 77 88**].

Maxheapify(A[1,..3],1)

Since A[1]<max(A[2],A[3]) (22<max(55, 33)), interchange A[1] with A[2].
$\therefore$ now A[1,...,6] = [55 22 33 **66 77 88**].

We are done with Maxheapify. Now interchange A[1] with A[3].
Array becomes A[1,...,6] = [33 22 **55 66 77 88**].

Maxheapify(A[1,..2],1)

Since A[1]>A[2] (33>22), $\therefore$ no interchange.

We are done with Maxheapify. Now interchange A[1] with A[2].
Array becomes A[1,...,6] = [22 **33 55 66 77 88**].

Maxheapify(A[1,..1],1)

Since there is only one element, we are done with Maxheapify.

$\therefore$ Sorted array A[1,...,6] = [**22 33 55 66 77 88**].