

Run the heapsort algorithm on the following array of numbers: (5, 13, 2, 25, 7, 17, 20, 8, 4). Give the state of the array (a) after the *BuildMaxHeap* operation, and (b) after three iterations of the loop.

```

Build-Heap (A)
01 for i =  $\lfloor n/2 \rfloor$  downto 1 do
02   Heapify(A, i)
  
```

a:

5	5	5
13      2	13      20	25      20
25    7   17   20	25    7   17   2	13    7   17   2
8   4	8   4	8   4
25	25	25
5      20	13      20	13      20
13    7   17   2	5    7   17   2	8    7   17   2
8   4	8   4	5   4

A = 25, 13, 20, 8, 7, 17, 2, 5, 4

The array is now a heap

```

Heapsort (A)
01 Build-Heap(A)
02 for i = n downto 2 do
03   exchange A[1] ↔ A[i]
04   A.heapsize = A.heapsize-1
05   Heapify (A, 1)
  
```

b:

25 13      20 8   7   17   2 5   4 Exchange 25 <-> 4	4 13      20 8   7   17   2 5 <b>25</b> Heapify(A,1)	20 13      4 8   7   17   2 5 <b>25</b>	20 13      17 8   7   4   2 5 <b>25</b> Exchange 20 <-> 5
5 13      17 8   7   4   2 <b>20 25</b> Heapify(A,1)	17 13      5 8   7   4   2 <b>20 25</b> Exchange 17 <-> 2	2 13      5 8   7   4 <b>17</b> <b>20 25</b>	

So 3rd iteration: (2,13,5,8,7,4,17,20,25)