LAB: Heap Sort

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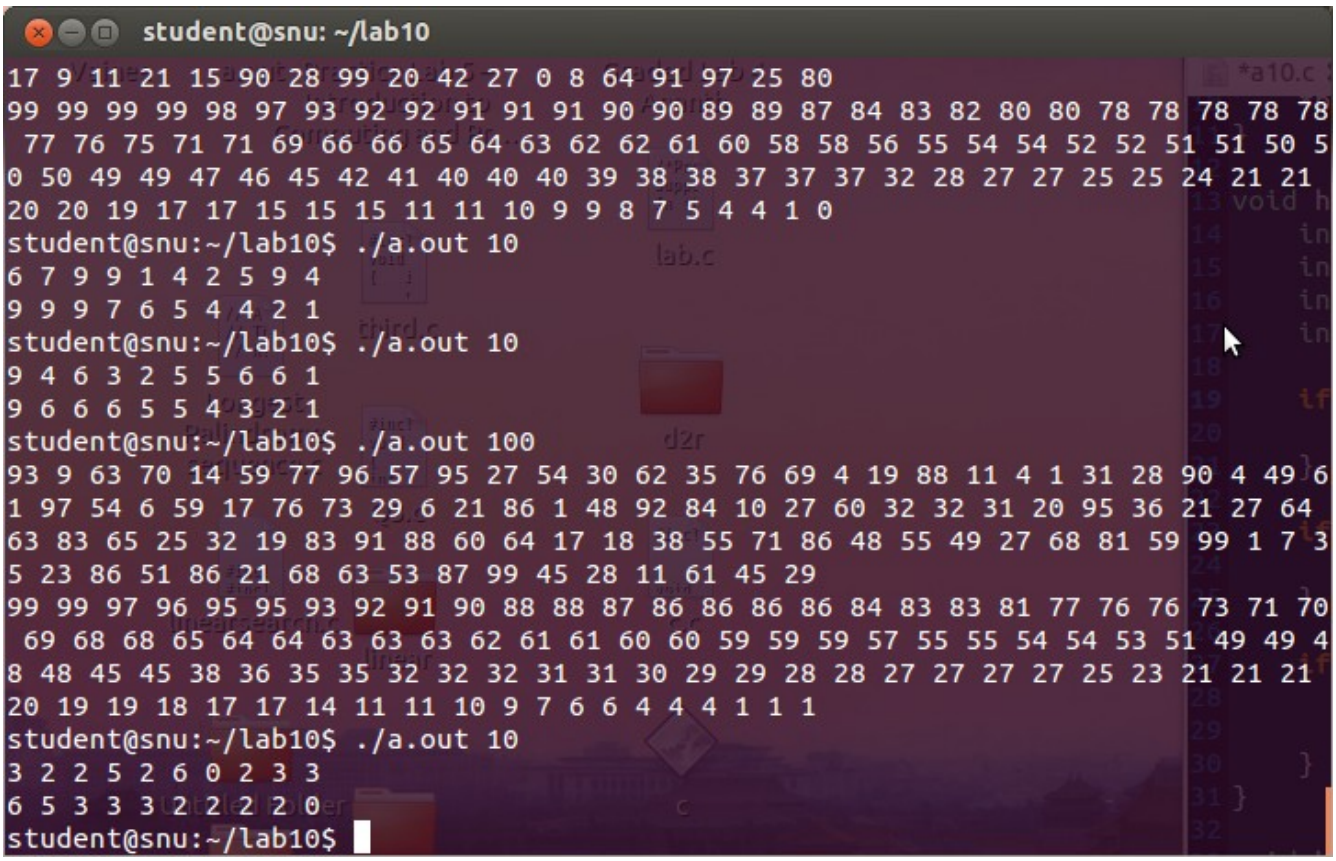
Code

```c
#include <stdio.h>
#include <stdlib.h>
#include <time.h>
#include <sys/time.h>

void swap( int *a, int *b){
        int temp;
        temp = *a;
        *a = *b;
        *b = temp;
}

void heapify(int arr[], int n, int i){
        int m = i;
        int leftChild = (2*i) + 1;
        int rightChild = (2*i) + 2;
        int temp;

        if(leftChild < n && arr[leftChild] < arr[m]){
                m = leftChild;
        }

        if(rightChild < n && arr[rightChild] < arr[m]){
                m = rightChild;
        }

        if(m!=i){
                swap(&arr[i], &arr[m]);
                heapify(arr, n, m);
        }
}

void heapSort(int arr[], int n) {
        int temp;
        for (int i = (n/2)-1; i >= 0; i--)
                heapify(arr,n,i);

        for (int i = n-1; i >=0; i--)
        {
                swap(&arr[0],&arr[i]);
                heapify(arr,i,0);
        }
}

void printArray(int arr[], int n, char* s){
    printf("%s", s);
        for (int i = 0; i < n; i++)
                printf("%d ",arr[i]);
```

```
        printf("\n");
}

void genArray(int arr[], int n){

        srand(time(NULL));

        for (int i = 0; i < n; i++)
                arr[i] = rand() % n;

}

int main(int argc, char* argv[])
{

        if(argc != 2){
                printf("usage: %s <LENGTH>\n", argv[0]);
                exit(1);
        }

        // Initialize Array
    int arr[atoi(argv[1]) + 1];
        genArray(arr,atoi(argv[1]));
        printArray(arr,atoi(argv[1]), "Input Array");

        // Sort and Display
    heapSort(arr, atoi(argv[1]));
    printArray(arr, atoi(argv[1]));
}
```

Screenshot


student@snu: ~/lab10
17 9 11 21 15 90 28 99 20 42 27 0 8 64 91 97 25 80
99 99 99 99 98 97 93 92 92 91 91 91 90 90 89 89 87 84 83 82 80 80 78 78 78 78 78
77 76 75 71 71 69 66 66 65 64 63 62 62 61 60 58 58 56 55 54 54 52 52 51 51 50 5
0 50 49 49 47 46 45 42 41 40 40 40 39 38 38 37 37 37 32 28 27 27 25 25 24 21 21
20 20 19 17 17 15 15 15 11 11 10 9 9 8 7 5 4 4 1 0
student@snu:~/lab10$ ./a.out 10
6 7 9 9 1 4 2 5 9 4
9 9 9 7 6 5 4 4 2 1
student@snu:~/lab10$ ./a.out 10
9 4 6 3 2 5 5 6 6 1
9 6 6 6 5 5 4 3 2 1
student@snu:~/lab10$ ./a.out 100
93 9 63 70 14 59 77 96 57 95 27 54 30 62 35 76 69 4 19 88 11 4 1 31 28 90 4 49 6
1 97 54 6 59 17 76 73 29 6 21 86 1 48 92 84 10 27 60 32 32 31 20 95 36 21 27 64
63 83 65 25 32 19 83 91 88 60 64 17 18 38 55 71 86 48 55 49 27 68 81 59 99 1 7 3
5 23 86 51 86 21 68 63 53 87 99 45 28 11 61 45 29
99 99 97 96 95 95 93 92 91 90 88 88 87 86 86 86 86 84 83 83 81 77 76 76 73 71 70
69 68 68 65 64 64 63 63 63 62 61 61 60 60 59 59 59 57 55 55 54 54 53 51 49 49 4
8 48 45 45 38 36 35 35 32 32 32 31 31 30 29 29 28 28 27 27 27 27 25 23 21 21 21
20 19 19 18 17 17 14 11 11 10 9 7 6 6 4 4 4 1 1 1
student@snu:~/lab10$ ./a.out 10
3 2 2 5 2 6 0 2 3 3
6 5 3 3 3 2 2 2 2 0
student@snu:~/lab10$