Data Structure Homework 12

繳交期限： 2020/1/12 17:00 前
補交期限(7 折)： 2020/1/19 17:00 前

手寫題：

2. An array contains the elements shown below. Show the contents of the array after it has gone through a one-increment pass of the shell sort. The increment factor is $k = 3$.

```
23 3 7 13 89 7 66 2 6 44 18 90 98 57
```

4. An array contains the elements shown below. What would be the value of the elements in the array after three passes of the heap sort algorithm?

```
44 78 22 7 98 56 34 2 38 35 45
```

6. An array contains the elements shown below. Using a quick sort, show the contents of the array after the first pivot has been placed in its correct location. Identify the three sublists that exist at that point.

```
44 78 22 7 98 56 34 2 38 35 45
```

註：three sublists 指小於 pivot 的集合、pivot 本身、大於 pivot 的集合

8. After two passes of a sorting algorithm, the following array:

```
80 72 66 44 21 33
```

has been rearranged as shown below.

```
21 33 80 72 66 44
```

Which sorting algorithm is being used (straight selection, bubble, or straight insertion)? Defend your answer.

10. Show the result after each merge phase when merging the following two files:

```
6 12 19 23 34 · 8 11 17 20 25 · 9 10 15 25 35
```

```
13 21 27 28 29 · 7 30 36 37 39
```

程式題：

註：只需要做 17、22 題，其餘為參考

17. Repeat Problem 14 using the heap sort (see Program 12-2).

- Program 12-2 即講義中 Heap Sort Pseudo Code (chapter12 p.13) 。
- Input 只有一筆指定測資如下 (沒有額外測資)，為 20 個正整數。
- 宣告一個 array 或 vector 存放以下測資 (順序不變)，不額外讀取檔案或鍵入測資。
- 47, 80, 42, 37, 45, 4, 52, 39, 65, 32, 54, 71, 82, 20, 99, 55, 30, 96, 2, 56
- Output 格式：

```
Unsorted array:  47 80 42 37 45  4 52 39 65 32 54 71 82 20 99 55 30 96  2 56
Sorted array:     2  4 20 30 32 37 39 42 45 47 52 54 55 56 65 71 80 82 96 99
Total exchanges: 189
```

- A data move (exchange) : element 搬移一次即算一次。
- Ex: tmp = heap[0] -> 1 次
  Heap[0] = heap[1] -> 1 次
  Heap[1] = tmp -> 1 次
- 檔名請命名為 “學號_12_17.c” / “學號_12_17.cpp” 繳交上傳 e3 ，請確認檔案正確，檔名錯誤不予計分，且不接受交錯檔案補交。
- 請勿抄襲!

參考：

14. Modify Program 12-3, “Insertion Sort,” to count the number of data moves needed to order an array of 1000 random numbers. A data move is a movement of an element of data from one position in the array to another, to a hold area, or from a hold area back to the array. Display the array before and after the sort. At the end of the program, display the total moves needed to sort the array.

22. Write an algorithm that applies the incremental idea of the shell sort to a selection sort. The algorithm first applies the straight section sort to items $n / 2$ elements apart (first, middle, and last). It then applies it to $n / 3$ elements apart, then to elements $n / 4$ apart, and so on.

Input:

Input file 為 “12_22_input.txt”，檔案中會有 10 個整數，請讀取數字後排序

Output:

請在螢幕上印出在每次使用不同 increment 排序後的結果，可參考以下範例

Sample input:

10 8 6 20 1 77 9 3 4 5

Sample output:

```
increment = 10 / 2 = 5
10  8  3  4  1 77  9  6 20  5

increment = 10 / 3 = 3
 4  1  3  5  6 20  9  8 77 10

increment = 10 / 4 = 2
 3  1  4  5  6  8  9 10 77 20

increment = 10 / 5 = 2
 3  1  4  5  6  8  9 10 77 20

increment = 10 / 6 = 1
 1  3  4  5  6  8  9 10 20 77
```

注意事項:

1. 繳交檔名為“學號_12_22.cpp” 或 “學號_12_22.c”
2. 不需要壓縮，不要上傳 .c, .cpp 以外的檔案
3. 請確保你的程式可以能被 g++或 gcc 編譯
4. 不符合以上格式者直接扣 2 分