# Data Structure Homework 9

繳交期限： 2020/12/15 17:00 前

補交期限(7 折)： 2020/12/22 17:00 前

手寫題：

2. Make a heap out of the following data read from the keyboard:

```
23 7 92 6 12 14 40 44 20 21
```

4. Apply the reheap down algorithm to the partial heap structure shown in Figure 9-20.


FIGURE 9-20 Partial Heap for Exercise 4

6. Apply the delete operation to the heap in Figure 9-21. Repair the heap after the deletion.

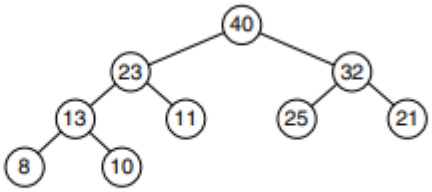


FIGURE 9-21 Heap for Exercises 5, 6, and 7

14. Show the resulting heap after 33, 22, and 8 are added to the following heap:

```
50 30 40 20 10 25 35 10 5
```

程式題：

29. Our study of tree algorithmics has shown that most tree structures are quite efficient. Let's examine the efficiency of heaps. Modify the heap ADT developed in Section 9.3 to determine the complexity of building a heap. For this program measure efficiency as the number of data moves necessary to build the heap.

    To determine a pattern, run your program with arrays filled with random numbers. Use five different array sizes: 100, 200, 500, 1000, and 2000. Then analyze the heuristics developed in these runs and determine which big-O notation best applies. Prepare a short report of your findings with appropriate tables and graphs.

30. Modify Project 29 to determine the efficiency of the reheap up and reheap down algorithms only. Again, analyze the data and prepare a short report of your conclusions regarding their efficiency.

9_30 程式題說明：

step 1.

讀取”data.csv”，將 array[100]、array[200]、array[500]、array[1000]、array[2000]中的 data 分別做 heap

step 2.

從 heap 當中取 root 做 delete，並做 reheap down

step 3.

隨機從 1~5000 取一個值做 insert，並做 reheap up

step 4

重複 step 2 與 step 3 多次

計算每次 reheap down & reheap up 過程中比較的次數，分別取平均 print 到螢幕上

step 5.

觀察 reheap down & reheap up 屬於哪一種 big-O 的關係

step 6.

討論為什麼屬於哪一種 big-O，討論的部分寫在程式碼中並註解，如下圖

```
/*
討論：
reheap up 的 Big(O) 為XXXXX，.....
reheap down 的 Big(O) 為XXXXX,.....
*/
```

有附上” 9_30_ADT ”可以直接使用

```
#include <stdio.h>
#include <stdlib.h>
#include <conio.h>
#include <time.h>
#include "P9-heap.h"
```

統一繳交格式：

(1) 請將程式命名為"學號_hw9_30.cpp"or"學號_hw9_30.c"。

(2) 不需要壓縮。

(3) 只能繳交一個檔案，請將所有程式碼寫在一個檔案中。