6

# Data Structures

姓名: 學號:

1.假設 n 為 2 的次方，試問下列程式敘述 ~~j=2*j~~ 被執行多少次

i=n; 設 $n=2^k$ => $k=\log_2 n$

```
while (i >= 1) {
  j=i;
  while (j <= n) {
    j=j*2;
  }
  i=i/2;
}
```

j=j*2

| | | | | | |
|---|---|---|---|---|---|
| i | $2^k$ | $2^{k-1}$ | $2^{k-2}$ | ... | $2^{k-k}$ |
| j | $2^k$ | $2^{k-1}, 2^k$ | $2^{k-2}, 2^{k-1}, 2^k$ | ... | $2^{k-k}, 2^{k-(k-1)}, \dots, 2^k$ |

總次數 $= \frac{(1+(k+1))(k+1)}{2} = \frac{(k+1)(k+2)}{2} = \frac{k^2+3k+2}{2}$

$= \frac{(\log_2 n)^2+3\log_2 n+2}{2}$ +2

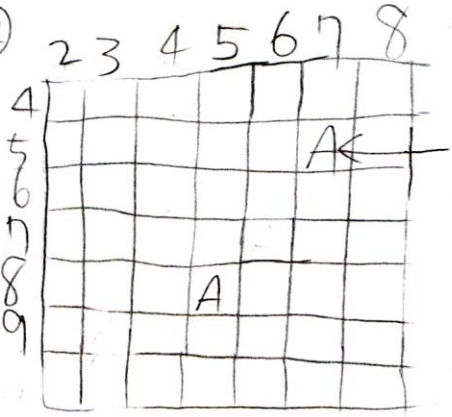
2. 設一陣列 A[4..9][2..8]為以列為主(row major)陣列，其中每一元素佔 1 byte，且 A[5][7]位址在 1230，請問 A[8][5]位址在 1249

3.將下列中序表示式(infix expression) 轉成後序表示式(postfix expression) (請利用堆疊)

e/(f+a*d)+c

+2

②




1230+(8-2+1)×2+5=1230+14+5=1249

③

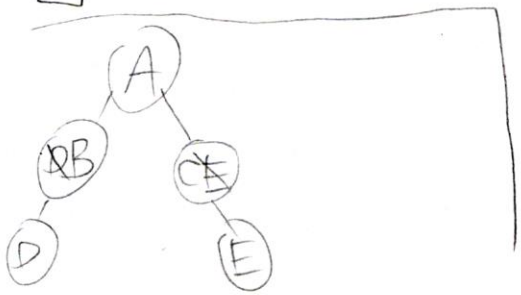
+2 遇到「+」pop出來

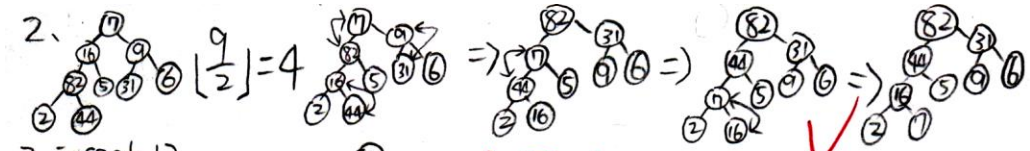
| |
|---|
| * |
| + |
| c |

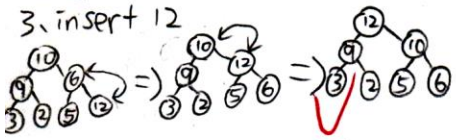
efad 遇到「)」pop出來 efadx+ => | + | efadx+/

=> | + | efadx+/c 中序式都寫完了 堆疊剩下的全pop

=> efadx+/c+

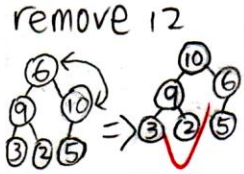






# Data Structures

姓名: 學號: **(請寫計算過程,共 12 分)**

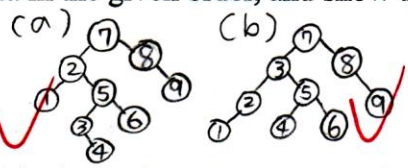


**1.**Read the following data in the given order, and show the corresponding trees

7,8,9,2,1,5,3,6,4

(a)Binary search tree

(b)AVL Tree



**2.**Suppose that we have the key values:7,16,9,82,5,31,6,2,44, write out the max heap after each values is inserted into the heap.

**3.**Consider the heap (Fig. 1). Draw the heap after you insert 12 and then remove 12.

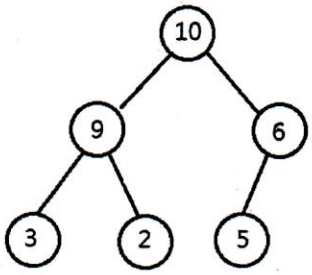



Fig.1

**4.**有關 AVL-Tree,請回答

(a)高度為 8 的 AVL-Tree,最少與最多節點數各是多少? (樹根在 level 1)

(b)若將 98 個不同鍵值存入一個 AVL 樹中,其最大可能高度為何?

**5.**請劃出 4 棵二元搜尋樹(Binary search tree), 每棵二元搜尋樹其高度為 3,有 4 個節點, 鍵值為 1,2,3,4