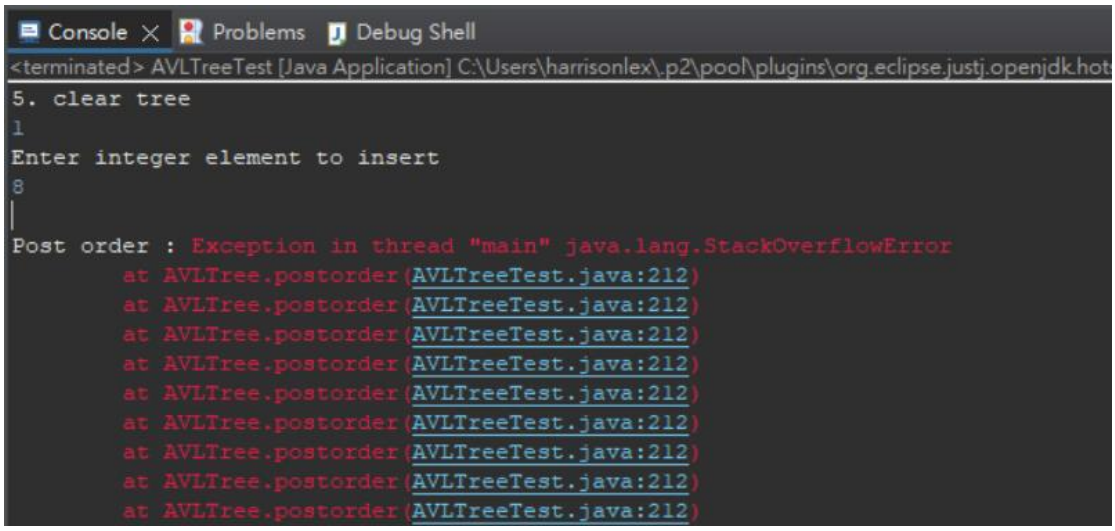
HW1_109403021

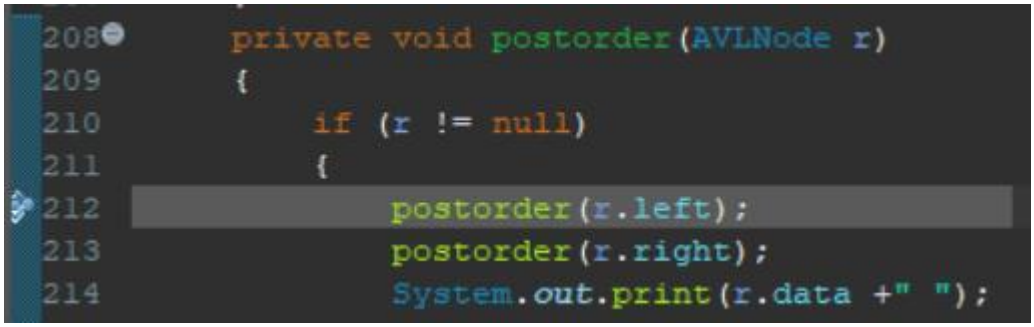
- Bug1: rotateWithLeftChild()這個 function　內部邏輯錯誤還有使用此 function 時參數輸入錯誤
- Bug2: rotateWithRightChild()這個 function 內部邏輯錯誤還有使用此 function 時參數輸入錯誤

Debug 流程

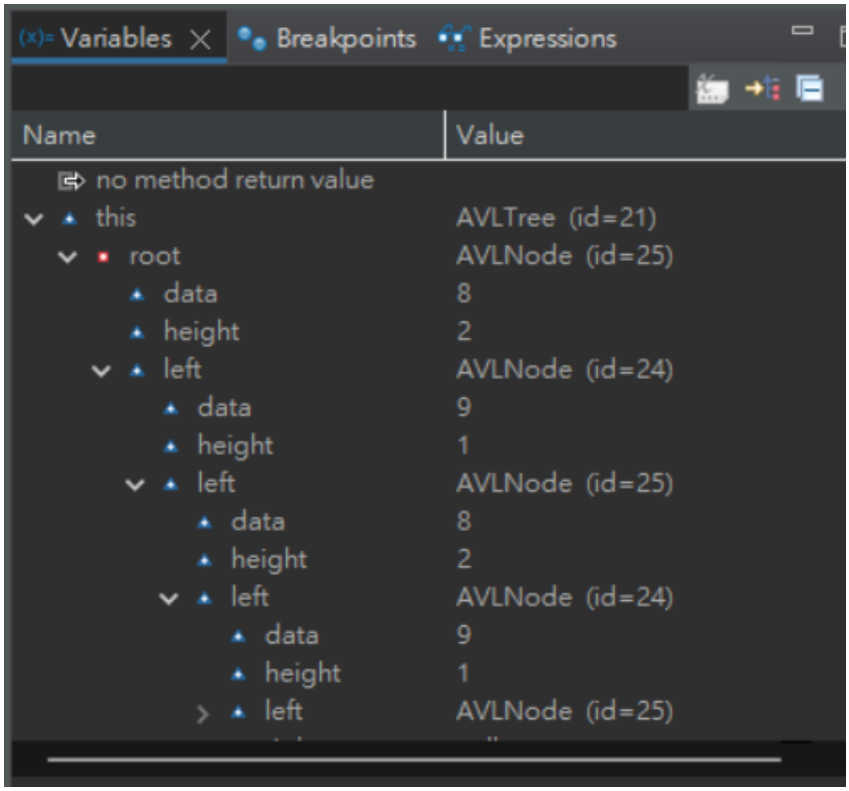
我按照表一先執行看看，結果在插入 8 時就遇到錯誤



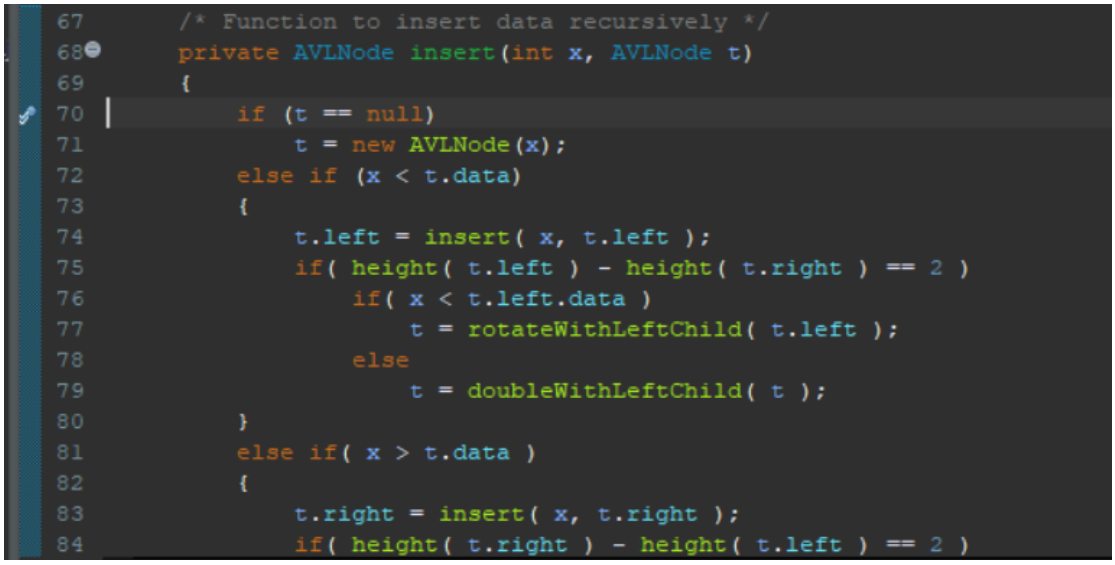
所以我先依照上圖在 212 行設一個 break point



結果發現樹在執行 212 行前已經長得不正確，所以應該是 insert 時就出錯了

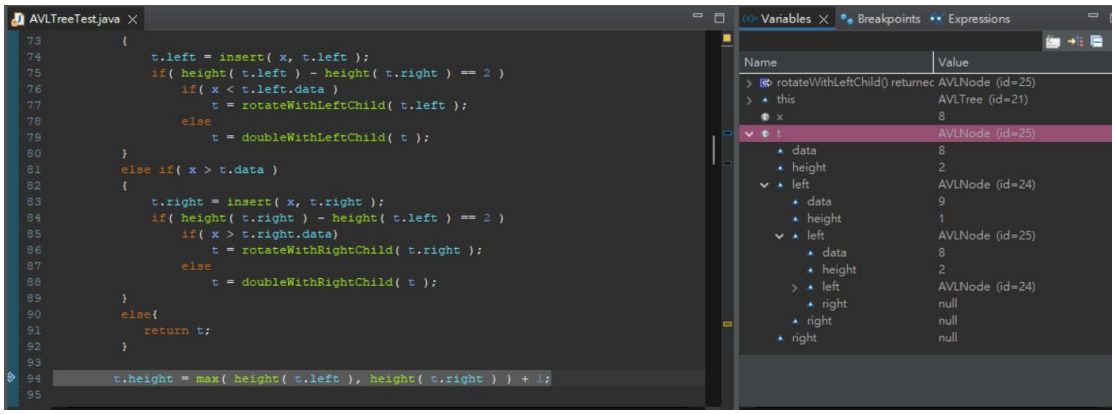


所以我在 insert 的 function 中設了一個 breakpoint，然後到裡面一直按 F6 看哪裡出問題

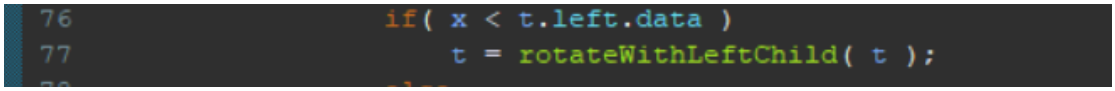


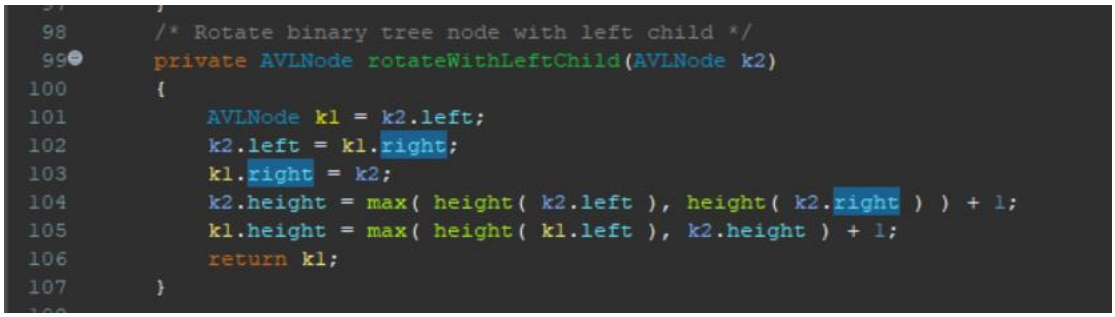
```
67      /* Function to insert data recursively */
68      private AVLNode insert(int x, AVLNode t)
69      {
70          if (t == null)
71              t = new AVLNode(x);
72          else if (x < t.data)
73          {
74              t.left = insert( x, t.left );
75              if( height( t.left ) - height( t.right ) == 2 )
76                  if( x < t.left.data )
77                      t = rotateWithLeftChild( t.left );
78                  else
79                      t = doubleWithLeftChild( t );
80          }
81          else if( x > t.data )
82          {
83              t.right = insert( x, t.right );
84              if( height( t.right ) - height( t.left ) == 2 )
```

結果發現樹是在執行完 77 行 rotate 的 function 變不正確



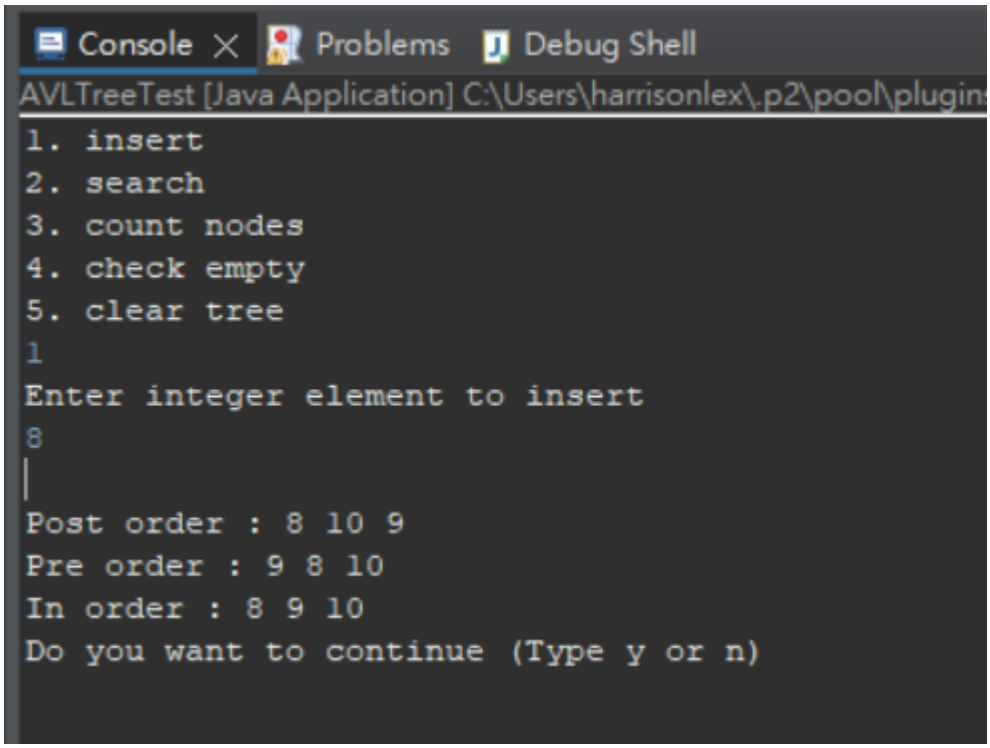
所以我再用 F5 到 rotateWithLeftChild()這個 function 裡看，確認錯誤是在 77 行執行 rotateWithLeftChild()後，我對程式碼做修改如下





原來是 77 行參數放錯，應該要放入節點本身而非其左子樹，還有 102 行和 103 行的 left 和 right 寫反了

修正後就可正常輸出


Console
Problems
Debug Shell
AVLTreeTest [Java Application] C:\Users\harrisonlex\.p2\pool\plugin
1. insert
2. search
3. count nodes
4. check empty
5. clear tree
1
Enter integer element to insert
8
Post order : 8 10 9
Pre order : 9 8 10
In order : 8 9 10
Do you want to continue (Type y or n)

剛剛的 10 , 9 , 8 插入屬於右旋，為測試左旋我插入 10 , 11, 12 發現同樣 bug，直接比照第一個 bug 找到錯誤處如下

```
85                  if( x > t.right.data)
86                      t = rotateWithRightChild( t.right );
87                  else
```

```
108
109     /* Rotate binary tree node with right child */
110     private AVLNode rotateWithRightChild(AVLNode k1)
111     {
112         AVLNode k2 = k1.right;
113         k1.left = k2.right;
114         k2.right = k1;
115         k1.height = max( height( k1.left ), height( k1.right ) ) + 1;
116         k2.height = max( height( k2.right ), k1.height ) + 1;
117         return k2;
118     }
119     /**
```

然後修改如下

```
86                      t = rotateWithRightChild( t );
```

```
109     /* Rotate binary tree node with right child */
110     private AVLNode rotateWithRightChild(AVLNode k1)
111     {
112         AVLNode k2 = k1.right;
113         k1.right = k2.left;
114         k2.left = k1;
115         k1.height = max( height( k1.left ), height( k1.right ) ) + 1;
116         k2.height = max( height( k2.right ), k1.height ) + 1;
117         return k2;
118     }
```

至此就兩個 bug 都找到並修正，可以進行表一的所規定的所有互動