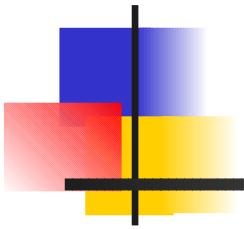
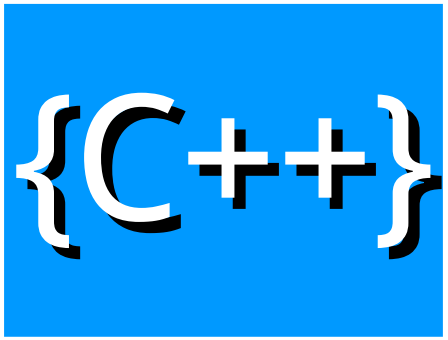


Exception

Week 12



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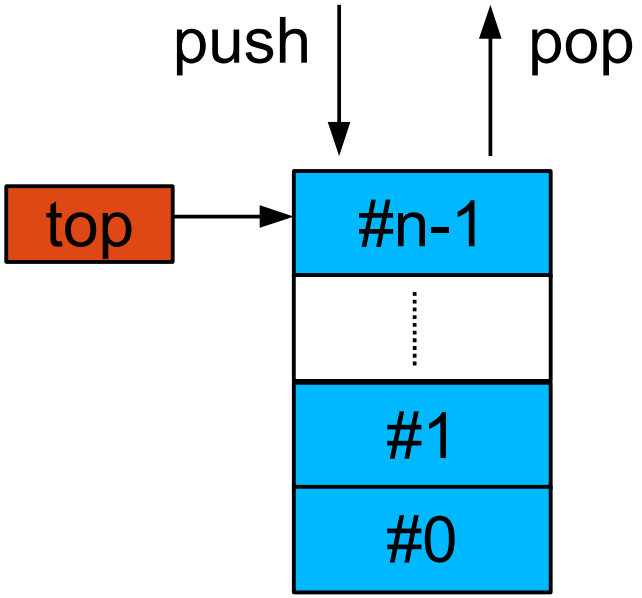
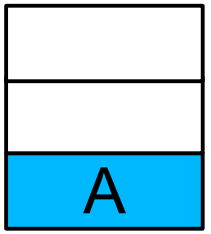
堆疊 (Stack)

- 加入 (push) 與刪除 (pop) 於同一端
- 具有後進先出 (LIFO, Last-in-First-out) 或先進後出 (FILO, First-in-Last-out) 性質的有序串列

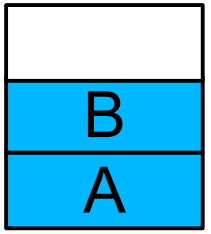


堆疊範例

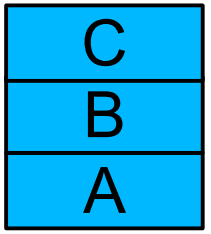
Push(A)



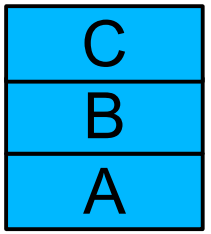
Push(B)



Push(C)

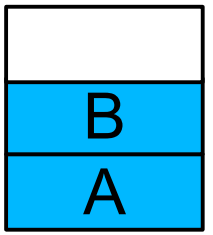
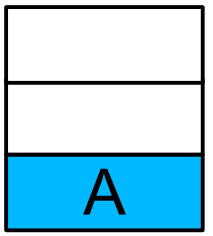
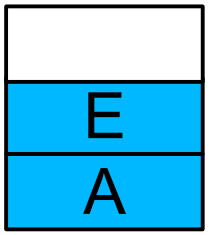
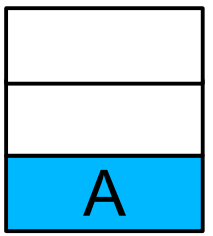


Push(D)



FULL

堆疊範例

Pop		C
Pop		B
Push(E)		
Pop		E

Assignment 12

- 實作 class StackType，需要俱備以下操作
  - bool IsEmpty() 決定堆疊是否爲空
  - bool IsFull() 決定堆疊是否爆滿
  - void Push(char item) 將字元放入堆疊
  - void Pop() 移除堆疊中最上方的資料
  - char Top() 傳回堆疊中最上方的資料
- Push(), Pop(), Top() 需處理例外狀況
  - 使用標準函式庫提供的例外基礎類別來撰寫自己的例外類別
- 堆疊用於儲存 char 型別的資料

Assignment 12

- 撰寫主程式測試字串中括號是否對稱
  - 使用堆疊 (Stack) 來實作
  - 用以下範例作爲測試資料
    - 第七個範例會造成堆疊爆滿，需要做例外處理，顯示異常訊息

#	字串	預期結果
1	(x)	Well formed
2	(x{})	Well formed
3	(x{x[]})	Well formed
4	(x[x)]	Not well formed
5	(x(x[]x	Not well formed
6	(xx)]	Not well formed
7	(x(((((	Not well formed

括號是否對稱

- 定義
  - Opening Symbol:characters "(", "{", or "["
  - Closing Symbol:characters ")", "}", or "]"
- 演算法
  - 字串狀態初始設定爲平衡
  - 讀入一個字元
  - 如果目前字元是 opening symbol，將字元放入 (Push) 堆疊
  - 或者如果目前字元是 closing symbol　然後：
    - 檢查堆疊是否爲空，如果是空，然後因爲沒成對的 opening symbol 所以字串狀態設爲不平衡，迴圈結束
    - 或者，
      - 取得 (Top) 堆疊最上方的字元
      - 彈出 (Pop) 堆疊最上方的字元
      - 比較目前字元與最上方的字元，如果兩者成對，則表示字串狀態仍然是平衡的，繼續執行迴圈 （讀入下一個字元），如果不成對，則表示字串狀態不平衡，結束迴圈
  - 當讀入字元爲 '\n'，則迴圈結束，如果字串狀態仍是平衡而且堆疊是空，然後印出 "Well formed"
  - 若字串狀態不是平衡的則印出 "Not well formed"

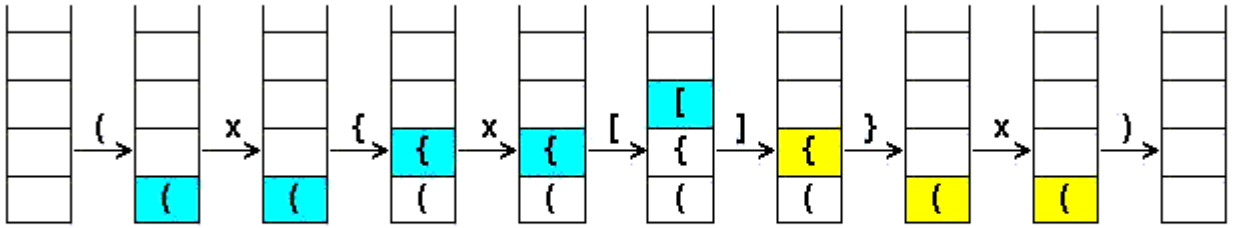
案例

- 字串 (x{x[]}x)

```
'('     : Push (
'x'     : Ignore
'{'     : Push {
'x'     : Ignore
'['     : Push [
']'     : Get top of stack, openSymbol='['
          Pop
          Compare if '[' matches ']'
'}'     : Get top of stack, openSymbol='{'
          Pop
          Compare if '{' matches '}'
'x'     : Ignore
')'     : Get top of stack, openSymbol='('
          Pop
          Compare if '(' matches ')'
'\n'    : Print expression is well-formed
```

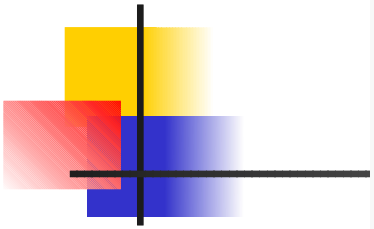
案例

- 字串 (x{x[]}x)

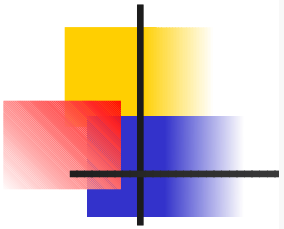


使用標準函式庫提供的例外基礎類別來撰寫自己的例外類別

```
1  // Fig. 27.1: DivideByZeroException.h
2  // Class DivideByZeroException definition.
3  #include <stdexcept> // stdexcept header file contains runtime_error
4  using std::runtime_error; // standard C++ library class runtime_error
5
6  // DivideByZeroException objects should be thrown by functions
7  // upon detecting division-by-zero exceptions
8  class DivideByZeroException : public runtime_error
9  {
10 public:
11    // constructor specifies default error message
12    DivideByZeroException::DivideByZeroException()
13       : runtime_error( "attempted to divide by zero" ) {}
14 }; // end class DivideByZeroException
```



```
1  // Fig. 27.2: Fig27_02.cpp
2  // A simple exception-handling example that checks for
3  // divide-by-zero exceptions.
4  #include <iostream>
5  using std::cin;
6  using std::cout;
7  using std::endl;
8
9  #include "DivideByZeroException.h" // DivideByZeroException class
10
11 // perform division and throw DivideByZeroException object if
12 // divide-by-zero exception occurs
13 double quotient( int numerator, int denominator )
14 {
15    // throw DivideByZeroException if trying to divide by zero
16    if ( denominator == 0 )
17       throw DivideByZeroException(); // terminate function
18
19    // return division result
20    return static_cast< double >( numerator ) / denominator;
21 } // end function quotient
22
23 int main()
24 {
25    int number1; // user-specified numerator
26    int number2; // user-specified denominator
27    double result; // result of division
28
29    cout << "Enter two integers (end-of-file to end): ";
```



```
30
31    // enable user to enter two integers to divide
32    while ( cin >> number1 >> number2 )
33    {
34       // try block contains code that might throw exception
35       // and code that should not execute if an exception occurs
36       try
37       {
38          result = quotient( number1, number2 );
39          cout << "The quotient is: " << result << endl;
40       } // end try
41
42       // exception handler handles a divide-by-zero exception
43       catch ( DivideByZeroException &divideByZeroException )
44       {
45          cout << "Exception occurred: "
46             << divideByZeroException.what() << endl;
47       } // end catch
48
49       cout << "\nEnter two integers (end-of-file to end): ";
50    } // end while
51
52    cout << endl;
53    return 0; // terminate normally
54 } // end main
```