NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

SC1007 Data Structures and Algorithms **2021/22 Semester 2**

Tutorial 2: Analysis of Algorithm and Stack and Queue

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Q1 The function subset() below takes two linked lists of integers and determines whether the first is a subset of the second. Give the worst-case running time of subset as a function of the lengths of the two lists. When will this worst case happen?

```
typedef struct _listnode{
  int item;
  struct _listnode *next;
} ListNode;

//Check whether integer X is an element of linked list Q
int element (int X, ListNode* Q)
{
  int found;  //Flag whether X has been found
  found = 0;
  while ( Q != NULL && !found) {
     found = Q->item == X;
     Q = Q->next;
  }
  return found;
}

// Check whether L is a subset of M
int subset (ListNode* L, ListNode* M)
{
  int success; // Flag whether L is a subset so far
  success = 1;
  while ( L != NULL && success) {
      success = element(L->item, M);
      L = L->next;
  }
  return success;
}
```

Q2 Find the number of printf used in the following functions. Write down its time complexity in Θ notation in terms of N.

```
void Q2a (int N)
{
   int j, k;
   for (j=1; j<=N;j*=3)
       for(k=1;k<=N; k*=2)
           printf("SC1007\n");
}
```

```
1   void Q2b (int N)
2  {
3      int i;
4      if(N>0)
5      {
6          for(i=0;i<N;i++)
7              printf("SC1007\n");
8          Q2b(N-1);
9          Q2b(N-1);
10     }
11 }
```

Q3 Given the precedence of some operators,

Operators	Precedence
*, /, %	highest
+, -	
<<, >>	
&&	
=	lowest

(a) convert an infix expression, $x = a + b * c\%d >> e$, to a postfix expression

(b) convert a prefix expression, $= y\&\& << ab >> c + de$, to an infix expression

(c) convert a postfix expression, $xabc * d\% + e >>=$, to a prefix expression