CS3201
Algorithm Design

Term Project Report

Problem: 1079

Maximum

Submitted to
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1. **INTRODUCTION**

1.1) **Problem Detail**

Problem number: 1079

Problem name: Maximum

Difficulty: 112

Problem Author: Emil Kelevedzhiev

Problem Source: Winter Mathematical Festival Varna ‘2001 Informatics Tournament

Problem Conditions: Time Limit - 2.0 second, Memory Limit - 64MB

1.2) **Problem Description**

Consider the sequence of numbers $a_i$, $i = 0, 1, 2, \ldots$, which satisfies the following requirements:

- $a_0 = 0$
- $a_1 = 1$
- $a_{2i} = a_i$
- $a_{2i+1} = a_i + a_{i+1}$

For every $i = 1, 2, 3, \ldots$

Write a program which for a given value of $n$ finds the largest number among the numbers $a_0, a_1, \ldots, a_n$.

1.3) **Input and Output**

Input: You are given several test cases (not more than 10). Each test case is a line containing an integer $n (1 \leq n \leq 99999)$. The last line of input contains 0.

Output: For every $n$ in the input write the corresponding maximum value found.
Sample

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>10</td>
<td>4</td>
</tr>
<tr>
<td>0</td>
<td></td>
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2) CODE OVERVIEW

2.1) Coding

```python
n = int(input())
lists = []

while n != 0:
    lists.append(n)
    n = int(input())

highest = max(lists) + 1

a=[0 for x in range(highest)]
a[0] = 0
a[1] = 1
for x in range(2,highest):
    if x % 2 == 0:
        a[x] = a[x//2]
    else:
        a[x] = a[x//2] + a[x//2 +1]

for x in lists:
    print (max(a[:x+1]))
```

2.2) Code Explanation

Line 1: Firstly, we declared a variable “n” which is set to accept an input and convert it to integer.

Line 2: Next, we declared a list called “lists”. 
Line 4 - 6: The condition of “While” loop is that if the input “n” is 0, it will stop adding numbers to the list “lists”.

Line 8: A variable “highest” is declared to accept the maximum value of the list “lists” and then add 1 (Eg: maximum value = 10, highest = 10 +1)

```python
a=[0 for x in range(highest)]
a[0] = 0
a[1] = 1
for x in range(2,highest):
    if x % 2 == 0:
        a[x] = a[x//2]
    else:
        a[x] = a[x//2] + a[x//2 +1]

for x in lists:
    print (max(a[:x+1]))
```

Line 10: We create a list ‘a’ of 0 length equivalent to the highest.

Line 11: As mentioned in the question we assigned a[0] = 0


Line 13: We looped from the 2nd index to (Highest - 1) index.

Line 14 -18: Inside the loop the conditions were if x % 2 is equivalent then we assign a[x] as the value of a[x//2]. The other condition was if the above condition was not satisfied then a[x] will be assigned as a[x//2] + a[x//2 +1].

Line 20 - 21: We loop through the lists and find the maximum numbers we have in the list ‘a’ and print the maximum.

2.3)Output

5
3) SUBMISSION RESULT

3.1) Timus Status

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<th>Author</th>
<th>Problem</th>
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<th>Judgement result</th>
<th>Test #</th>
<th>Execution time</th>
<th>Memory used</th>
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</tr>
</tbody>
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3.2) Submission Detail

LANGUAGE :- Python 3.6

Execution Time :- 0.202 & 0.187

Memory Used :- 2.080 KB