Name and ID#:___

AMERICAN UNIVERSITY OF ARMENIA
College of Science and Engineering
CS 121 Data Structures and Algorithms

MIDTERM 1 EXAM

8/24

Date:	Tuesday, October 18 2016
Starting time:	09:00
Duration:	1 hour 15 min
Attention:	**ANY TYPE OF COMMUNICATION IS STRICTLY PROHIBITED**

Please write down your name and ID# at the top of all used pages

Problem 1: Consider below two recursive expressions:

$$a_n = 1 + a_1*b_1 + a_2*b_2 + a_3*b_3 + \ldots + a_{n-1}*b_{n-1}$$
$$b_n = 1 + 2*b_1 + 2*b_2 + 2*b_3 + \ldots + 2*b_{n-1} - b_{n-1}*b_{n-1}$$

The base cases are: $a_1 = b_1 = 1$.

Write an optimal C++ function or Java method that takes as its argument an int index ***int n*** and returns a_n.

$a_1 = 1$ $\quad b_1 = 1$

$a_2 = 1 + a_1 b_1$ $\quad b_2 = 1 + 2*b_1$

$a_3 = 1 + a_1 b_1 + a_2 b_2$ $\quad b_3 = 1 + 2*b_1 + 2b_2$

$a_3 = a_2 + a_2 b_2$ $\quad b_3 = b_2 + 2b_2$

$a_4 = a_3 + a_3 b_3$ $\quad b_4 = b_3 + 2b_3$

$a_n = a_{n-1} + a_n b_n$ $\quad b_n = b_{n-1} + 2b_n$

```
int an(int n){
  if (n == 1)
    return 1;
  if (n = 1)
    return 1;
  int an;
  if(n = 1)
    return 1;
return an = an(n-1) + an(n) * bn(n);
```

~~int an;~~
~~int bn;~~

```
(1) int bn(int n)
    int bn;
    if (n = 1)
      return 1;
return bn = bn(n-1) + 2b_n
```

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Use the backside, if needed

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