Competitive Programming Team: AB IdeaLab at Fall Activities Fair

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1 Description

Hello prospective IdeaLab **Competitive Programming Team** (CPT) member!

This year is AB's first year competing in the **American Computer Science League** (ACSL) competition! As you will see with the three samples on the back page, the problems are an interesting mix between Math and Computer Science and cover topics such as:

- Recursion (see Figure 1 and Problems 2 and 4)
- Graph Theory (see Figure 2)
- Computer Number Systems (see Problem 3)
- Data Structures

If you would like to collaborate with others, learn how to solve these and similar problems, and enter the world of Competitive Programming, come to IdeaLab's first meeting, **September 14, 2018 in the SYSCO lab**[1] **at 3:00 PM**.

The only pre-requisites are a **love for solving problems and an open mind**. We value these **more** than prior experience coding (as we'll be teaching basic coding skills on an ad-hoc basis).

Represent AB, join an inclusive and caring team, and learn a ton in our first year competing in ACSL!

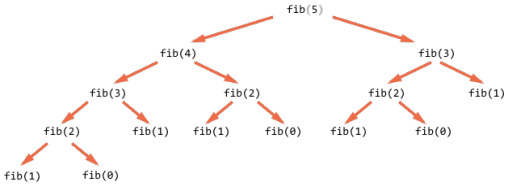

Figure 1: A tree representing the recursive calls made to the Fibonacci function.

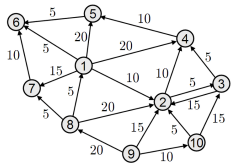

Figure 2: A graph theoretic representation of nodes, directed edges, and weights.

[1]Location: Upper West, near math department center

2 Easy Problem

Find $f(-1)$:

$$f(x) = \begin{cases} x - f(x+1) & \text{if } x < 3 \\ f(2x) & \text{if } 3 \leq x < 5 \\ x + 1 & \textit{otherwise} \end{cases}$$

Your Answer:

3 Medium Problem

Let n be any positive base 10 integer from 1 to 2^{12} inclusive. Let $S(n)$ be the number of 1's in the binary representation of n. Find the number of possible n's such that $S(n) - S(n+1) = 3$.

Your Answer:

4 Hard Problem

Ackerman's function is defined as:

$$A(x,y) = \begin{cases} y + 1 & \text{if } x = 0 \\ A(x-1,1) & \text{if } x \neq 0 \text{ and } y = 0 \\ A(x-1, A(x, y-1)) & \text{if } x \neq 0 \text{ and } y \neq 0 \end{cases}$$

Find $A(3,4)$.

Your Answer: