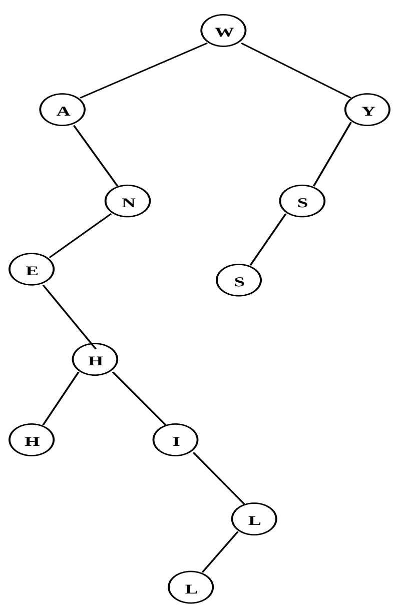
American Computer Science League

2018-2019 **Contest #3**

JUNIOR DIVISION SOLUTIONS

1. Boolean Algebra $(A+B)\overline{B} = A\overline{B}+0 = A\overline{B} = A\overline{B}+0 = A\overline{B}$ So $A=1 \wedge \overline{B}=1 \rightarrow B=0$ Therefore (1,0) makes it TRUE.	**1.** (1, 0)
2. Boolean Algebra $A(A\overline{B}+B)+B(\overline{A}+B) = AA\overline{B}+AB+\overline{A}B+BB$ $= A\overline{B}+AB+\overline{A}B+B$ $= A\overline{B}+B(A+\overline{A}+1)$ $= A\overline{B}+B$ $= A+B$	**2.** $A+B$
3. Data Structures  The depth of the tree at the left is 7.	**3.** 7

JUNIOR DIVISION SOLUTIONS

4. Data Structures

The stack is constructed using LIFO as follows: H, HU, HUR, HURR, HUR, HURI, HURIC, HURICA, HURICAN, HURICA, HURIC, HURICE, HURICES, HURICESA, HURICESAN, HURICESA, HURICES, HURICE, HURICED, HURICEDV, HURICEDVO, HURICEDVOL, HURICEDVO, HURICEDV, HURICED, HURICE, HURICEC, HURICECA, HURICECAN, HURICECA, HURICEC, HURICE, HURICEO, HURICEOE, HURICEOES, HURICEOE, HURICEO
The next item popped would be O.

4. O

5. What Does This Program Do? - Arrays

The first loop sets up the initial array which is comprised of the first 16 numbers of the Fibonacci sequence.

1	1	2	3
5	8	13	21
34	55	89	144
233	377	610	987

The second loop divides the entries without a 0 as a subscript by the product of the subscripts. If there is no remainder, the entry is replaced by 1. Otherwise it is replaced by the integral value of the quotient.

1	1	2	3
5	1	6	1
34	27	22	1
233	125	101	109

The third loop first subtracts 100 from any entry larger than 99 and then applies modulo 3 to the entries.

1	1	2	0
2	1	0	1
1	0	1	1
1	1	1	0

The last loop sums the entries on the two main diagonals which is 4.

5. 4