

JUNIOR DIVISION SOLUTIONS

1. Boolean Algebra

$$(A + B)\bar{B} = A\bar{B} + 0 = A\bar{B} = A\bar{B} + 0 = A\bar{B}$$

So $A = 1 \wedge \bar{B} = 1 \rightarrow B = 0$ Therefore (1,0) makes it TRUE.

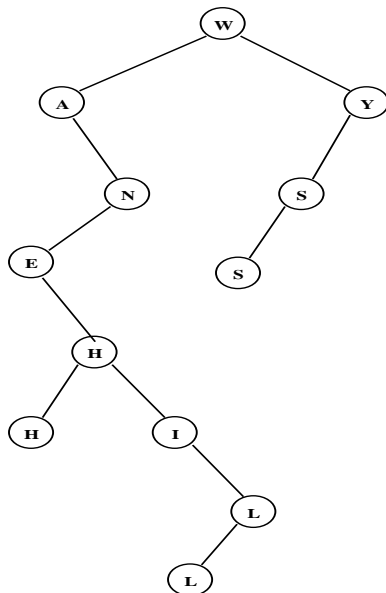
1. (1, 0)

2. Boolean Algebra

$$\begin{aligned} A(\bar{A}B + B) + B(\bar{A} + B) &= A\bar{A}B + AB + \bar{A}B + BB \\ &= \bar{A}B + AB + \bar{A}B + B \\ &= \bar{A}B + B(A + \bar{A} + 1) \\ &= \bar{A}B + B \\ &= A + B \end{aligned}$$

2. $A + B$

3. Data Structures



The depth of the tree at the left is 7.

3. 7

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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