

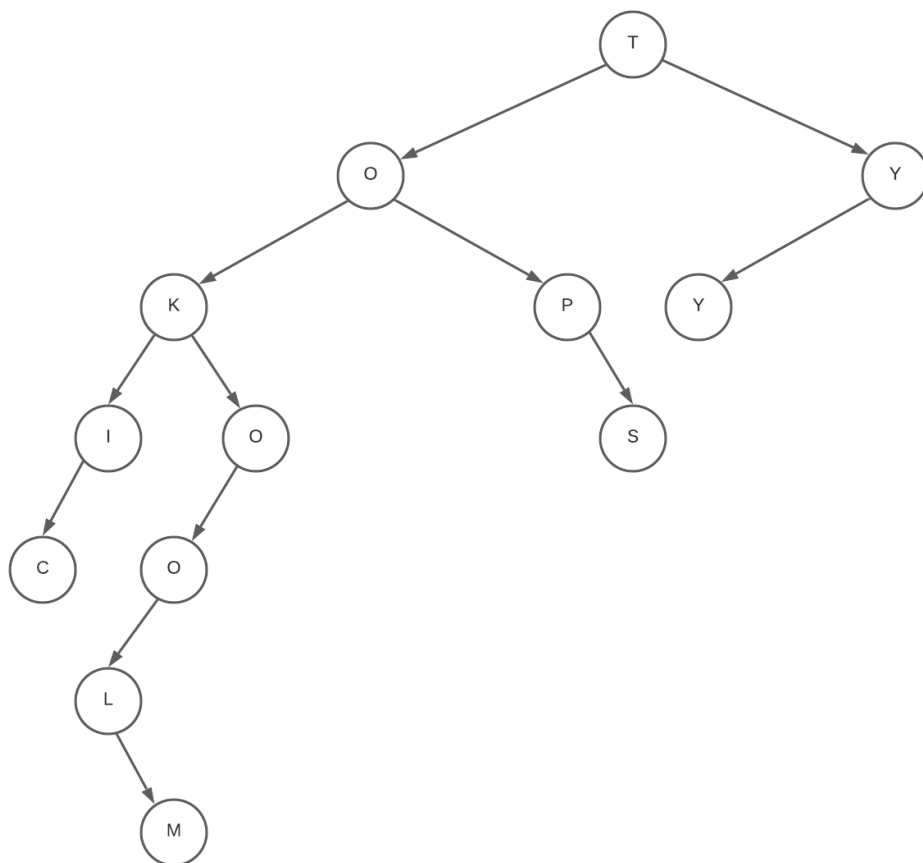
American Computer Science League

2021-2022 • Contest 3: Short Problems Solutions • Junior Division

<p>1. Boolean Algebra</p> $\begin{aligned}\overline{A}(AB + \overline{B}) &= A\overline{A}B + \overline{A}\overline{B} \\ &= 0 + \overline{A}\overline{B} \\ &= \overline{A}\overline{B}\end{aligned}$ <p>To be true both \overline{A} & \overline{B} must be 0. So (0, 0) is the only ordered pair that satisfies the condition.</p>	<p>A. (0, 0)</p>
<p>2. Boolean Algebra</p> $\begin{aligned}A(\overline{B} + \overline{C}) + \overline{A}B + \overline{B}\overline{C} &= A\overline{B} + A\overline{C} + \overline{A}B + \overline{B} + \overline{C} \\ &= (A\overline{B} + \overline{B}) + (A\overline{C} + \overline{C}) + \overline{A}B \\ &= \overline{B} + \overline{C} + \overline{A}B\end{aligned}$	<p>D. $\overline{B} + \overline{C} + \overline{A}B$</p>

3. Data Structures

The binary search tree for TOKYOOLYMPICS is as follows:



E. I O S

4. Data Structures

The queue is constructed using FIFO as follows:

A, AQ, AQU, QU, QUA, QUAR, UAR, AR, ARI, RI, RIU, RIUS

C. R

5. What Does This Program Do? (Arrays)

The original array defined in the first nested loop is as follows:

0	3	6	9
2	5	8	11
4	7	10	13
6	9	12	15

The next nested loop removes the tens digit and also replaces any entry less than 6 by 0. The resulting table is:

0	0	6	9
0	0	8	0
0	7	0	0
6	9	0	0

There are 10 zero entries and 6 non-zero entries.

C. 6
