ACSL

American Computer Science League

**All-Star # 5**

**008 2015 - 2016**

**ACSL BOOLEO**

**PROBLEM**: Booleo is a card game using boolean logic gates. It was first published by Tessera Games LLC in 2009. The cards are of 2 types: BINARY (always on the bottom row) which contain either a 1 or a 0 and GATES which contain the operators AND, OR and XOR with a result of 1 or 0.  
  
The object of the game is to try, with the cards dealt, to build a pyramid of cards that follow the boolean rules. In the diagram below the 1 and 0 cards on the bottom row at locations (1,1) and (1,2) are OR’ed to get a result of 1. The 0 and 1 cards at locations (1,2) and (1,3) are XOR’ed to get a result of 1. The 1 and 1 cards at locations (1,3) and (1,4) are AND’ed to get a result of 1. All of those results are correct. Continuing to the next level the 1 and 1 cards at locations (2,1) and (2,2) are XOR’ed to get a result of 0. The process continues in this manner until the pyramid is complete.

AND 0

XOR 0

AND 1

OR 1

XOR 1

AND 1

1

0

1

1

INPUT: There will be 10 (note only 5 are shown in the Sample Input) lines of input. Each input line will contain the number of BINARY cards followed by their representation in hexadecimal. In Sample Input #1 the B would be converted to binary 1011 as shown in the diagram above. This will be followed by the GATE cards used to form the pyramid. Sample Input line #1 has the data for the pyramid above. The number of BINARY cards will not be more than 6. To shorten the input A, R and X will be used to represent AND, OR and XOR

**OUTPUT**: For each input line build the pyramid using the list of cards given and in the order given. If the pyramid is correct, then print TRUE. If it is not correct, then print the location (row, col order) that produces the first error (left to right and bottom to top) and from the list below, in order, print the first gate that corrects the error and keeps the binary value the same. If there is no correction possible, print NONE and do not seek other errors.

AND1, OR1, XOR1, AND0, OR0, XOR0

A pyramid could have more than one error. Print each error on a new line. Find all errors and print their location and the correction GATE(S) as described above.

**SAMPLE INPUT SAMPLE OUTPUT**  
1. 4, B, R1, X1, A1, X0, A1, A0 1. TRUE  
2. 3, 6, A1, X0, R1 2. 2, 2, AND0  
3. 4, 6, A0, X1, A0, R0, R1, X1 3. 2, 2, AND1 3, 1, AND0  
4. 5, 0, A0, R1, A0, A0, X1, X1, 4. 2, 2, NONE   
 R1, A0, R0, X0   
5. 6, 33, A1, R1, X0, R1, A1, 5. TRUE  
 R1, A0, A0, R1, X1, R0, X1, A0, R1, X1

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**TEST DATA**

**TEST INPUT TEST OUTPUT**  
1. 3, 6, A0, R1, A1 1. 2, 1, XOR0  
 3, 1, OR1

2. 3, 6, X0, X0, R1 2. 2, 2, AND0  
 3, 1, NONE

3. 3, 6, X1, R1, A1 3. 2, 1, AND1

4. 4, F, X1, R1, A1, R0, R1, X1 4. 2, 1, AND1   
 3, 1, XOR0

5. 4, C, A1, R1, X1, R0, X0, A1 5. 2, 3, NONE

6. 4, 0, A0, X0, R0, X0, A0, R0 6. TRUE

7. 5, 1F, R1, X1, R1, X1, A1, A1, 7. 2, 2, AND1

2, 4, AND1  
4, 2, AND1

R1, A1, X1, A1

8. 5, 4, A0, X0, R0, X0, A1, R1, 8. 2, 2, AND0  
 2, 3, AND0  
 3, 1, NONE

R0, A0, R0, A1

9. 6, 33, A1, R1, A1, R1, A1, R1 9. 2, 3, NONE

X0, R0, X1, A1, X1, R0, R1, X0, A0, R1

10. 6, 38, A1, R1, X1, R1, A1, 10. 2, 4, NONE  
X0, X0, X0, X0, A1, R0, A1, X1, X1, A0