ACSL

**American Computer Science League**

**2012 - 2013**

#### All-Star #5

**Ternary Boolean**

PROBLEM: The complicated diagram below shows a ternary digital circuit. That is, each logic gate requires 3 inputs and outputs one solution. We will define 4 types of gates A, B, C and D. An A gate is True only if all of its inputs are False. A B gate is True if at most 1 input is True. A C gate is True if all its inputs are True. A D gate is True if at most two of its inputs are True.



INPUT: There will be 5 lines of input. The first item on each line will be the number of gates initially used. This number will be a 3 or a 4. The initial gates will all be different. That will be followed by that number of pairs of values. The first part of the pair will be a 2-character string giving the letter of the gate and an octal value that when written using 3 binary values gives the ternary input. The second part of the pair will be a string telling which gate(s) will get the output. The last item on the input line will give the letter of the final gate. Sample Input line #1 tells you that there will be 4 initial gates. The first gate is an A gate that has an input of 111. The output of gate A only goes to gate B. The second gate is a B gate and its input is 011. The output from gate B goes to gates B, C and D. The remaining data is defined in a similar manner. The final C means that the output from gates B, C, and D all go to C. As the Sample Output #1 shows, the output from gates B, C and D (must be in alphabetical order) is 101. Since C is True when all its inputs are True, the final output is 0.

OUTPUT: There will be 10 outputs. For each of the 5 lines of input there will be 2 outputs. First print the 3 binary inputs for the final gate in alphabetical order of the input gates and then print the final gate's binary truth value.

SAMPLE INPUT SAMPLE OUTPUT

1. 4, A7, B, B3, BCD, C5, BCD, D0, CD, C 1. 101  
2. 3, A7, D, B3, D, C5, D, D 2. 0  
3. 3, A0, B, B4, B, C6, B, B 3. 000  
4. 3, A7, ACD, B6, ACD, C5, ACD, B 4. 1  
5. 4, A0, AC, B1, AB, C2, ABC, D3, BC, A 5. 110  
 6. 0  
 7. 101  
 8. 0  
 9. 000  
 10. 1

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**TEST DATA**

**TEST INPUT TEST OUTPUT**1. 3, A1, D, B0, D, C7, D, D 1. 011  
2. 3, A0, C, B0, C, D0, C, C 2. 1  
3. 4, A4, CD, B2, ACD, C3, AD, D5, AC, B 3. 111  
4. 4, A5, BCD, B6, BCD, C7, CD, D0, B, A 4. 1  
5. 3, A1, ABD, B3, ABD, C5, ABD, C 5. 001  
 6. 1  
 7. 101  
 8. 0  
 9. 111  
 10. 1