AMERICAN COMPUTER SCIENCE LEAGUE

2019-2020 **Contest #3**

Intermediate Division - Veitch

1

	A	A	~A	~A	
B			X	X	~D
B			X	X	D
~B			X	X	D
~B			X	X	~D
	~C	C	C	~C	

2

	A	A	~A	~A	
B					~D
B					D
~B	X	X			D
~B	X	X			~D
	~C	C	C	~C	

3

	A	A	~A	~A	
B		X	X		~D
B					D
~B	X			X	D
~B					~D
	~C	C	C	~C	

4

	A	A	~A	~A	
B	X				~D
B	X				D
~B				X	D
~B					~D
	~C	C	C	~C	

PROBLEM: Given a Boolean expression with at most 4 variables, describe its Veitch Diagram. Each Boolean expression will use just the OR operator to combine terms and the terms will be joined using just the AND operator. Note that variables are eliminated from a term's representation if the variable and its negation are included in its grid representation. The Boolean expressions for the Veitch Diagrams in Figures #1 - #4 above are: 1) ~A 2) A~B 3) BC~D + ~B~CD 4) AB~C + ~A~B~C D

EXAMPLE: The expression AB + ~C + ~A~D fills the grid in the following way:

5

	A	A	~A	~A	
B	X	X			~D
B	X	X			D
~B					D
~B					~D
	~C	C	C	~C	

6

	A	A	~A	~A	
B	X			X	~D
B	X			X	D
~B	X			X	D
~B	X			X	~D
	~C	C	C	~C	

7

	A	A	~A	~A	
B			X	X	~D
B					D
~B					D
~B			X	X	~D
	~C	C	C	~C	

8

	A	A	~A	~A	
B	X	X	X	X	~D
B	X	X		X	D
~B	X			X	D
~B	X		X	X	~D
	~C	C	C	~C	

AB fills the 4 cells in Figure #5. ~C fills the 8 cells of Figure #6. ~A~D fills the 4 cells of Figure #7. Figure #8 shows all the X's combined in one diagram. Changing the X's in each row to 1's and the blanks to 0's in Figure #8, and then converting the digits to hexadecimal gives FD9B.

INPUT: There will be 5 lines of input (for clarity 10 sample inputs are given). Each line will contain a valid Boolean expression with at most 4 variables. Variables within a term will always be in alphabetical order.

OUTPUT: For each line of input, print a representation of the entries of the Veitch diagram from top to bottom as a string of 4 hexadecimal values.

AMERICAN COMPUTER SCIENCE LEAGUE

2019-2020 **Contest #3**

Intermediate Division - Veitch

SAMPLE INPUT:

```
AB+~AB+~A~B
AB~C~D+AB~CD+~A~B~CD
AB~C~D+~AB~C~D+A~B~C~D
B~D+~B~D
~A~BD+~A~B~D
B~D+~A~BD+A~B~C
~B~C+BCD+B~C~D
A~C+ACD+~A~CD
AB~D+~ABD+A~BD+~A~B~D
B~D+~A~CD+~A~B~C~D
```

SAMPLE OUTPUT:

1. FF33
2. 8810
3. 9008
4. F00F
5. 0033
6. F0B8
7. 9699
8. 8DD8
9. C3C3
10. F111

AMERICAN COMPUTER SCIENCE LEAGUE

2019-2020 **Contest #3**

Intermediate Division - Veitch

TEST DATA

TEST INPUT:

~A~B+AB+~CD+C~D
B~D+AC+~A~B+CD
~ABD+~BCD+D
~A~BD+~A~BD+AC+BD
~ABC~D+A~B~C~D+~A~B~C

AMERICAN COMPUTER SCIENCE LEAGUE

2019-2020 **Contest #3**

Intermediate Division - Veitch

1

	A	A	~A	~A	
B			X	X	~D
B			X	X	D
~B			X	X	D
~B			X	X	~D
	~C	C	C	~C	

2

	A	A	~A	~A	
B					~D
B					D
~B	X	X			D
~B	X	X			~D
	~C	C	C	~C	

3

	A	A	~A	~A	
B		X	X		~D
B					D
~B	X			X	D
~B					~D
	~C	C	C	~C	

4

	A	A	~A	~A	
B	X				~D
B	X				D
~B				X	D
~B					~D
	~C	C	C	~C	

PROBLEM（问题）： 给定一个最多含有4个变量的布尔表达式，且用维奇图(Veitch Diagram)来表示。每个布尔表达式只使用OR操作符来连接各项，且每个项中的变量使用AND操作符来连接。注意，在维奇图（如图方格）的表示中，如果一个变量及其否定都被包含，那么将这个变量从这个项的表示中删除。以上维奇图1-图4的布尔表达式为：

1) ~A 2) A~B 3) BC~D + ~B~CD 4) AB~C + ~A~B~C D

EXAMPLE（示例）**:** 表达式 AB + ~C + ~A~D 按照以下方式填入方格中:

5

	A	A	~A	~A	
B	X	X			~D
B	X	X			D
~B					D
~B					~D
	~C	C	C	~C	

6

	A	A	~A	~A	
B	X			X	~D
B	X			X	D
~B	X			X	D
~B	X			X	~D
	~C	C	C	~C	

7

	A	A	~A	~A	
B			X	X	~D
B					D
~B					D
~B			X	X	~D
	~C	C	C	~C	

8

	A	A	~A	~A	
B	X	X	X	X	~D
B	X	X		X	D
~B	X			X	D
~B	X		X	X	~D
	~C	C	C	~C	

将AB项填入图5的4个格中，将 ~C项填入图6的8个格中，最后将 ~A~D 项填入图7的4个格中。 图8表示的是将图5、图6和图7中所有的X都整合在同一张图表的状态。然后将图8中每一行的X都变成1，空格都变成0，然后将这些数字转换成十六进制，得到FD9B。

INPUT（输入）： 将会有5行输入（为了方便理解，会提供10行示例输入）。每行都包含一个有效的布尔表达式，且变量最多为4个。每一项的变量会按照字母表顺序排列。

OUTPUT（输出）**:** 对于每一行的输入，将维奇图中的每一行从上到下打印输出为一个由4个十六进制值组成的字符串。

AMERICAN COMPUTER SCIENCE LEAGUE

2019-2020 **Contest #3**

Intermediate Division - Veitch

SAMPLE INPUT:

```
AB+~AB+~A~B
AB~C~D+AB~CD+~A~B~CD
AB~C~D+~AB~C~D+A~B~C~D
B~D+~B~D
~A~BD+~A~B~D
B~D+~A~BD+A~B~C
~B~C+BCD+B~C~D
A~C+ACD+~A~CD
AB~D+~ABD+A~BD+~A~B~D
B~D+~A~CD+~A~B~C~D
```

SAMPLE OUTPUT:

1. FF33
2. 8810
3. 9008
4. F00F
5. 0033
6. F0B8
7. 9699
8. 8DD8
9. C3C3
10. F111

AMERICAN COMPUTER SCIENCE LEAGUE

2019-2020 **Contest #3**

Intermediate Division - Veitch

TEST DATA

TEST INPUT:

~A~B+AB+~CD+C~D
B~D+AC+~A~B+CD
~ABD+~BCD+D
~A~BD+~A~BD+AC+BD
~ABC~D+A~B~C~D+~A~B~C