PROBLEM: The Veitch Diagram is a method to represent a Boolean expression. The method places an X in the cell that describes each term and groups adjacent cells. For this program, the X's are already placed. Each diagram will represent an expression of at most 3 variables. Variables are eliminated from a term's representation if the variable and its negation are included. Terms are always joined by the OR symbol (+). AND within terms will always be implied. Each X can be used just once in the forming of groups. The ~ symbol will be used to indicate NOT.

X's are grouped according to the following priorities:

1. Group 4 adjacent X's. This is shown in Diagrams 1 and 2. When 4 adjacent X's are grouped, the representation is one term. The representation of Diagram 1 is ~A. Note B and ~B and then C and ~C are included in the grouped X's and are eliminated. The priority for grouping 4 adjacent X's is top row, then bottom row, and finally columns from left to right. The representation of Diagram 2 is ~B.

2. Group 4 end column adjacent X's. That is X's fill the first and last column. There is only one way that this can be done which yields ~C.

3. Group 2 adjacent X's. When 2 adjacent X's are grouped, the result is a term of 2 variables. In Diagram 3 there are 2 groups of 2 adjacent X's. The priority for grouping 2 adjacent X's is top row from left to right, bottom row from left to right, and then columns from left to right. The top row representation is ~AB. The bottom row representation is A~B. The expression for Diagram 3 is ~AB + A~B.

4. Group 2 end column adjacent X's. The priority is top row adjacent X's first. This is shown in Diagram 4. The top row in the diagram has end column adjacent X's. That part of the representation is B~C.

5. Represent single X's in the priority top row, bottom row, and then left to right. Diagram 4 has a single X that is not already used by the above rules. Single X's always translate to a term of 3 variables. It translates to A~BC. The expression for Diagram 4 is B~C + A~BC.

 INPUT: There will be 5 lines of input. Each line will contain a 2-character string. The 2 characters will each represent a hexadecimal digit. When each is converted to a 4-digit binary number with leading zeros and placed into the diagram top row then bottom row, the 1's will represent the placement of the X's in the Veitch Diagram. The input for Diagram 4 is 94 which represents 1001 and 0100.

OUTPUT: For each line of input, print the expression using the rules and priorities above. Since the listed priorities apply, the terms must be listed in the order specified. Also, the factors must always be in ABC order. Spacing between terms and within terms will not affect the answer.

SAMPLE INPUT: **SAMPLE OUTPUT:**
(http://www.datafiles.acsl.org/2020/contest3/jr-sample-input.txt)

INPUT	OUTPUT
33	1. ~A
3C	2. ~AB + A~B
94	3. B~C + A~BC
77	4. C + ~A~C
95	5. ~A~C + AB~C + A~BC

TEST DATA

TEST INPUT:
  F0
  1D
  9D
  E9
  E7

TEST OUTPUT (spaces are optional):

1. B

2. A~B + ~A~C

3. ~C + A~BC

4. AB + ~B~C + ~ABC

5. C + AB~C + ~A~B~C