Homework 5 (Deadline 15:00, April 15, submit your files to TronClass)

Please submit the source code only. The file name should include your student ID number. For example, if your ID number is 406290123, then the file names for problems 1 and 2 should be **406290123_hw5_1.txt** and **406290123_hw5_2.txt**, respectively.

1. Task Description

Write a program to find the leading digit of a positive integer.

Input Format

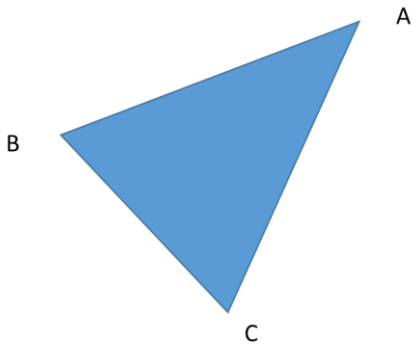
There is only one line in the input, giving the positive integer. There is no limit on the number of digits in the input, but it must be less than 2^{32}-1 due to the limit of 4-byte storage for integer. However, you don't have to check if the input exceeds the limit.

Output Format

There are one line in the output, giving the leading digit of the input.
For example, if the input is 3452984, the output should be 3.

2. Task Description

Ask the user to input the coordinates of 4 points on the xy plane. Determine if the three points form a triangle. In addition, output the three pairs of coordinates in clockwise order. Use the figure below as an example, there are three possible clockwise orders: ACB, CBA, BAC.



Input format

6 numbers in one line, corresponding to $x_A, y_A, x_b, y_b, x_c, y_c$.

Output format

There are 4 lines in the output. In the first line, if the points can form a triangle, output an integer 1; if not, output an integer 0. In each of the following lines, output the three pairs of one clockwise order in each line.

Sample input

1 0 0 1 -1 0

Sample output

1

1 0 -1 0 0 1

-1 0 0 1 1 0

0 1 1 0 -1 0

3. Task description

Given a binary number, convert it to the corresponding decimal number.

Input

Ask the user to input a positive integer. There is no limit on the number of digits. There is no limit on the digits of the input, but it must be less than 2^{32}-1 due to the limit of 4-byte storage for integer. However, you don't have to check if the input exceeds the limit.

Output

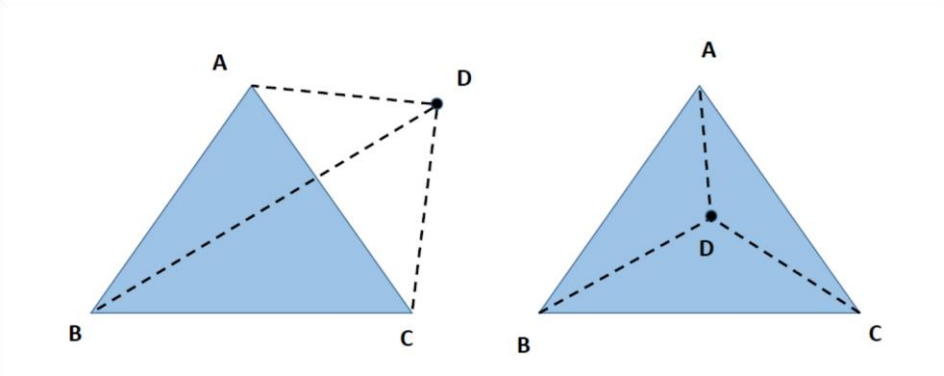
If the input is negative, write an error message indicating that it is negative. If the input is not a valid binary number (including digits other than 0 or 1), output an error message indicating that it is invalid. Otherwise, output the corresponding decimal number.

For example, if the input is 123, then the output should be 'The input number is not a binary number.' If the input is -3, then the output should be 'The input number is negative.' If the input is 1111, then the output should be 15.

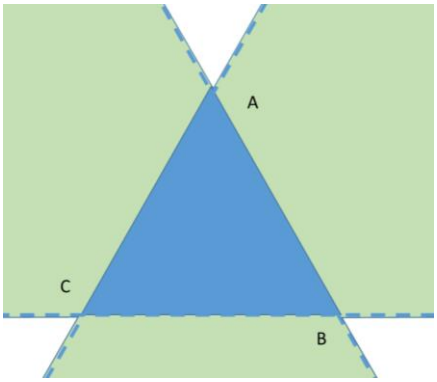
4. EXTRA BONUS PROBLEM

Task Description

Ask the user to input the coordinates of 4 points on the xy plane. Determine of these points form a convex quadrilateral (凸四邊形). A simple algorithm is as the following. Use the first three points ABC to form a triangle, if they are not collinear. Compute the sum of the area of these triangles, ΔABD, ΔBCD, ΔACD, and check if it is larger than the one of ΔABC.



However, one more condition needs to be included. Using the three lines connecting three points, A, B, and C, one divides the area outside the triangle into 6 difference regions. If point D is in one of these green regions, these points form a convex quadrilateral. If point D is in one of the white regions, these points form a concave quadrilateral.



Input format

8 numbers in one line, corresponding to $x_A, y_A, x_b, y_b, x_c, y_c, x_d, y_d$.

Output format

Only one integer appears in one line. If the 4 points do not form a quadrilateral, output an integer 0. If the 4 points form a convex quadrilateral, output an integer 1. If the 4 points form a concave quadrilateral, output an integer 2.