Given a number, we can form a number chain by

1. arranging its digits in descending order

2. arranging its digits in ascending order

3. subtracting the number obtained in (2) from the number obtained (1) to form a new number

4. and repeat these steps unless the new number has already appeared in the chain

Note that 0 is a permitted digit. The number of distinct numbers in the chain is the *length* of the chain. You are to write a program that reads numbers and outputs the number chain and the length of that chain for each number read.

Input

The input consists of a sequence of positive numbers, all less than 10^9, each on its own line, terminated by '0'. The input file contains at most 5000 numbers.

Output

The output consists of the number chains generated by the input numbers, followed by their lengths exactly in the format indicated below. After each number chain and chain length, including the last one, there should be a blank line. No chain will contain more than 1000 distinct numbers.

Sample Input

```
123456789
1234
444
0
```

Sample Output

```
Original number was 123456789
987654321 - 123456789 = 864197532
987654321 - 123456789 = 864197532
Chain length 2

Original number was 1234
4321 - 1234 = 3087
8730 - 378 = 8352
8532 - 2358 = 6174
7641 - 1467 = 6174
Chain length 4

Original number was 444
444 - 444 = 0
0 - 0 = 0
Chain length 2
```