

Problem HAPPYNUMBER: Happy Numbers

I like numbers. Thus I am always looking for new theorems about numbers. Last time I found an interesting article in MathWorld about *Happy Numbers*.

Those numbers are based on the simple function f . $f(n)$ is the sum of the squares of the digits of n . For example $f(123) = 1^2 + 2^2 + 3^2 = 14$. A number is called *happy*, if the repeated application of f leads to the result 1.

Hint: Numbers, which are not happy, lead to a periodical cycle of length 8.

Input

Each testcase contains one single integer n ($1 < n < 2147483647$). Input is ended by a single 0.

Output

Output 'This number is a happy number:' if the number can be called *happy* according to the definition above. In the case you found more than this happy number by iterative application of f , print these numbers from the last to the first one in parentheses.

If the number cannot be called *happy*, just print 'We feel sorry for this number:'.

Sample Input 1

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19
58
100
0
```

Sample Output 1

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This number is a happy number: 19 (100 68 82)
We feel sorry for this number: 58
This number is a happy number: 100
```