Problem 5—1 or 4

The Barbies are rating Oppie and Ken by intelligence. They've decided that Oppie is a 4 and Ken is more of a 1. What Oppie understands (but Ken does not) is that the digit square sum sequence always leads to 1 or 4. What this means: You start with any positive decimal number. You generate a new number by squaring the digits of this number and adding them together. You repeat this process until you get either 1 or 4, and you are guaranteed to get to 1 or 4 sooner or later. Given an input number, you are to compute whether the digit square sum sequence leads to 1 or 4 and how many applications of the digit square sum you will need to get there. For example, 16-->$1^2 + 6^2 = 37$ -->$3^2 + 7^2 = 58$ --> $5^2 + 8^2 = 89$ --> $8^2 + 9^2 = 145$ --> $1^2 + 4^2 + 5^2 = 42$ --> $4^2 + 2^2 = 20$ --> $2^2 + 0^2 = 4$, so 16 reduces to 4 in 7 steps.

INPUT SPECIFICATION. Each input case consists of an unsigned decimal integer representing the starting number. The last case is a 0, which is not to be processed; it merely signifies the end of input. There may be any number of 0's and/or **<EOLN>**'s before, after, or between these numbers.

OUTPUT SPECIFICATION. The output cases should be processed in the same order as their respective input cases. Each output case should be "Case *c*: *i* shrinks to *n* in *s* step(s)." where *c* is the case number, *i* is the input number, *n* is the final number (1 or 4) and *s* is the number of steps. Two **<EOLN>**'s should follow each case.

SAMPLE INPUT.

```
16<EOLN>
1<EOLN>
12345<EOLN>
0<EOLN>
<EOF>
```

SAMPLE OUTPUT.

```
Case·1:·16·shrinks·to·4·in·7·step(s).<EOLN>
<EOLN>
Case·2:·1·shrinks·to·1·in·0·step(s).<EOLN>
<EOLN>
Case·3:·12345·shrinks·to·4·in·10·step(s).<EOLN>
<EOLN>
<EOF>
```