Happiness index   X18514_en

A positive natural number is *happy* if the sequence of natural numbers obtained by replacing the number by the sum of the squares of its digits contains the number 1. Otherwise, it is a *sad* number, and it can be proved that the sequence contains the number 4.

For example, 19 is a happy number, because:

- $1^2 + 9^2 = 82$

- $8^2 + 2^2 = 68$

- $6^2 + 8^2 = 100$

- $1^2 + 0^2 + 0^2 = 1$

On the other hand, 18 is a sad number, because:

- $1^2 + 8^2 = 65$

- $6^2 + 5^2 = 61$

- $6^2 + 1^2 = 37$

- $3^2 + 7^2 = 58$

- $5^2 + 8^2 = 89$

- $8^2 + 9^2 = 145$

- $1^2 + 4^2 + 5^2 = 42$

- $4^2 + 2^2 = 20$

- $2^2 + 0^2 = 4$

The *happiness index* of a happy number is the length of the sequence of natural numbers described above, and the happiness index of a sad number is always -1. For example, the happiness index of 19 is 5, because the associated sequence is $(19, 82, 68, 100, 1)$, and the happiness index of 20 is -1.

Write a program that gives the happiness indices of several given natural numbers.

Your program must define and use the function

```
int happiness_index(int n);
```

that gives the happiness index of a natural number n.

Note: Recall that at this point of the course using vectors or any other method to store massive data is not allowed.

Exam score: 3 **Automatic part:** 40%

Input

The input is a non-empty sequence of positive natural numbers.

Output

For each natural number of the input, print its happiness index. Afterwards, print an empty line and the number of happy numbers and sad numbers read. Follow the format of the instance.

Sample input

```
1
2
3
4
5
6
7
8
9
10
```

Sample output

```
1 has happiness index 1
2 has happiness index -1
3 has happiness index -1
4 has happiness index -1
5 has happiness index -1
6 has happiness index -1
7 has happiness index 6
8 has happiness index -1
9 has happiness index -1
10 has happiness index 2

happy numbers: 3
sad numbers: 7
```

Problem information

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