

The Great Computer Challenge

Scientific/Non-Business Programming

Level IV

Solve all five problems. All problems are equal in point value. The main criterion is to get the problem solved correctly. Focus your time on the problem itself; a fancy user interface will not get you any more points than a simple one.

Problem 1: Cube Roots

Write a program that takes as input an integer and outputs the cube root of the input to the third decimal place. This should be the smallest value that is equal to or greater than the actual cube root (infinite precision). The input integer is in the range of 0 to $2^{32}-1$.

examples

input

27

output

3.000

input

6859

output

19.000

input

7919

output

19.933

Input

62710560

output

397.296

Problem 2: Analysis of Decoration

Characters can be used to make decorative motifs such as:

O0o.o0000o.o0000o.o00
/_/|-|_#+=[]/_/|-|_#+=[]/_/|-|_#+=[]/_/|-|_#+=[]

Write a program that takes as input a character string of up to 256 non-blank characters and outputs an integer indicating the length of the smallest underlying motif.

Examples:

Input:
O0o.o0000o.o0000o.o00
Output:
7

Input:
/_/|-|_#+=[]/_/|-|_#+=[]/_/|-|_#+=[]/_/|-|_#+=[]
Output:
13

Problem 3: Archeology

Archeologists often find scraps of old texts and have to determine whether two texts are (could be) the same or related to each other. Because the texts are damaged, the paper or parchment may be missing or damaged or the ink may have become illegible. The problem of this question is to find out whether lines that have been transcribed from two damaged texts may be related to each other.

Your program will compare lines that might be related. The input to the program will be two lines consisting of words from damaged texts. These lines consist of only the readable parts of the text so some words are likely to be missing from one or both lines. Your program is to compare the lines of text, identify the words which are common to both lines, and determine how many words are common and whether they are in the same order or not.

The input to your program will be two lines of text. The output will be one line with a count of the number of common words and the word SAME if the common words are in the same order or the word DIFFERENT if the common words are not in the same order.

EXAMPLES:

input

```
brillig and the wabe troves did gimble in gyre  
twas and the slithy troves did gimble wabe
```

output

```
6 DIFFERENT
```

input

```
dotes dozy dotes iddle amzy divvy  
marzy dotes dozy amzy divvy
```

output

```
4 SAME
```

Problem 4: Character Classification

Input: one line of text

Output: the contents of that line counted by character type. The character types are:

- a) Characters from the first half of the alphabet, a-m, case insensitive.
- b) Characters from the second half of the alphabet, n-z, case insensitive.
- c) Spaces
- d) Quotation marks whether single or double
- e) Punctuation characters that come in pairs: (), {}, [], and <>
- f) All other punctuation found on the keyboard.

Example:

Input

James 'Popeye' Doyle (Ya got'a love this guy) said, "Shoot the #\$\$}<.! jerk!"

Output

first half: 26

second half: 23

spaces: 12

quotes: 5

pairs: 4

punctuation: 6

Problem 5. Nutrition

Produce the information for a nutrition label such as is found on many food products. Information for the label will be found in input lines that are in mixed format. The two formats are:

Nutrient:MDR:Unit

where MDR means Minimum Daily Requirement and Unit is the unit in which that nutrient is measured such as IU (international units) or mg (milligrams); and

Nutrient:Actual

where Actual is the actual amount provided. For any particular nutrient, the first format will always be provided first. After all the input for all the nutrients has been provided, your program should print out a nutritional label for all the nutrients in the form:

Nutrient:Actual:Unit:Percent

where Percent is rounded to the nearest whole percent and followed by a percent sign.

Example:

input

```
Vitamin A:3000:IU
Phosphorus:1000:mg
Vitamin A:6000
Calcium:500:mg
Phosphorus:100
Calcium:250
```

output

```
Vitamin A:6000:IU:200%
Phosphorus:100:mg:10%
Calcium:250:mg:50%
```