

Important Contest Instructions

Please read the following instructions carefully. They contain important information on how to write your programs, how to run them and how to prepare them for submission.

Language Versions

The judges will be using the following versions for each of our supported languages.

Language	Version
Java	21.0.2
Python	3.12
C	13.2
C++	13.2

Java

Your program source file name **must** be named **probXX.java** and your class name **must** be **probXX**, where **prob** is all lower case and **XX** corresponds to the two digit problem number.

- Example class name: `public class prob01`
- Example source file name: `prob01.java`

Java programs can rely on the standard Java library.

Python

We recommend naming your program **probXX.py** (where **XX** corresponds to the two digit problem number).

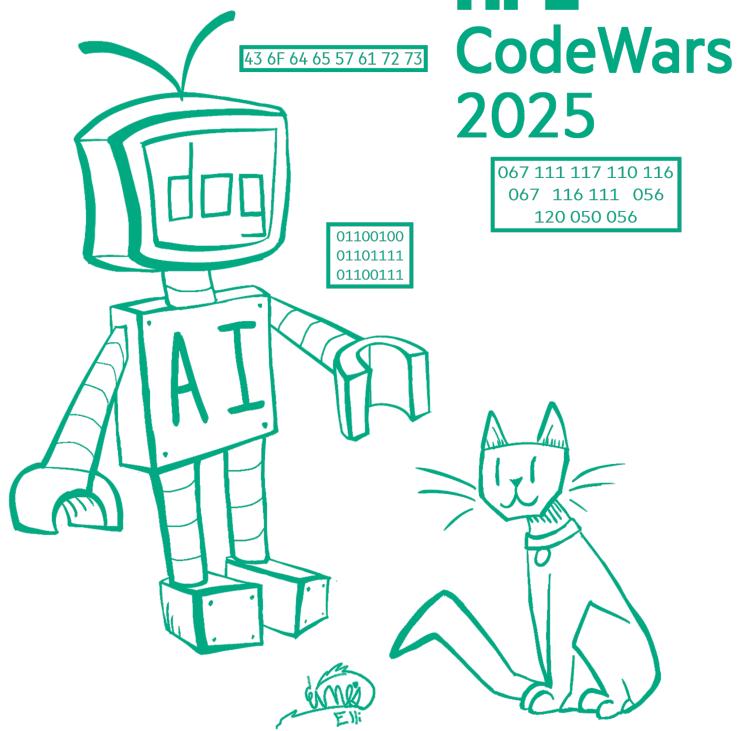
Python programs can rely on the standard python library.

C / C++

We recommend naming your program source file **probXX.c** or **probXX.cpp** (where **XX** corresponds to the two digit problem number).

C or C++ programs must be submitted as source files and can rely on glibc/libm and the standard headers.

Download our "C/C++ Developers Guide" from <https://hpecodewars.org/downloads>



Note

If there is a discrepancy between a data set in the problem statement and the data set file (for either input or output), please consider the data set file to be correct! We will announce any errata as needed.

Program Input

Most programs will require input. You have two options, File Input or Keyboard Input. Some problems may require Directory Input.

File Input

Your program may read input from a file named **input.txt** for all problems. The file will be in the same directory as your program. Use "input.txt" as the filename and **do not prefix it with a path**.

| Download our "Guide to data file I/O" from <https://hpecodewars.org/downloads>

Keyboard Input

Your program may read input from standard in (the keyboard). Do **not** include any prompts in your output. There are two options to provide input to your program via standard in (the keyboard).

- (1) The preferred option is to redirect the contents of a file to standard in of your program.

```
java prob01 < input.txt  
python prob01.py < input.txt  
prob01.exe < input.txt
```

- (2) Otherwise you may type everything manually, or copy/paste from the data set files.

| Tip: Type `Ctrl-Z <return>` to signal the end of keyboard input.

Directory Input

For some problems, you will need to read from a directory (folder) named "files". The directory will be in the same directory as your program. The student dataset includes a new directory called "files". **MOVE IT** to the same directory as your program.

Use "files" as its name and do not prefix it with a path. The judges will also place the "files" directory in their testing directory.

| Download our "Guide to Directory I/O" from <https://hpecodewars.org/downloads>

Program output

Your program must send the output to the screen (standard out, the default for any print statement). Do **not** include any prompts for input in the output! The only output for your program should be the expected output for the given problem.

Testing your program

Test your program like a judge will with the Python Check Program script (`checkProgram.py`) in the student ZIP file. The script will automatically run your program with each data set for that problem. See `README.txt` in the student ZIP file for more details.

| We strongly encourage you to test your program with all data sets in the `student_datasets` directory of the student ZIP file!

Online Code Submission

Programs will be submitted through the contest site using a text box (with a large character limit, don't worry!) instead of a file upload. You will need to copy and paste the program from your local source code file into the text box. Once you select the problem number and language from the respective drop-downs, you can submit the program for judging.

Input

There is no data file to read in for this (and only this) problem.



Output

Print this, exactly as shown:

The battle bus has launched!

Discussion

This is the only problem in the packet which does not require you to read data in from a file.

These first two problems are intended to help you check that your setup is working to produce code which will run on the judges' systems. Common problems found every year which will cause the judges to fail your coding for this problem include:

- Including a package reference in a Java class
- Not naming your Java class to match the problem (this is only an issue for Java coders)
- Including libraries not available in the standard library set (this affects everyone -- only vanilla standard libraries are allowed for the contest!)
- Using an IDE (such as BlueJ) which hides the rest of the coding needed for your program to run outside of that IDE
- Hardcoding paths in your code which only exist on your computer (affects everyone)

As a new commander for House Harkonnen, Mentat Hayt has some instructions for you.



Input

You will receive one name on a single line. It will not contain spaces or punctuation (even if the proper spelling of the name would include them).

LadyJessica

Output

Print to the screen the following text. **The only part of the text which should change is the NAME!**

```
It is by will alone I set my mind in motion.  
It is by the juice of sapho that thoughts acquire speed,  
the lips acquire stains.  
The stains become a warning.  
It is by will alone I set my mind in motion.  
I'm going to let you in on a secret, LadyJessica.  
Things aren't going so well for the Harkonnen.  
Are we to sit back and watch as the Emperor gives away Spice that is rightfully ours?  
Cheer as the Atreides take our Imperial Basin?  
Go. Take some men and mine everything.
```

Discussion

Be sure to run your solution against **all** of the student data sets. They have DIFFERENT names.

Additional Example

Input 2	Output 2
Chani	<pre>It is by will alone I set my mind in motion. It is by the juice of sapho that thoughts acquire speed, the lips acquire stains. The stains become a warning. It is by will alone I set my mind in motion. I'm going to let you in on a secret, Chani. Things aren't going so well for the Harkonnen. Are we to sit back and watch as the Emperor gives away Spice that is rightfully ours? Cheer as the Atreides take our Imperial Basin? Go. Take some men and mine everything.</pre>

Hawkeye is working on his jokes, but he's worried about rival comedians stealing his material, so he wants to write them down in a code only he understands. Show Hawkeye a way to encode text that he can use for his joke journal.



Input

You will receive a single line of text up to 750 characters in length (line may wrap in the packet, but in your data set it will not).

```
Knock knock. Who's there? George Washington. George Washington, who? Don't you know me?  
That was terrible.  
Knock knock. NO! C'mon. Knock knock? WHO'S THERE? Thomas Jefferson. Thomas Jefferson,  
who?  
Was George Washington just here? Hawkeye ... I never liked you. --M*A*S*H
```

Output

Remove every third character from the sentence, then output the changed sentence with those characters removed, followed by a line with those collected removed characters. (Output may wrap in your packet, but must be only 2 lines when output from your code)

```
Knckknck Wo' ter? eogeWahigtn.Gerg Wshngon wo?Do'tyo kowme Tatwa trrbl. nok nok.NO Cmo.  
nok nok?WH'STHRE Toms eferon Toms eferon wo?Wa Gore asinto jsthee?Hakee ..I evr ikd ou  
-M**SH  
o o.hsheGr sno oeait,h n un ?h seieKckc !'nKckc O E?haJfs.haJfs,h segWhgnu r wy.  
neley.-A*
```

Discussion

Reminder: have you run your solution against **all** of the student data sets?

Additional Examples

Input 2

In 2148, humanity discovered an alien outpost on Mars, and learned that of a "mass relay" that enables faster-than-light travel across the galaxy.

Output 2

```
In218,huantydicoerd n lin utos o Mrs ad  
eane tatofa mas ely"tht nale fstr-ha-lgh  
tavl crsst glay.  
4 mi sveaaeoptna,nlrdh "sra  
aebsaetnitreao eax
```

Come on, ChatGPT, don't fail me now. I need coding help to finish this job that I am not ... *entirely* ... able to do ... yet. Just another couple of YouTube lessons though, and I'll be better than anyone!

Input

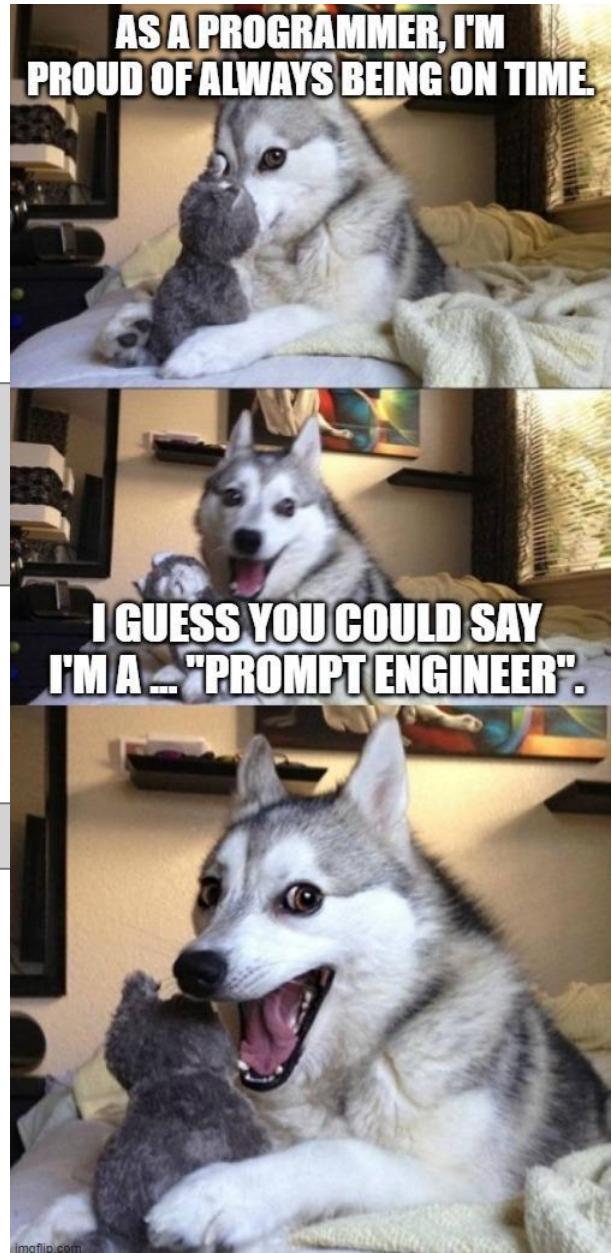
Your Agile Scrum Master is assigning you functions and entire classes to work on. Your input will be the signature stubs (one per line) for your assignments for the current sprint. One per line. Input ends on the code <TERMINATE> on a line by itself.

```
private static int counter(String x, bool y){}
function findMax(String data, string toFind){}
public Task<List<HPEData>> Multiplexer<T>(){}
class CodeWars<T>{ bool IsTheBest(ref T a, ref T b){}}
<TERMINATE>
```

Output

Tell ChatGPT how many codes you need (that is totally how we say that, right?). You will need one *code* per stub. If you only need one, say you only "a code"

Hey, ChatGPT, I need 4 codes!



Discussion

Simply count the number of functions and classes from your input and use that to shape your message to ChatGPT.

Reminder: have you run your solution against **all** of the student data sets?

Additional Examples

Input 2

```
function FakeItTilYouMakeIt(int IAmAwsum){}
<TERMINATE>
```

Output 2

Hey, ChatGPT, I need a code!

Several teens visited the latest Bazaar Bazaar, where representatives of movies, series, and performers reveal new items for their followers. Each person took advantage of the low prices to pick up new ways to support their favorites.

All shirts were \$13, hats were \$9, and stickers were \$2. Figure out how many of each item a student bought, and their total cost.



Input

The first line is a student name (one word), followed by an integer N: the number of vendors they visited. The next N lines each have 3 integers, for the count of shirts, hats, and stickers that student bought at each vendor.

```
Tabitha 5
1 4 8
0 1 8
0 0 4
0 5 0
0 3 0
```

Output

Find the total of each item and total cost for the student. Print one line as below. Make an item name plural if its count is not 1 ("shirt" below is singular, while others are plural.)

```
Tabitha spent $170 on 1 shirt, 13 hats, and 20 stickers.
```

Discussion

All integers in the input will be from 0 to 20. Do not use commas or decimal points in output.

Additional Example

Input 2	Output 2
Mauricio 4 19 0 0 20 0 0 18 0 0 20 1 0	Mauricio spent \$1010 on 77 shirts, 1 hat, and 0 stickers

Dasha's microphone keeps cutting out during sound check. The sound engineer (you) thinks something is wrong with the voltage regulator on the equipment. Professional audio equipment is designed with precise voltage requirements. Write a quick script to check the tolerances with your voltmeter. You will have to truncate the values before you enter them in your test suite though, as they only accept values to specific decimal lengths.



Input

You will receive between 3 and 10 lines. The first line will be the number of decimals your test equipment can handle. The rest of the numbers will be various voltages that have been recorded in the surge protection system recently. 000 on a line by itself ends input.

```
2
19770525.4444
19800521.55555
19830525.6
000
```

Output

Truncate (cut off) the decimals at the length specified. If the number's decimals are already at the specified length, or shorter, do nothing. **DO NOT ROUND**

```
19770525.44
19800521.55
19830525.6
```

Discussion

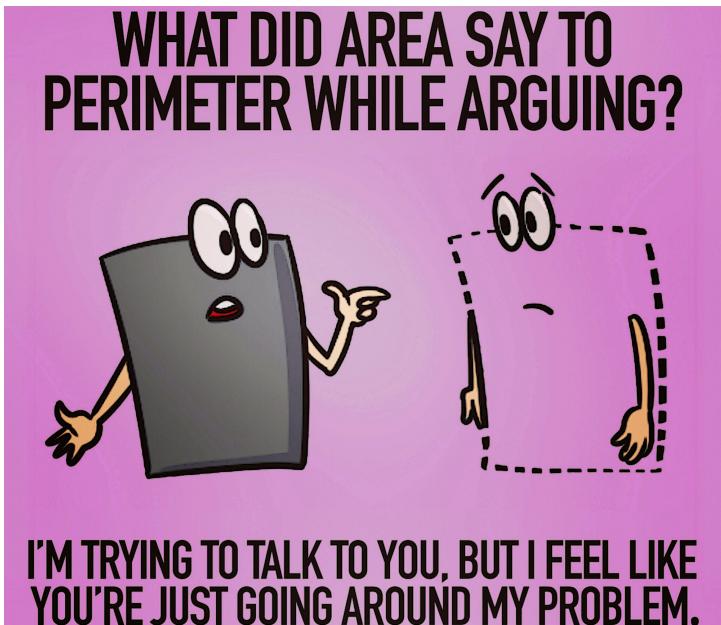
Note, it is a *mistake* to treat the inputs as floats/doubles, as not all of the decimal lengths given in your datasets can be *reliably* stored at those lengths in standard floats/doubles. Some of the numeric values will also be too large to store in a standard int-32, just FYI. If you would like to listen to our TED talk about number issues in programming languages, and have 3 hours free, we have a lot to say about this topic. (╯°□°)╯︵ ┻━┻

Additional Examples

Input 2	Output 2
3 1999005019.11 20020516.2222 20050519.333333333333333333 000	1999005019.11 20020516.222 20050519.333

Input 3	Output 3
7 151218.7000007000007000007000007 20171215.8888888 20191220.999999999999999999999999999999 000	151218.7000000 20171215.8888888 20191220.9999999

Help your contractor design your new kitchen space. First order of business, choose room dimensions. Make sure you make it clear to the contractor that while technically speaking a room size of 1ft x 100ft has the required area of 100ft^2 ... you will not be building it. (No room should have a 1ft width.)



Input

You will receive a rectangle's area as an integer on a single line.

```
100
```

Output

Output all possible integer side lengths the rectangle could have to generate that area, printing from largest to smallest. Do not repeat a combination of sides.

E.g. do not list both "50 x 2" and "2 x 50", as that is redundant. All side lengths must be larger than 1.

```
50 x 2
25 x 4
20 x 5
10 x 10
```

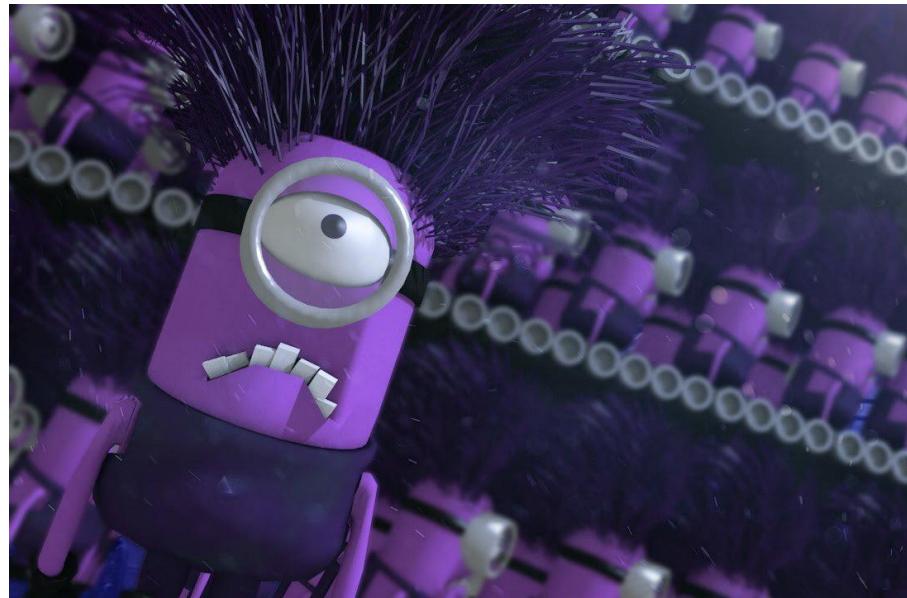
Discussion

Reminder: have you run your solution against **all** of the student data sets?

Additional Examples

Input 2	Output 2	Input 3	Output 3
1024	512 x 2 256 x 4 128 x 8 64 x 16 32 x 32	8	4 x 2

Gru's minion cloning machine is going haywire and is cloning the wrong minions! Help Gru count the minions to find the minion that was cloned the least amount of times so he can reconfigure the machine.



Input

You will receive a single line (input may look wrapped in your packet, but will be a single line in your dataset) of input consisting of up to 1000 characters. All of the characters will be numbers.

```
028309283849834798230932840923848932643498230482309489238473920840923849834565248326478  
340893729842398646
```

Output

Find the super cool (and mostly unique) number which is repeated the least frequently and output that along with the count of times the number is repeated.

If the number only appears one time in the input, simply output zero (since it was never repeated).

```
5 : 1
```

Discussion

Pro-tip: You are counting **repetitions!** That means the very first time a number is seen, it hasn't *repeated* yet.

Reminder: have you run your solution against **all** of the student data sets?

Additional Examples

Input 2	Output 2
1111211211121	2 : 2

It is time to settle the age-old question. How many R's are there, in the word Strawberry?



Input

You will receive two lines. The first line will contain a single word. The second line will contain a single letter (it may be upper or lower case).

```
Strawberry
R
```

Output

Count the number of times the letter appears in the word (disregard case). Then print as below with the searched letter as upper case.

```
There are 3 R's in Strawberry
```

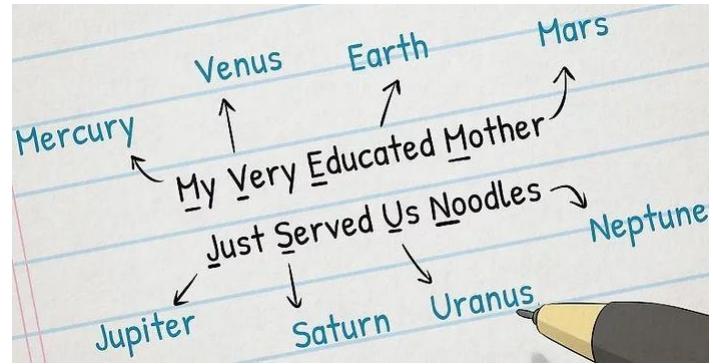
Discussion

Reminder: have you run your solution against **all** of the student data sets?

Additional Examples

Input 2	Output 2	Input 3	Output 3
Experience u	There are 0 U's in Experience	California A	There are 2 A's in California

Using the first letter of words or sentences can be called a Mnemonic or Acrostic, a way to help memorize lists or spellings. In this case, the first letter in each word below will spell the solution.



Input

Read one line of words. Words may be any connected characters, including punctuation and numbers. All such such "words" are separated by a single space between each.

```
Come on down everyone! We are rapidly selling _out_! 20%off! 8hrs! !Come_And_See!
```

Output

On one line, print the first character of each "word". Or, put another way: Print the first character of the line followed by every character that follows a space.

```
CodeWars_28!
```

Discussion

There will only be single spaces. The end of the line will not be a space.

Additional Example

Input 2	Output 2
They went each night, to yell -Yippee!- Eventually, it grew humbly tiresome.	Twenty-Eight

David Levinson is working to crack the code the aliens are using to communicate their countdown. For reasons that only the bugs understand, they seem to invert the case of all letters in their communications. Help David finish cracking their code by prepping the intercepted messages into the format the aliens use.



Input

You will receive several lines of text. Each line will be no longer than 100 characters in length. 000 on a line by itself ends the input.

The world's only hope lies with a determined band of survivors uniting for one last strike against the invaders – before the end of mankind. On, Independence Day.
000

Output

Change the case of all uppercase letters to lowercase, and all lowercase to uppercase. Output the changed sentence.

THE WORLD'S ONLY HOPE LIES WITH A DETERMINED BAND OF SURVIVORS UNITING FOR ONE LAST STRIKE AGAINST THE INVADERS – BEFORE THE END OF MANKIND. oN, iNDEPENDENCE dAY.

Discussion

Reminder: have you run your solution against **all** of the student data sets?

Additional Examples

Input 2

I still think it's important to be polite,
but not at all costs.
Not when you're being pushed beyond your
limits, and not when people are walking all
over you.
I needed to get to a point where I was
ready, able and willing to call out BS
rather than
just smiling my way through it.
--Taylor Swift
000

Output 2

i STILL THINK IT'S IMPORTANT TO BE POLITE,
BUT NOT AT ALL COSTS.
nOT WHEN YOU'RE BEING PUSHED BEYOND YOUR
LIMITS, AND NOT WHEN PEOPLE ARE WALKING ALL
OVER YOU.
i NEEDED TO GET TO A POINT WHERE i WAS
READY, ABLE AND WILLING TO CALL OUT bS
RATHER THAN
JUST SMILING MY WAY THROUGH IT.
--tAYLOR sWIFT

Good news, you landed an internship. Bad news, your mentor is giving you all of the un-fun jobs they don't want to do. Time to pay your dues!

Input

You will receive up to 15 lines of text. END on a line by itself ends input.

The text you will receive will be in the format of:
Key = Value. Both Key and Value may contain spaces, periods and commas (see student dataset
3.) Only space=space separates Key and Value.

```
CA = California
NV = Nevada
AZ = Arizona
MT = Montana
END
```



Output

Create a JSON representation of the data which can then be used by another programmer to send to an API.

```
{
  "CA": "California",
  "NV": "Nevada",
  "AZ": "Arizona",
  "MT": "Montana"
}
```

Discussion

Arrange the items into the JSON in the same order they were listed in the input. Remove any "whitespace" characters before and after the keys and values. Your JSON format must follow the example, exactly.

Beginning and ending curly braces must be on a line by themselves. Key-Values pairs should be indented exactly 4 spaces from the left margin.

Commas separating Key-Value pairs must come on the end of the line. And the final Key-Value pair in the collection should not have a comma trailing it.

Reminder: have you run your solution against **all** of the student data sets?

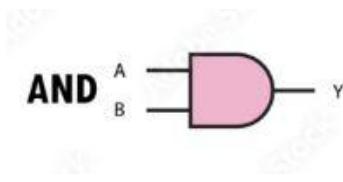
Additional Examples

Input 2	Output 2
0 = Sunday 1 = Monday 2 = Tuesday 3 = Wednesday 4 = Thursday 5 = Friday 6 = Saturday END	{ "0": "Sunday", "1": "Monday", "2": "Tuesday", "3": "Wednesday", "4": "Thursday", "5": "Friday", "6": "Saturday" }

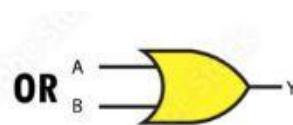
Cassian needs to make sure his compound is locked up. He has two gates that allow people in, but only if they're opened properly. The first gate uses AND logic - it will only turn on (1) if both of its inputs are on. The second uses OR logic - it will turn on (1) if either of its inputs is on. Help him test his gates by showing the output for both. (This is a terrible security setup, but it's a start.)



Cassian's configuration is similar to a computer's logic gates. Logic gates are computer components that take one or more binary inputs (0 or 1) and produce a binary output (0 or 1). Their logic can be represented in a truth table. A truth table shows what the outputs should be for each input configuration. Below are two examples of logic gates and their corresponding truth table.



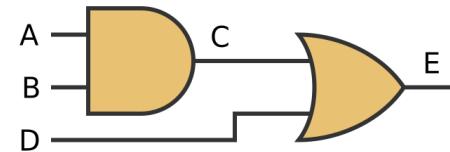
A	B	Y
0	0	0
0	1	0
1	0	0
1	1	1



A	B	Y
0	0	0
0	1	1
1	0	1
1	1	1

An **AND** gate has an output that is a 1 if both the inputs are 1. An **OR** gate has an output that is 1 if either of the inputs are 1.

Gates can be put in place sequentially into a circuit, where the output of one gate is the input of another gate. The diagram above shows a sequential circuit with an AND gate and an OR gate. Your goal is to calculate the intermediate signal (C) and the output of this circuit (E) given the inputs (A, B, D).



Input

You will read 3 bits (A B D) on one line.

1 0 0

Output

You will output 2 bits. Print the intermediate signal (C), then the output of the given circuit (E). Make sure they are in order (C E).

0 0

Discussion

HINT: First calculate the intermediate signal (C) from the AND gate, then use it as an input to the OR gate. Most coding languages have a built in variable type for bit, like there is for int. They also have built in operators for AND (&) as well as OR (|).

Reminder: have you run your solution against **all** of the student data sets?

Additional Examples

Input 2	Output 2	Input 3	Output 3
1 0 1	0 1	1 1 0	1 1

NOTE: THIS IS NOT THE CORRECT WAY TO REDUCE A FRACTION!

Consider yourselves warned, aspiring math teachers.

Working with large fractions can be confusing. Let's simplify (correctly) as far as we can.

$$\frac{16}{64} = \frac{1\cancel{6}}{\cancel{6}4} = \frac{1}{4}$$

Input

Each line of input has 2 integers separated by a space: the numerator N, and the denominator D. N and D are both greater than 0 and less than 100 million. "0 0" ends the input.

```
16 65
1234567 12345670
76543210 7654321
6543213 654321
0 0
```

Output

Print the fraction in reduced form.

If it doesn't reduce, this will be N/D.

If the fraction is less than 1, print the reduced fraction.

If the fraction reduces to an integer, print the integer.

If the fraction is larger than 1, print the whole number, one space, and the remaining fraction in reduced form.

```
16/65
1/10
10
10 1/218107
```

Discussion

Reminder: have you run your solution against **all** of the student data sets?

Ordering one of our handcrafted frames has become so much simpler! Since our company only creates frames for pictures with integer-length sides, we're taking advantage of one of the most famous equations and now you only need to enter a single number to describe your frame size! Simply square the width and the length, and add them together!

$$W^2 + L^2 = D^2$$

Send us the sum (D^2). We will do the math to find W and L for the largest area and start building!

$$\text{Area} = (W)(L)$$

Disclaimer: We want you to get the most for your order, so we build our frames with the largest area possible. If you enter a D^2 value that has multiple side combinations (W, L) to achieve it, we will choose the Width and Length to give you the largest area! If you want skinny frames, we'll take your call another time.

We need you to implement the math portion of our interface!

Input

The input is a single positive integer N (at most 20000), the square of the diagonal (D^2) of the rectangle.

50

Output

Find the Width (W) and Length (L) of the rectangle, with $W \leq L$. There may be more than one solution, so choose sides with the largest area. Print W and L on one line separated by a space. If you can't find two integer sides, print "That diagonal does not lead to integer sides!"

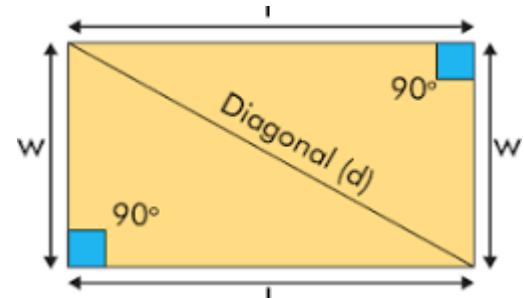
5 5

Discussion

In the example above, "1 7" also has a D^2 of 50, but "1 7" has an area of 7, and "5 5" has an area of 25, so "5 5" is the best answer.

Additional Examples

Input 2	Output 2	Input 3	Output 3
18049	25 132	18051	That diagonal does not lead to integer sides!



The Wizard thinks he finally has mastered some of the spells in his book of magic. He needs numerical alignment in the stars to do it though. Help the wizard align the numbers in his spell book evenly.

Input

You will receive a positive number on a single line, from 4 to 10 digits in length. One digit will repeat more than the others.

```
3334233
```



Output

Check to see if there is enough value available in the higher columns to redistribute to the lower columns to make each column contain the same digit. The original digit repeated the most is the digit all columns should match. If it is possible, output 4 lines: the ORIGINAL number, a row showing values SUBTRACTED, a row showing values ADDED, and the FINAL row.

If there is either too much or not enough value in higher columns to even out all of the digits, also output 4 lines: the ORIGINAL number, how much is AVAILABLE to subtract, how much is NEEDED to add, then the target number IMPOSSIBLE to reach.

```
3334233 ORIGINAL
0001000 SUBTRACTED
0000100 ADDED
3333333 FINAL
```

Discussion

In Input 1, 3 is the most repeated. There is one column of 2, and one column of 4, so the redistribution is easy. Simply take one from the '4' column, and add it to the '2' column.

In Input 2, 8 is the most repeated. However, there are not enough high columns to make the others equal 8.

The input number will never have all digits the same.

Additional Examples

Input 2	Output 2
887971878	887971878 ORIGINAL 000100000 AVAILABLE 001017010 NEEDED 888888888 IMPOSSIBLE

The neighborhood kids are arguing about who can run the fastest. Settle the argument once and for all.



Input

Your input will be 2 lines. All numbers will be integers.

The first line will be the distance (an integer), then a space then the unit (possible units are: in = inches, ft = feet, m = meters, y = yards).

The second line will be the time in seconds (also an integer).

```
100 ft  
13
```

Output

Change the units of the given measurements to convert the observed speed of the runner into miles/hour.

Truncate to (cut at) 2 decimal places.

```
5.24 miles/hour
```

Discussion

- 1 mile = 5280 feet
- 1 yard = 3 feet
- 1 foot = 12 inches
- 1 foot = 0.3048 meters
- 1 meter = 39.37008 inches

Ace is on the case again, tracking down some penguin smugglers. First order of business is to get his suspect list in order so he can contact them and setup meetings. Help Ace get organized!



Input

Your input will be a list of e-mail addresses. There may be more than one per line separated by spaces or commas. `;;;` on a line by itself ends input.

```
abc@example.com xyz@example.net
123@example.edu, codewarsisgreat@hpe.com abc@XYZ.com
heretherebeDRAGONS@hpe.com
abc@example.com
;;;
```

Output

Collect the e-mail addresses and eliminate the duplicates (ignore case: `abc@xyz.com` should be counted the same as `ABC@xYZ.CoM`). Any address you collect as unique should be converted to lowercase. Once you are done eliminating duplicates, sort the addresses in Ascending alphabetical order, and output them to the screen in Outlook separated (semi-colon) format, one address per line:

```
123@example.edu;
abc@example.com;
abc@xyz.com;
codewarsisgreat@hpe.com;
heretherebedragons@hpe.com;
xyz@example.net;
```

Discussion

Reminder: have you run your solution against **all** of the student data sets?

Additional Example

Input 2

```
a@a.com a@a.com a@a.com a@a.com A@A.com A@A.com a@a.com a@a.com a@a.com
a@a.com, A@A.com a@a.com, a@a.com, a@a.com
a@a.com a@a.com a@b.com
;;;
```

Output 2

```
a@a.com;
a@b.com;
```

Good news: Team Rocket finally got their Pikachu cloning machine working. Bad news: They don't know how to turn it off.

Help the local area Pokémon authorities figure out how many trainers they need to summon to catch the run-away pikachus before they overrun the city, by figuring out the cloning sequence being used!

Input

You will receive a sequence of integers on a single line, separated by commas.

20, 26, 32, 38, 44, 50, 56, 62

Output

Determine the sequence and the next number in the sequence, and print them out one per line. If the sequence cannot be determined write UNKNOWN for both outputs. If the sequence is addition output a "+" in front of the sequence, for subtraction output "-", for multiplication "*" and for division "/"

Sequence: +6
Next: 68



Discussion

The sequence can be positive or negative, and can involve Multiplication, Division, Addition or Subtraction. Only whole number sequences will be given in the datasets. The same single operation will be done on every sequence step (e.g. the sequence will not be something like *8, then +3 in one step). Each step will be the same INTEGER change (*Integer, -Integer, etc.) Division will result in integers, and any division floating point points generated when calculating the next number in the sequence need to be converted to integers.

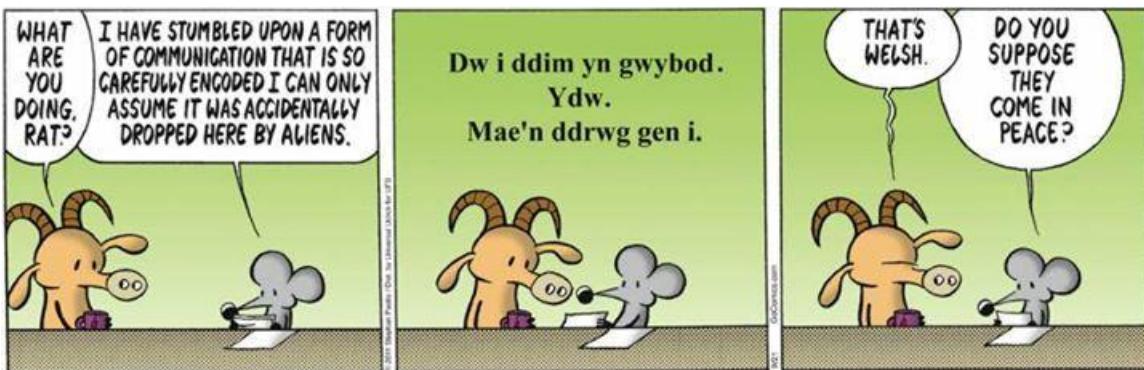
Reminder: have you run your solution against **all** of the student data sets?

Additional Examples

Input 2	Output 2	Input 3	Output 3
95, 90, 85, 80, 75, 70	Sequence: -5 Next: 65	3, 30, 300, 3000, 30000, 300000	Sequence: *10 Next: 300000

Input 4	Output 4	Input 5	Output 5
1024, 512, 256, 128, 64	Sequence: /2 Next: 32	18, 32, 2, 97, 100, 1, 15	Sequence: UNKNOWN Next: UNKNOWN

Which vowel is best? I won.



Gather up all of the vowel pairs to prepare them for life in Wales, separated by long distances, and rain.

Input

You will receive several lines of text, up to 500 characters per line are possible. END on a line by itself signals the end of input.

There is unrest in the Galactic Senate. Several thousand solar systems have declared their intentions to leave the Republic.
This separatist movement, under the leadership of the mysterious Count Dooku, has made it difficult for the limited number of Jedi Knights to maintain peace and order in the galaxy.
Senator Amidala, the former Queen of Naboo, is returning to the Galactic Senate to vote on the critical issue of creating an ARMY OF THE REPUBLIC to assist the overwhelmed Jedi....
END

Output

Count the number of vowels that can be found in the text which touch exactly one other vowel, as a pair, surrounded by consonants, spaces or punctuation. Output the vowel pairs found, and their counts in the order the pairs are first encountered in the text. Convert all vowels pairs to lowercase when counting and outputting them. Do not count any vowels that are part of a series of 3 vowels or more (as in the word "Queen" above.)

```
ou: 2
ei: 1
io: 1
ea: 4
oo: 2
ai: 2
ue: 1
```

Discussion

Reminder: have you run your solution against **all** of the student data sets?

Additional Examples

Input 2

What if the democracy we thought we were serving no longer exists,
and the Republic has become the very evil we have been fighting to destroy?
--Padme Amidala
END

Output 2

```
ou: 1
ee: 1
```

After missing a three-peat, the Chiefs are planning to win another Super Bowl and are scheduling their games now. Several Chiefs fans have chosen to support them by relabeling their season calendars.

All the fans have chosen to relabel the days of the week with 7 Chiefs players who made the top 100 for 2024. Each fan used the same order of days, but chose their own date to start. For example, one fan made Mondays "Mahomesday", while another put "Mahomesday" on Fridays. The other days follow in the order shown.



Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Mahomesday	Jonesday	Kelceday	McDuffeday	Humphreyday	Thuneyday	Smithday

Input

You will receive three lines of text. The first will be a date in ISO yyyy-MM-dd format. The second will be the Cheifsday of the week for that date. The third will be a date in the future from the first date given.

```
2025-03-01
Humphreyday
2025-03-14
```

Output

Determine what Cheifsday of the week the date in the future will fall on, and also how many days there were between the starting date and the ending date (exclusive, do not count either of the dates given in the input for that range) and output that using the following format.

```
2025-03-14 is a McDuffeday
There are 12 days between the two dates
```

Discussion

There are a variety of ways to do this, including simply counting. Some programming languages have libraries which will make this somewhat trivial. Some don't. To help those of you using languages without comprehensive datetime libraries, we have supplied the days in each month of the U.S. calendar. Note that February can have 28 days, or 29 in leap years (in years that are multiples of 4).

Days in U.S. calendar months:

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
31	28/29	31	30	31	30	31	31	30	31	30	31

In the Additional Examples given below, the actual day of the week for 2024-12-25 is Wednesday, but it's labeled Kelceday, so when the real answer for 2025-01-31 would be Friday, replace it with Humphreyday. For 2028-03-05, the actual day of the week is Sunday, but Thuneyday is given. The actual day of the week of 2030-01-09 is Wednesday, so we output Jonesday. Important: Each dataset may use a different shift of Chiefsdays.

Reminder: have you run your solution against **all** of the student data sets?

Additional Examples

Input 2	Output 2
2024-12-25 Kelceday 2025-01-31	2025-01-31 is a Humphreyday There are 36 days between the two dates

Input 3	Output 3
2028-03-05 Thuneyday 2030-01-09	2030-01-09 is a Jonesday There are 674 days between the two dates

Help Lisa guide Homer to get his new HPE hPhone in the size he needs for all of his files and future storage needs.

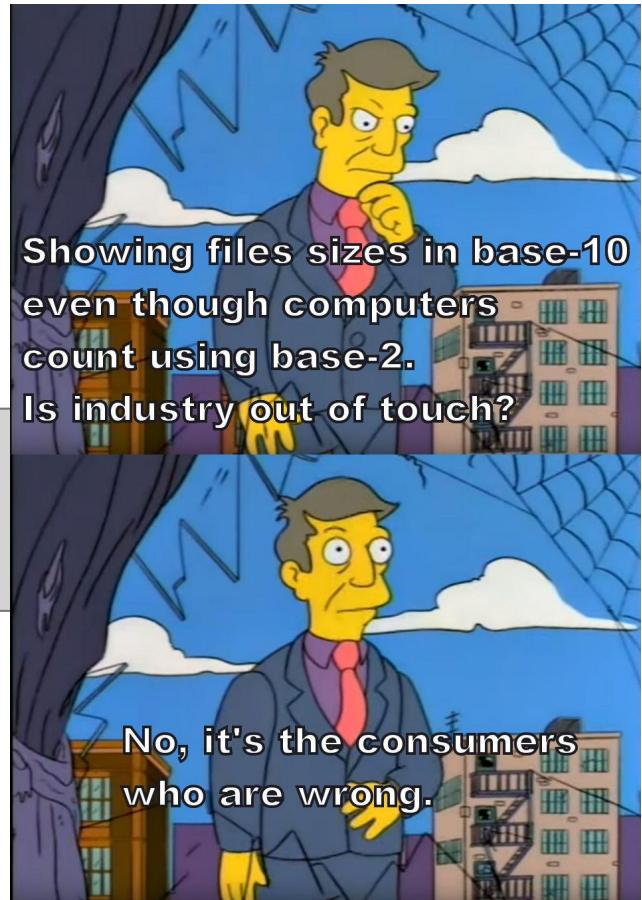
Input

You will be given a list of items to store on a phone.

Each item will be listed in the format of NAME Q NN.nn
Where Q is the integer quantity of the item, and NN.nn are the average size of those file types in MiB.

STOP on a line by itself ends input.

```
Photos 713 5.83
Videos 65 222.04
Apps 2 512.15
WordDocs 10 1.23
Songs 321 6.72
STOP
```



Output

Truncate all output floating point numbers to 2 decimal places. Do not truncate until ready to output! Truncated numbers must be accurate to +/- 0.01.

Calculate how much space the user needs for their files in MiB, then translate that to MB and determine which phone model the user will need to store: their files + the OS files + have at least 500 MiB of free space available.

List the following in your output: the calculated space needed for files in MiB. The file size translated to MB. The size needed on the phone for files + 500MiB (translated to MB) + 200 MiB for OS files. The phone model chosen.

```
Files 21783.10 MiB
Files 22841.24 MB
Total 23575.24 MB
Need hPhone5 with 50 GB storage
```

Discussion

While the size of the files will be given in the actual units computers use (MiB, which is base-2), the size of the storage for phones in stores is almost always given in MB (which is base-10). The difference between those 2 start off small, but grow quickly apart as sizes grow. A quick size chart is given from digital file sizes in the discussion section. Your job is to determine what size phone (storage) the person needs to hold all of their files. Keep in mind that all phones take up at least 200MiB of the storage space for the operating system, and other phone-specific files. They should also have at least 500MiB of space free after all of the files have been loaded. E.G. if a phone has 1000MiB of space available, and the user has 800MiB of files to store, while technically the files would fit on that 1000MiB phone (200MiB for the OS files + the 800MiB for the person's files), there would be zero free space left, so the user would need to choose the next size up that would allow for at least 500MiB of free space. Available phone sizes are listed below. Your output should use the largest whole number units applicable for phone sizes. E.G. 1000MB should be output as 1GB.

MiB to MB size comparisons:

Unit	1s (bits)	byte (8 bits)	1000s	1,000,000s	1,000,000,000s
MiB	2^0	$2^0 * 8$	$2^{10} = 1024$	$2^{20} = 1048576$	$2^{30} = 1073741824$
MB	10^0	$10^0 * 8$	$10^3 = 1000$	$10^6 = 1000000$	$10^9 = 1000000000$

Digital Size Names:

Units	1000s	1,000,000s	1,000,000,000s	1,000,000,000s
Base-2	$2^{10} = \text{Kibibytes}$	$2^{20} = \text{Mibibytes}$	$2^{30} = \text{Gibibytes}$	$2^{40} = \text{Tebibytes}$
Base-10	$10^3 = \text{Kilobytes}$	$10^6 = \text{Megabytes}$	$10^9 = \text{Gigabytes}$	$10^{12} = \text{Terabytes}$

Phone Models Available:

Model	hPhone	hPhone1	hPhone2	hPhone3	hPhone4	hPhone5	hPhone6
Storage	100MB	250MB	500MB	1GB	10GB	50GB	75GB
Model	hPhone7	hPhone8	hPhone9	hPhoneX	hPhoneX1	hPhone12	
Storage	100GB	150GB	200GB	500GB	1TB	2TB	

This table is available in `phones.csv` in the files directory.

Additional Examples

Input 2	Output 2	Input 3	Output 3
Photos 9943 18.99 Videos 3155 109.72 Apps 82 123.45 OfficeFiles 55 6.93 Songs 15 5.28 Ringtones 6 1.22 Misc 85 55.65 STOP	Files 550304.98 MiB Files 577036.60 MB Total 577770.60 MB Need hPhoneX1 with 1 TB storage	Photos 3 22.12 Videos 0 111.11 Apps 1 39.99 Songs 0 8.13 STOP	Files 106.35 MiB Files 111.51 MB Total 845.51 MB Need hPhone3 with 1 GB storage

There are 9 million (9×10^6) 7-digit numbers.

There are 5040 (7!) 7-digit numbers using all the digits 1-7.

There are 576 (4! squared) 7-digit numbers using all the digits 1-7 and divisible by 11. Call these the Seven-Elevens.

When in numerical order, we can reference the 576 Seven-Elevens by their order from least to greatest (indexed from 1 to 576.) Given an integer index, find the corresponding Seven-Eleven in the list. Get it right, and you may win a Slurpee (see Discussion)!



Input

In each dataset, you will read up to 10 integers (each from 1 to 576), one per line. 0 ends the input.

```
1
2
576
0
```

Output

Print the Seven-Eleven from the ordered list at each index requested.

```
1235476
1235674
7645231
```

Discussion

It is your choice how to find the right answer. For example: search through 9 million numbers; search through 5040 numbers; search through 576 numbers; generate the answer when you read the index; throw darts; or a method you see most reliable. (While simple, throwing darts may be the least accurate.)

Extra credit - Can you explain why "4! squared"?

You won't actually win a Slurpee.

There is no extra credit.

Useful (?) math trivia: For any multiple of 11, the sum of the digits in the odd locations (first, third, ...) minus the sum of the digits in the even locations (second, fourth, ...) will equal zero or a multiple of 11. For example, in the first two answers above (which of course are multiples of 11): $(1+3+4+6) - (2+5+7) = 0$.

TRANSMISSION FROM THE BRIDGE

"CIC, report! Lieutenant Ani, are you there?"

"We aren't sure yet, Commander Jaina, we need more time."

"Time is the one thing I cannot give you, lieutenant."

"What does Captain Jacen think about--"

"The captain was hit in the last attack. Helm and navigation are wounded too. They are bypassing our shield harmonics too fast. I need a solution, now!"

"The shields are calibrated by the ship's main battle computer. It's a binary system, right?"

"Yes, so?"

"What if we ran the calibrations through a ternary--"

"INCOMING FIRE!"

TRANSMISSION ENDS**Input**

You will receive 3 lines of numbers in the format of M.nn, one per line representing the X, Y and Z axis of the ship's shields in base-10 (decimal). M can range from 1 to 100000. All numbers will be positive.

You will also receive a 4th line (note, we are showing it below on several lines, because we don't have as much space on paper as we do in a data file) which has been ternary (base-3) encoded as a baseline check.

In the ternary encoding, letters and connected punctuation are separated by a period and words by a space.

```
123.45
67.89
276.54
2102.10220.11020 10200.11010.11002.11022.11020.11010.11000
11101.10202.10200.11022.11010.11020 10220.11021 11112.10202.11020.11010
11002.10220.11002.10202.11020.1201
```

Output

For lines 1-3: convert all of the input characters to ternary (base-3) encoded ASCII.

Separate each encoded character with a period.

For line 4, decode the ternary encoded ASCII and output the baseline check in standard ASCII.

```
1211.1212.1220.1201.1221.1222
2000.2001.1201.2002.2010
1212.2001.2000.1201.1222.1221
Air control vector is zero niner.
```



Discussion

An ASCII to decimal (base-10) table is included in your files. It is named ASCII.txt

To encode an ASCII character into ternary, first look up its value in the table (or use your programming language's ordinal function, if available), then convert that decimal value to ternary.

For instance, "A" is 65_{10} in decimal. 65 in ternary is 2102. "B" is 66_{10} , and 2110 in ternary. "C" is 67_{10} , and 2111 in ternary.

So, "ABC" encoded into ternary, with a period between each character, would be: 2102.2110.2111

Decoding is the same thing, in reverse. $2102_3 == 65_{10}$, $2110_3 == 66_{10}$, $2111_3 == 67_{10}$ 65 == "A", 66 == "B", 67 == "C". So, 2102.2110.2111 == "ABC"

Reminder: have you run your solution against **all** of the student data sets?

Additional Examples

Remember for the 4th line of input, we are showing it below on several lines, because we don't have as much space on paper as we do in a data file.

Input 2

```
9.99
12.12
100000.53
2102.10122.10200.10201.10202.10210.10211.10212.10220.10221.10222.11000.11001.11002.1101
0.11011.11012.11020.11021.11022.11100.11101.11102.11110.11111.11112
```

Output 2

```
2010.1201.2010.2010
1211.1212.1201.1211.1212
1211.1210.1210.1210.1210.1210.1201.1222.1220
Abcdefghijklmnopqrstuvwxyz
```

Persistence will help you finish a CodeWars program.

Mathematical Persistence is the count of how many times you can multiply the digits of a number until you finish in a single digit.

For example, consider the number 7117.



1: Multiply $7 * 1 * 1 * 7$ to get 49.

2: Multiply $4 * 9$ to get 36.

3: Multiply $3 * 6$ to get 18.

4: Multiply $1 * 8$ to get 8.

So, 7117 has a Persistence of 4: $7117 \rightarrow 49 \rightarrow 36 \rightarrow 18 \rightarrow 8$.

Only single digits (0-9) have a Persistence of 0 (no multiplication needed.)

Between 0 and 100 million, the largest Persistence is 9 (only 7448 numbers reach 9.) And over half have a Persistence of 1 because many include 0 as a digit. Here is a table of Persistence and the first number with that Persistence. You will be searching for Persistence.

Persistence:	0	1	2	3	4	5	6	7	8	9
First:	0	10	25	39	77	679	6788	68889	2677889	26888999

Input

Each line of input holds two integers and a letter ("N P X"), separated by single spaces.

The first integer (N, from 1 to 99999999) is the number to start your search.

The second integer (P, from 0 to 9) is the Persistence you're searching for.

The letter (X) can be:

"N" = Ignore P. Simply find the Persistence of N.
"G" = Search for the first number (N or Greater) that has a Persistence of P. Search up to 100,000,000.
"L" = Search for the first number (N or Lower) that has a Persistence of P. Search down to 0.
"S" = Stop. The input lines end with "0 0 S".

Example

```
99999999 0 L
77 0 N
31000000 8 G
76 4 L
99999992 5 G
12345 9 G
0 0 S
```

Output

Reprint each original line, a colon and space, then your result.

Either:

- "Persistence P does not exist between N and (0 or 100000000).", or
- "Z has a Persistence of P."

For any Z>9 also print on a new line four spaces followed by a summary of the multiplication values from Z down to a single digit as shown (with " -> " between each step.)

```
99999999 0 L: 9 has a Persistence of 0.  
77 0 N: 77 has a Persistence of 4.  
    77 -> 49 -> 36 -> 18 -> 8  
31000000 8 G: 31477889 has a Persistence of 8.  
    31477889 -> 338688 -> 27648 -> 2688 -> 768 -> 336 -> 54 -> 20 -> 0  
76 4 L: Persistence 4 does not exist between 76 and 0.  
99999992 5 G: Persistence 5 does not exist between 99999992 and 100000000.  
12345 9 G: 26888999 has a Persistence of 9.  
    26888999 -> 4478976 -> 338688 -> 27648 -> 2688 -> 768 -> 336 -> 54 -> 20 -> 0
```

Discussion

Your program must print an answer within 5 seconds for each line of input.

Be smart! Use the information above to skip searches. For example, the last line in the Input above asks for P=9 above 12345; but you don't have to calculate millions of options since the table gives it to you.

The datasets are constructed such that needed searches will finish within 1,000,000 of N.

See the student datasets for other examples of searches to skip.

28 years of CodeWars archives can create quite a cleanup job for the bots in the basement.

Each room in the basement has collected its own pile of data. Each day we drop the bot at a different location and tell it to find the basement's exit room in the shortest time, shredding boxes of old data as it goes.

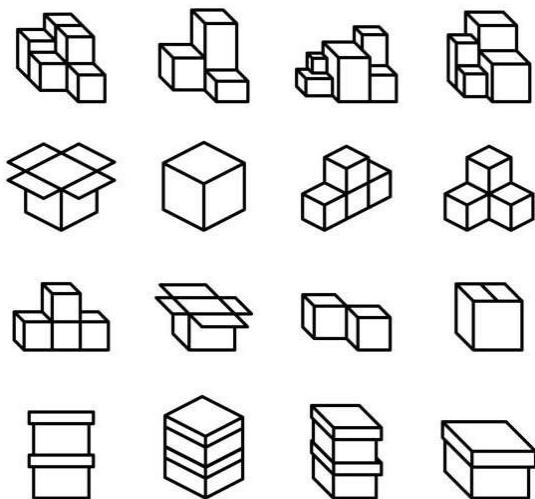
The amount of data in each room directly affects how long it takes to enter the room. The bot knows the amount of clutter for each room, and has very basic instructions on how to pick a path with the shortest time. For each map provided, find its path.

Input

The first line of input is two integers separated by a space, the height (H , max 10) and width (W , max 20) of the room. Each of the next H lines has W characters showing the map.

Each room is marked, with '*' for the START, '@' for the FINISH, '#' for a wall (a blocked room), or a label for the number of seconds it takes to clear and enter the room: 1-9,A-Z. A=10, Z=35. It takes 1 second to enter the FINISH room.

```
6 10          4 5
1111441111  11111
1P112#1321  12224
2292121811  *353@
22#1##T211  12341
23*Z@11311
111Y111111
```



Output

Print the time of the fastest path in seconds, then reprint the solved grid showing only start '*', finish '@', walls '#', and the solution path. All other squares should be replaced with a period '.'.

Remember to include 1 second for entering the final square. At every intersection where multiple paths have the same time, prioritize Down before Right before Up before Left. For example, if paths Right and Up have the same total time to the finish, choose Right. This may lead to a longer distance, but it's the same time, and distance doesn't matter.

```
36 seconds      11 seconds
111.....      .....
1..11.#132.    1222.
2..2121.1.    *...3@.
2.#.##..1.    .....
3.*.@11.1.    ...
111...111.
```

Discussion

In the first example above, moving only 2 squares to the right is also a time of 36 seconds ($Z+1$). Since they're the same time, the bot prioritizes the path going Down over the path going Right.

In the second example, the path through the top '1' rooms is also 11 seconds, but Right is prioritized before Up, so the bot makes a right turn to the 2.

Cookies are for closers!

Your company needs to report this quarter's numbers to the shareholders, and your company needs to highlight a win.

Help find this quarter's most valuable customer driving profits, or the most valuable employee closing those sales!



Input

Your input file will specify a recordset you will need to search for answers on line one.

On line two you will receive the format for that comma delimited recordset using the following codes:

- DT is Date & Time
- OID is Order ID
- CID is customer ID
- EID is Employee ID
- PID is product ID
- USD is price per unit given to that customer for that product
- QTY is Quantity
- SST is Shipping status

Line three of your input will specify the file name for our customer index.

Line four will specify the file name for our employee directory.

Line five will specify which most valuable person your code needs to find. Employee or Customer.

```
Sales-2024-11-12.ord
DT,OID,CID,EID,PID,USD,QTY,SST
CompanyIndex23-34.cust
HumanResources-2024.emp
Customer
```

The company index will always list the company ID in position "zero", and the company name in position "one". The employee directory always lists employees as follows: EID, NameFirst, NameLast

Note that all of the files listed are text files, even if they do not end with a ".txt" file extension.

Output

Output the ID of the "most valuable" person/company found.

Output the name of the person or company associated with the ID (as per your input).

Output the total dollar amount found associated with the "most valuable" person or company (there will not be any ties).

Output all of the orders (one per line) matching the person you found using the following format: OID: 123, CID: 123, EID: 123, PID: ABC for QTY at \$USD

```
674043
Shining Ferret Investment
96531955.54
OID: 483178, CID: 674043, EID: 865166, PID: J955AAS for 464 at $44441.22
OID: 378863, CID: 674043, EID: 138551, PID: J1234 for 104 at $123.45
OID: 125802, CID: 674043, EID: 134424, PID: J9876543 for 197 at $100.0
OID: 544584, CID: 674043, EID: 469429, PID: J1234 for 570 at $123.45
OID: 921050, CID: 674043, EID: 629429, PID: S772B123 for 286 at $8765.44
OID: 404675, CID: 674043, EID: 87546, PID: J955AAS for 724 at $44441.22
OID: 898293, CID: 674043, EID: 813503, PID: J9876543 for 578 at $100.0
OID: 110404, CID: 674043, EID: 301699, PID: J77442211 for 800 at $555.55
OID: 792117, CID: 674043, EID: 847758, PID: J955AAS for 912 at $44441.22
OID: 29067, CID: 674043, EID: 603606, PID: J77442211 for 168 at $555.55
```

Discussion

Your calculated total for the "most valuable" person/company must be accurate to +/- \$0.09. **Do not round.** Truncate/cut more than 2 decimal places (if needed).

A "most valuable" customer would be the customer which has ordered the largest dollar amount of products. E.G. a customer who ordered one product which costs one million dollars would be more "valuable" than a customer who ordered nine hundred of a product that costs ten dollars.

A "most valuable" employee would be the sales representative employee who was credited for the largest dollar amount of products in sales (which could be spread across multiple customers). You will need to look up employee names in the employee directory. You will need to look up company names in the customer index.

Note many of the files in use by the company use utf-8 encoding. If you do not handle the encodings properly, a name like José Delacruz can show as something like Jos   Delacruz -- and that will be counted as **incorrect** by the judges.

For CodeWars 28, you'll notice a few of the instruction pages need ... well, more instructions. So, while you have the input and output datasets, you'll need to determine how to get from one to the other.

For this one, the instructions are simply ... hidden. If you look in the right place, you'll find them.



Input

There is one line of input, which can have letters, numbers, punctuation and spaces.

This is CodeWars 28! We know you can find what you need!

Output

The output will be a single integer. How to determine that integer ... is for you to find.

308

Discussion

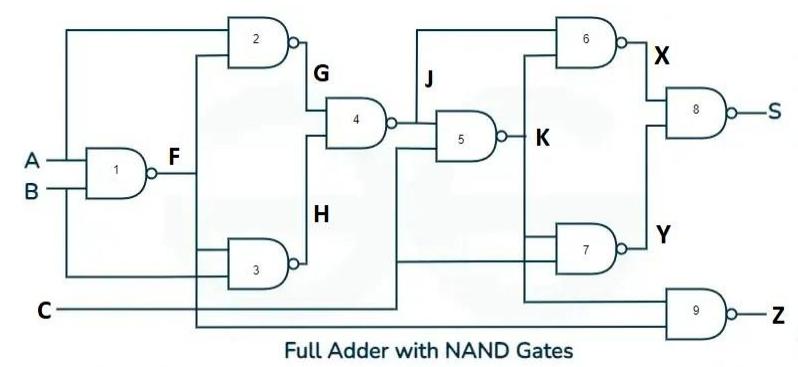
Have you run all prior datasets?

Additional Examples

Input 2	Output 2
A 1 B 2 C 3 D 4 E 5 F 6 G 7 H 8 I 9 J 10 K 11 L 12 M 13 N 14 O 15 P 16	644
Input 3	Output 3
You might guess. Hmm. Chances aren't good. Guessing might find 308, but what about 644?	1232

Ken needs to build a Full Adder for his circuit, but all he has currently are blueprints for a two-bit NAND gate. A NAND gate, as shown, takes two inputs (A,B) and has one output (X). Its truth table is also given. A truth table shows what the outputs should be for each input configuration. Two bits have 4 possible input configurations. As can be seen from the truth table, a NAND gate's output is 1 as long as A and B are not both 1.

The Full Adder Ken needs to build adds three bits: two inputs and a carry-in bit (A,B,C). The Full Adder has two outputs: a sum and a carry-out bit (S,Z). A Full Adder is used to add two bits while carrying in from a previous operation and carrying out to the next operation. They can be chained together to add multi-bit values of any size.



$$X = \overline{A} \cdot \overline{B}$$



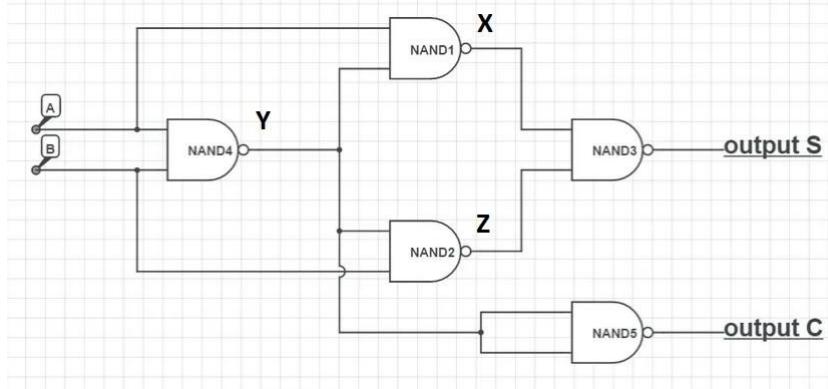
A	B	X
0	0	1
0	1	1
1	0	1
1	1	0

NAND gates are considered a universal gate since all digital logic can be derived from them. Logic derived from NAND gates is called NAND logic. Here we have provided the circuit diagram that Ken came up with to implement his full adder. You can find the truth table for this circuit in the student datasets. Help Ken turn his circuit diagram with NAND logic into a program that turns a series of NAND operations into a truth table. This will help him verify that he designed the full adder circuit correctly.

Input

The first 5 lines provide: Title; Inputs; Intermediate Signals; Outputs; and Number (N) of NAND Gates.

If there are no Intermediate Signals, that line will be blank. The last N lines provide the output and the two inputs for each of the NAND Gates. Signals are noted as single capital letters, separated by single spaces. Two examples follow. The first is a single NAND Gate, and the other is a Half Adder. A Half Adder adds only two bits: (A,B). It has two outputs: Sum (S) and Carry (C).



NAND Gate	Half Adder
A B	B A
X	Y X Z
1	C S
X A B	5

Y A B	
X Y A	
Z Y B	
C Y Y	
S X Z	

Output

First print the title. On the next line, print the labels for the Inputs, Intermediate Signals and Outputs in the order provided in the Input file. Separate each letter with a space, and each section with a colon (:). If there are no Intermediate Signals, just print the Outputs. Determine all values by iterating over the Inputs. The Inputs should count up in binary, line by line. On each line, print the values for the Inputs, Intermediate Signals, and Outputs, separated by spaces and colons as in the line of labels. Refer to the examples below.

NAND Gate	Half Adder
A B : X	B A : Y X Z : C S
0 0 : 1	0 0 : 1 1 1 : 0 0
0 1 : 1	0 1 : 1 0 1 : 0 1
1 0 : 1	1 0 : 1 1 0 : 0 1
1 1 : 0	1 1 : 0 1 1 : 1 0

Discussion

There will up to 4 Inputs, and up to 25 NAND Gates (total Intermediate Signal and Outputs). All 26 capital letters may be used. Output signals may be used as inputs to a following NAND Gate. The order of the NAND gates in the Input is the order in which your program should process them.

NAND Background Info

NAND gates are a good way to build up digital circuits using truth tables, which makes them an effective teaching tool. However, transistors are the more authentic building blocks of digital circuits as they model the physical properties of the circuit much more precisely. There are different kinds of transistors but the most common are MOSFET transistors. MOSFET transistors can be thought of as a switch. There are two kinds of MOSFET transistors, NMOS and PMOS. In an NMOS transistor, the switch is closed if you input 1 and is open if you input 0. In a PMOS transistor, the switch is closed if you input 0 and is open if you input 1.

Most MOSFET circuits use a CMOS layout. A CMOS layout is a parallel layout that ensures the output of a circuit is either connected to the ground (bit=0) or connected to the voltage source (bit=1). Using NMOS to connect the ground and PMOS to connect the voltage source is the parallel aspect that ensures you are not connecting your voltage source to the ground (this is called shorting a circuit which is bad). Think of this like when you accidentally breathe in your saliva. Either your mouth should be breathing or swallowing. If it does both, you are doing something wrong. Your larynx is in charge of protecting your lungs from the stuff you were meant to eat. The CMOS layout protects you from connecting your voltage source to ground.

The most simple CMOS circuit is an inverter. Here the parallel layout is very apparent. There is a NMOS on the bottom and a PMOS on top (indicated by the circle on the input). In the case Vin is 0, the PMOS switch closes and the NMOS switch opens. The voltage source saturates the Vout to be 1. In the case Vin is 1, the PMOS switch opens and the NMOS switch closes. The ground saturates the Vout to be 0.

You're given a dictionary file words.txt. This is a dictionary from competitive Scrabble tournaments, there are nearly 200,000 words and lots of them are obscure. Your job is to read in all those words and then search a square letter grid from size 2x2 to size 10x10 for all the unique words of at least three letters from the dictionary that you can find in the grid. With 200,000 words and up to 100 starting points in the 10x10 grid, you'll need to be efficient with how you search. When forming a word you can use each letter in the grid only once and the letters must be vertically, horizontally, or diagonally adjacent. Print out the number of unique words followed by the list of words sorted alphabetically.

Input

The first line of input will be an integer which is the dimension of the letter grid. The following lines will be a grid of capital letters.



```
2
CO
DE
```

Output

Print out the number of unique words that are at least three letters long found in the dictionary file words.txt, followed by the list of words sorted in alphabetical order

```
8
COD
CODE
COED
DECO
DOC
DOE
ECO
ODE
```

Discussion

This is a more challenging problem than a straightforward word search. You'll need to be very efficient in how you generate all the possible words and how you check against the words in the dictionary. If you try to generate all the words and then check against the whole dictionary against each word, then your code won't be able to handle anything beyond the smallest grid sizes.

Be sure to run your solution against **all** of the student data sets.

Additional Examples

Input 2	Output 2
2 WA SR	8 ARS RAS RAW RAWS SAW WAR WARS WAS

INCOMING TRANSMISSION

--epeat, this is Commander Jaina with Forward Recon Unit --nder attack *--ay again, under attack!

We cannot hold this position much longer. I am sending the intel we have on this new enem-- we --ust find a way to counter their EW capabilities!

Binary based ASCII encoding didn't even slow the things down. Going to try next lev*--

-- am ordering all remaining elements of my task force to Zeta sector. Tell Admiral Anderson --rry. We held as long as we *--

**TRANSMISSION LOST**

A copy of this message has been saved to your command files

Input

```
10022,11010,11100 11102,10220,11000,11000 11020,10202,10200,10202,10220,11101,10202  
11022,11102,11010 11000,10220,11002,10202,11021 11010,10210 10220,11002,11011,11100,11022,1201  
10010,10212,10202 10210,10220,11020,11021,11022 11000,10220,11002,10202 11102,10220,11000,11000  
10122,10202 11022,10202,11110,11022 11022,11010 10200,11010,11002,11101,10202,11020,11022  
10220,11002,11022,11010 10202,11002,10200,11010,10201,10202,10201 2102,10002,2111,2201,2201,1201  
10010,10212,10202 11021,10202,10200,11010,11002,10201 11000,10220,11002,10202  
11102,10220,11000,11000 10122,10202 11022,10212,10202 10122,10121,11021,10202 11022,11010  
11100,11021,10202 11022,11010 10200,11010,11002,11101,10202,11022 11022,10212,10202  
11022,10202,11110,11022,1201
```

```
2201,11022 10220,11021 10121 11011,10202,11020,10220,11010,10201 11010,10210  
10200,10220,11101,10220,11000 11102,10121,11020,1201 10001,10202,10122,10202,11000  
11021,11011,10121,10200,10202,11021,10212,10220,11011,11021,1122  
11021,11022,11020,10220,10222,10220,11002,10211 10210,11020,11010,11001 10121  
10212,10220,10201,10201,10202,11002 10122,10121,11021,10202,1122  
10212,10121,11101,10202 11102,11010,11002 11022,10212,10202,10220,11020  
10210,10220,11020,11021,11022 11101,10220,10200,11022,11010,11020,11111  
10121,10211,10121,10220,11002,11021,11022 11022,10212,10202 10202,11101,10220,11000  
2122,10121,11000,10121,10200,11022,10220,10200 2120,11001,11011,10220,11020,10202,1201  
2002
```

Output

2221,11100,11022,11011,11100,11022 11022,10212,10202 10202,11002,10200,11010,10201,10202,10201
2102,10002,2111,2201,2201,1201

```
1211,1211,1211,1122,1211,2000,1221 1211,1222,1211,1122,1211,2000,1220 1211,1221,1211  
1211,2000,1210,1122,1211,1221,1222,1122,1211,2000,1212,1122,1211,1222,1211,1122,1211,12  
22,2001,1122,1211,1221,1221 1211,1222,2001,1122,1211,1221,2000  
1211,1221,1220,1122,1211,1222,1211,1122,1211,2000,2000,1122,1211,1222,1211,1122,1211,12  
22,1221 1211,2000,2001,1122,1211,1221,1211,1122,1211,2000,1212,1122,1222,2000  
1211,1212,1212,1122,1211,1221,1222,1122,1211,1221,1212,1122,1211,1221,1222,1122,1211,12  
22,1221  
1211,2000,1220,1122,1211,2000,1210,1122,1211,1221,1211,1122,1211,1221,1220,1122,1211,12  
21,1222,1122,1211,2000,1220,1122,1211,1222,1210,1122,1211,1222,1211,1122,1211,2000,1210  
,1122,1211,2000,1220,1122,1222,1221  
1211,2000,1220,1122,1211,2000,1221,1122,1211,2000,1212,1122,1211,1222,1211,1122,1211,12  
22,1220,1122,1211,1222,1211,1122,1211,2000,1122,1211,1221,2001  
1211,1221,2000,1122,1211,2000,1212,1122,1211,1222,2001,1122,1211,1222,1222  
1211,1221,1211  
1211,1222,1210,1122,1211,1222,1211,1122,1211,1221,1122,1211,1221,1221,1122,1211,12  
21,1222,1122,1211,1222,2000  
1211,1221,1212,1122,1211,1221,1211,1122,1211,2000,1220,1122,1211,1221,1222,1122,1222,12  
21 1211,1222,1210,1122,1211,1221,1211,1122,1211,2000,2000,1122,1211,1221,1222  
1211,2000,2001,1122,1211,1222,2001,1122,1211,1222,2000  
1211,2000,1221,1122,1211,1222,1210,1122,1211,1221,1222,1122,1211,1222,1211,1122,1211,20  
00,1212  
1211,1221,2000,1122,1211,1222,1211,1122,1211,2000,1212,1122,1211,2000,1220,1122,1211,20  
00,1221  
1211,2000,2000,1122,1211,1222,1211,1122,1211,1221,1220,1122,1211,2000,1221,1122,1211,12  
22,2001,1122,1211,2000,1212,1122,1211,2001,1211  
1211,1221,1211,1122,1211,1221,2001,1122,1211,1221,1211,1122,1211,1222,1211,1122,1211,12  
22,2000,1122,1211,2000,1220,1122,1211,2000,1221  
1211,2000,1221,1122,1211,1222,1210,1122,1211,1221,1222  
1211,1221,1222,1122,1211,2000,2000,1122,1211,1222,1211,1122,1211,1222,1221  
1211,1210,2001,1122,1211,1221,1211,1122,1211,1222,1221,1122,1211,1221,1211,1122,1211,12  
21,1220,1122,1211,2000,1221,1122,1211,1222,1211,1122,1211,1221,1221,1122  
1211,1210,1222,1122,1211,1222,1122,1211,2000,1210,1122,1211,1222,1211,1122,1211,1221,20  
00,1212,1122,1211,1221,1222,1122,1222,2000
```

Discussion

2112,11010 11002,11010,11022 10200,11010,11002,11101,10202,11020,11022
11021,11011,10121,10200,10202,11021,1122 11000,10202,10121,11101,10202
11021,11011,10121,10200,10202,11021 10121,11021 11021,11011,10121,10200,10202,11021,1201
10002,10202,11011,10121,11020,10121,11022,10202 10202,10121,10200,10212
10202,11002,10200,11010,10201,10202,10201 10200,10212,10121,11020,10121,10200,11022,10202,11020
11102,10220,11022,10212 10121 10200,11010,11001,11001,10121 11022,11010 11001,10121,10222,10202
10201,10202,10200,11010,10201,10220,11002,10211 10202,10121,11021,10220,10202,11020,1201