

Island Hopping (30 points)

You are given a 2D grid where each cell represents a piece of land ('L') or water ('W'). An island is a group of connected land cells ('L'). Cells are considered connected if they are horizontally, vertically, or diagonally adjacent.

Write a program that reads the grid from standard input and outputs the number of islands.

Input:

The first line contains two integers, n and m , which represent the number of rows and columns in the grid, respectively.

The next n lines each contain a string of m characters where each character is either 'L' (land) or 'W' (water).

Output:

Output a single integer representing the number of islands.

Examples:

Input:

```
4 5
LWWLL
WLLWW
WWWWW
LLWWW
```

Output:

```
2
```

Input:

```
3 4
LLLL
LLLL
LLLL
```

Output:

```
1
```

Wordle Guesser (10 points)

Create a Wordle guess validator. In the game of Wordle, players try to guess a hidden 5-letter word. Each guess provides feedback in the form of colored indicators:

A green indicator means the letter is in the correct position.

A yellow indicator means the letter is in the word but in the wrong position.

A gray indicator means the letter is not in the word at all.

Given the hidden word and a series of guesses, you need to determine the feedback for each guess.

Input:

The first line contains a single string representing the hidden word. This string will always be a 5-letter lowercase alphabetic string.

The second line contains an integer N representing the number of guesses.

The following N lines each contain a single string representing a guess. Each guess will also be a 5-letter lowercase alphabetic string.

Output:

For each guess, output a string of length 5 where each character corresponds to the feedback for the respective letter in the guess:

'G' for green (correct position),

'Y' for yellow (wrong position but correct letter),

'X' for gray (letter not in the word).

Example:

Input:

apple

3

apply

piano

grape

Output:

GGGGX

YXYXX

XXYYG

Vigenere Cipher (15 points)

Vigenere Cipher is a method of encrypting alphabetic text. Below is the Vigenere square:

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
A	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
B	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A
C	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B
D	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C
E	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D
F	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E
G	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F
H	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G
I	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H
J	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I
K	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J
L	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K
M	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L
N	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M
O	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N
P	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
Q	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
R	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
S	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
T	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
U	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
V	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
W	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
X	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
Y	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
Z	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y

An encryption key will be entered followed by a line of text to be encrypted. Each combination of text character and key character provides the row, column index value into the Vigenere square. For example, assume the text to encode is “no pets” and the key is “dog”. The first letter of the encrypted text is located at [d][n] or q from the square above. The remaining letters in the encrypted text are listed below:

- [o][o] → c
- [g][p] → v
- [d][e] → h
- [o][t] → h
- [g][s] → y

Input

Each test case will consist of two lines. The first line will represent the encryption key. The key will have at least one letter and will not have any spaces. The second line will represent the text to be encrypted. The text will only contain lower case letters and spaces.

Output

For each test case, output the encrypted text.

Examples

Input:

dog

no pets

Output:

qc vhhv

Input:

ctis

programming builds character

Output:

rkwyttuekgo twbtvu vpsttklgk

Hailstone Sequence (5 points)

A hailstone sequence is a calculation of numbers that increase and decrease but eventually settles into a repeating pattern of the numbers 4, 2, 1. The sequence is generated by starting with any positive whole number greater than zero and completing the following steps:

If the number is even, divide it by 2 to calculate a new number

If the number is odd, multiply it by 3 and add 1 to calculate a new number

Repeat the above process for calculated numbers until the sequence 4, 2, 1 is generated.

For example, the hailstone sequence for the number 3 is:

10, 5, 16, 8, 4, 2, 1, 4, 2, 1, 4, 2, 1, . . .

Since the pattern 4, 2, 1 repeats endlessly, the hailstone sequence in our problem will be considered complete when the formula calculates the number 1 the first time.

Input

Each test case will consist of one whole number greater than zero.

Output

For each test case, when the number calculated is equal to 1, output the number of iterations.

Examples

Input:

3

132

1599

Output:

7

28

73

Currency Conversion (10 points)

DigiKey accepts orders worldwide in 26 different currencies. This provides customers with the comfort of purchasing products using their local currency, if they so choose. Because DigiKey's global headquarters are located in Thief River Falls, MN, USA (where you are right now!), our accounting department needs to report sales in the US Dollar currency (USD) to determine annual revenue. They are requesting your help in creating a conversion program they can use to input an order's details and output the properly formatted USD value of the order.

The accounting department has provided you with a conversion table you can use to construct your program (see below).

Input

Each test case will consist of x number of line items where $0 < x < 100$ in the format "A – B – C" where A is an alphanumeric string representing the part number, B is an integer representing the quantity ordered, and C is a decimal representing the unit price. These line items are followed by input indicating the tax collected on the order "Tax: 1.21", a shipping charge "Shipping: 20.00", and the 3-character code indicating the currency used when placing the order.

Output

For each test case, output should be a single line containing the USD equivalent of the order total. USD values should contain a leading dollar sign and rounded to the nearest hundredth of a cent.

Currency	\$1.00 USD Equivalent
CAD	1.38
EUR	0.92
ZAR	18.17
CNY	7.27
HKD	7.81
INR	83.68
JPY	157.08
MYR	4.69
PHP	58.42
SGD	1.35
KRW	1387.75
TWD	32.83
THB	36.30
AUD	1.51
NZD	1.67
CZK	23.20

DKK	6.85
HUF	357.77
NOK	10.96
PLN	3.93
RON	4.57
SEK	10.73
CHF	0.89
GBP	0.77
ILS	3.63

Examples:

Input:
XYZ123 – 4 – 3.50
Tax: 1.21
Shipping: 20.00
EUR
987ABCDEF – 1 – 151.45
ASD456 – 50 – 0.49
Tax: 13.59
Shipping: 18.00
AUD

Output:
\$38.27
\$137.44

Digital Printout (20 points)

Write a program that reads in a digital number printout and outputs the numbers represented. Each test case will have 3 lines of input. There will be between 1 and 10 digits presented, so between 3 and 30 characters per line.

Input

There are 10 test cases.

Output

Each output should be the numbers represented by the test case.

Examples:

Input:

```
  _  _  _  _  |  |  _  
| | | | | | | |  
| | | | | | | |
```

```
  _  _  _  
| | | | |  
| | | | |
```

Output:

543210

089

Order of Operations Parser (30 points)

In mathematics and computer programming, the order of operations (or operator precedence) is a collection of rules that reflect conventions about which procedures to perform first to evaluate a given mathematical expression.

While computers tend to help us with these operations automatically, it is sometimes necessary to evaluate these expressions by hand, which is where PEMDAS can be useful.

PEMDAS is an acronym for the words parenthesis, exponents, multiplication, division, addition, subtraction. Given two or more operations in a single expression, the order of the letters in PEMDAS tells you what to calculate first, second, third and so on, until the calculation is complete.

For this problem, you will be given an expression that must be parsed in the proper order and the solution found.

An example would be the following string.

$$(2 + 3) * 3 - 5 + 10 / 2 = X$$

You must write a program to solve for X.

$$5 * 3 - 5 + 5$$

$$15 - 5 + 5 = 15$$

$$X = 15$$

Input

The input for this problem will consist of 10 test cases. Each case will have one equation which must be parsed and the final answer output in the form of the character being solved for, followed by an equal's sign "=" with a space on either side, and then the value. Such as "X = 15", or "Y = 23", and so forth. The character will be placed in the equation and must be located. Note that there may be operators on both sides of the equals sign, but you will only be solving for one character at a time.

Examples:

Input:

$$(2 + 3) * 3 - 5 + 10 / 2 = X$$

$$b + 5 = 20 - (3 + 7) / 2 - 10$$

Output:

$$X = 15$$

$$b = 0$$

Secret Message Encoder (10 points)

Objective:

Create a program that encodes a secret message using a custom encryption method.

Description:

Imagine you are a secret agent and you need to send encoded messages to your partner. Your task is to write a program that encodes a message by shifting each letter in the message by a certain number of positions in the alphabet. This is similar to the Caesar cipher but with a twist: the shift amount will vary for each letter based on its position in the message.

Encoding Rules:

For the first letter, shift it by 1 position.

For the second letter, shift it by 2 positions.

For the third letter, shift it by 3 positions.

Continue this pattern for the entire message.

Assume the alphabet is written in the standard order.

Always shift from left to right.

If the shift goes beyond the end of the alphabet, start back at the beginning. (Z shifted 1 position is A)

Requirements:

The program should preserve the case of the letters.

Non-letter characters should remain unchanged.

The program should be able to handle both upper-case and lower-case letters.

Example:

Input:

HELLO

Output:

IGOPT

Magic Square Validation (10 points)

Objective:

Write a program that checks if a given square matrix is a magic square.

Description:

A magic square is a grid of numbers where the sums of the numbers in each row, each column, and both main diagonals are the same. Your task is to write a function that determines whether a given square matrix is a magic square.

Input:

The input file will contain a square matrix. The size of the square matrix can vary up to 20x20. The columns within the matrix will be separated by a comma. The rows of the matrix will be separated by lines.

Output:

If the matrix is a magic square, output the sum of a row, column, or diagonal. If the matrix isn't a magic square, output 0.

Examples:

Input:

16,3,2,13
5,10,11,8
9,6,7,12
4,15,14,1

Output:

34

Input:

8,1,6
3,5,8
4,9,2

Output:

0

True Shooting Percentage (5 points)

In basketball, True Shooting Percentage (TS%) is a metric used for tracking shooting efficiency. The formula for calculating TS% is as follows: $TS\% = PTS / (2 * TSA)$. Where PTS is the number of points that the player scored and TSA is the player's True Shooting Attempts. The formula for calculating TSA is as follows: $TSA = FGA + 0.44 * FTA$. Where FGA and FTA are the number of field goals and free throws attempted by the player.

Given PTS, FGA, and FTA for a player, write a program that calculates the True Shooting Percentage for that player.

Input

Each test case will consist of three integers representing PTS, FGA, and FTA respectively.

Output

For each test case, output the TS% for the given statistics. TS% should be converted to a percentage, include a trailing percent sign, and be rounded to the nearest tenth of a percent.

Examples

Input:

1822 1269 404

1654 1492 460

Output:

63.0%

48.8%

Alphabetical Digits (10 points)

The number factory in your hometown is looking for a fresh way to sort their numbers. They are sick and tired of sorting numerically, so they have tasked you with writing an algorithm for sorting their numbers alphabetically using the English spelling of the numbers' digits.

Input

Each test case will consist of a string of digits.

Output

For each test case output the string of digits in alphabetical order based on the English spelling of each digit.

Examples

Input:

12345

8675309

Output:

54132

8597630

Farkle (25 points)

Farkle is a dice game played by two or more players, with each player in succession having a turn at throwing the dice. At the beginning of each turn, the player throws all six dice at once. After each throw, one or more scoring dice must be set aside (see Farkle Scoring below). The player may then either end their turn and bank the score accumulated so far or continue to throw the remaining dice. If none of the dice score in any given throw, the player has "farkled" and all points for that turn are lost. Given a particular throw during a Farkle turn and the scoring rules below, determine the highest possible score for that throw.

Farkle Scoring

A single 1 is worth 100 points

A single 5 is worth 50 points

Three of a kind is worth 100 points multiplied by the given number, e.g. three 4s are worth 400 points

Three 1s are worth 1000 points

Four of a kind is worth double the points of three of a kind, so four 4s are worth 800 points

Five of a kind is worth double the points of four of a kind, so five 4s are worth 1600 points

Six of a kind is worth double the points of five of a kind, so six 4s are worth 3200 points

Full straight 1-6 is worth 1500 points

partial straight 1-5 is worth 500 points

partial straight 2-6 is worth 750 points

Input

Each test case will consist of anywhere from one to six digits ranging from 1 to 6 separated by a space representing a particular throw in a turn of Farkle.

Output

For each test case, output the highest possible score for the given throw. If none of the dice score in the throw, output farkle.

Examples:

Input:

6 3 4 2 5 1

2 6

1 1 1 1 5

Output:

1500

farkle

2050

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Examples:

Input:

6 3 4 2 5 1

2 6

1 1 1 1 5

Output:

1500

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Each test case will consist of anywhere from one to six digits ranging from 1 to 6 separated by a space representing a particular throw in a turn of Farkle.

Output

For each test case, output the highest possible score for the given throw. If none of the dice score in the throw, output farkle.

Examples:

Input:

6 3 4 2 5 1
2 6
1 1 1 1 5

Output:

1500

farkle

2050

Farkle (25 points)

Farkle is a dice game played by two or more players, with each player in succession having a turn at throwing the dice. At the beginning of each turn, the player throws all six dice at once. After each throw, one or more scoring dice must be set aside (see Farkle Scoring below). The player may then either end their turn and bank the score accumulated so far or continue to throw the remaining dice. If none of the dice score in any given throw, the player has "farkled" and all points for that turn are lost. Given a particular throw during a Farkle turn and the scoring rules below, determine the highest possible score for that throw.

Farkle Scoring

A single 1 is worth 100 points

A single 5 is worth 50 points

Three of a kind is worth 100 points multiplied by the given number, e.g. three 4s are worth 400 points

Three 1s are worth 1000 points

Four of a kind is worth double the points of three of a kind, so four 4s are worth 800 points

Five of a kind is worth double the points of four of a kind, so five 4s are worth 1600 points

Six of a kind is worth double the points of five of a kind, so six 4s are worth 3200 points

Full straight 1-6 is worth 1500 points

partial straight 1-5 is worth 500 points

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2 6

1 1 1 1 5

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Reading Zigzags (10 points)

The phrase “DIGIKEYISHIRING” is printed below in a zigzag pattern across 3 rows.

D		K		S		I
I	I	E	I	H	R	N
G		Y		I		G

When read left to right and top to bottom, the phrase becomes “DKSIIIEIHRNGYIG”. Write a program that takes in a string and an integer indicating the number of rows the phrase will be zigzagged across. Then output what the new phrase would be when read from left to right and top to bottom.

Input

Each test case will consist of one string of characters and one integer.

Output

For each test case, output the string read from left to right and then top to bottom.

Examples

Input:

DIGIKEYISHIRING 3

DIGIKEYISHIRING 4

Output:

DKSIIIEIHRNGYIG

DYIIEIRNGKSIGIH

Mean of Prime Pairs (20 points)

Given a number N , find the total number of prime pairs (x, y) , $x < y$ for which N is the mean. For example, the number 10 is the mean of the pairs $(7, 13)$ and $(3, 17)$ for a total of 2 pairs.

Input:

Each test case will consist of a single positive integer N , on its own line. The number N will not exceed 100000. There will be multiple test cases per test.

Output:

For each test case, output the number of prime pairs for which N is the mean.

Examples:

Input:

10

25

Output:

2

4

Factorials Cubed (15 points)

Given a non-negative integer N , determine the last non-zero digit of $(N!)^3$.

Input:

Each test case will consist of a single number N where $0 \leq N \leq 1000000$, on its own line. There will be multiple test cases per test.

Output:

For each test case, output the last non-zero digit of $(N!)^3$, on its own line.

Examples:

Input:

7

8

Output:

4

8