PLU February 2016 Programming Contest

Novice Problems

I. General Notes

1. Do the problems in any order you like. They do not have to be done in order from 1 to 12.

2. Problems will have either no input or will read input from standard input (stdin, cin, System.in -- the keyboard). All output should be to standard output (the monitor).

3. All input is as specified in the problem. Unless specified by the problem, integer inputs will not have leading zeros.

4. Your program should not print extraneous output. Follow the form exactly as given in the problem.

II. Names of Problems

Number	Name
Problem 1	Absolutely
Problem 2	C3PO
Problem 3	Decoder
Problem 4	Droid Expenses
Problem 5	Episodes
Problem 6	Escape
Problem 7	Pilot Rating
Problem 8	Rhonda
Problem 9	Semmy
Problem 10	Total Count
Problem 11	Triangle
Problem 12	V for Vendetta

1. Absolutely

We will call the distance between any two values on the number line the **absolute line distance**. Given two values, find the **absolute line distance** and output it, rounded and formatted to one place of precision.

Input: The first line contains a single positive integer, n, indicating the number of data sets. Each data set is on a separate line and contains two values on the number line, separated by a single space.

Output: The **absolute line distance** between the two points, rounded to the nearest tenth, and print exactly one decimal digit.

Sample input:
```
3
3 5
8.1 -9
-6.4 -18.34
```

Sample output:
```
2.0
17.1
11.9
```

2. C3PO

C3PO is in trouble. To escape his current predicament you must broadcast this ASCII picture to the Resistance.

Input: None

Output: ASCII picture exactly has shown below. Each eye is the lowercase letter 'o'.

.

Sample output:

```
    /~\
   ( oo|
   _\=/_
  /     \
 //|/"\|\\
 || |\"/|  ||
 ++++++++++
```

3. Decoder

All the First Order messages are sent using an encryption scheme. You have cracked their code and must write a program to decode their messages. Their code works as follows. The table below is used to replace all of the vowels in the original message (plaintext) with a different vowel to create the encrypted message.

Original	a	e	i	o	u	y
Replacement	y	a	e	i	o	u

Input: A positive integer, n, on the first line. After the first line there will be n lines of encrypted text.

Output: The n lines of decoded text.

Sample input:
```
4
Wa most fend ynd dastriu Loka
Skuwylkar, bafira ha bacimas
ynithar Ibe-Wyn.
- Kuli Ran
```

Sample output:
```
We must find and destroy Luke
Skywalker, before he becomes
another Obi-Wan.
- Kylo Ren
```

4. Droid Expenses

It's your job calculate the cost of replacing damaged battle droids. The cost of equipment and parts is given in the table below.

Blast Rifle	$350.34
Visual Sensors	$230.90
Auditory Sensors	$190.55
Arms	$125.30
Legs	$180.90

Input: A positive integer, n, on the first line indicating the number of data sets to follow. Each data set will consist of 5 positive integers separated by a space (A B C D E).
A: number of blast rifles needed
B: number of visual sensors needed
C: number of auditory sensors needed
D: number of arms needed
E: number of legs needed

Output: For each data set print the total cost of replacing damaged battle droids formatted to two decimal places and preceded by a dollar sign.

Sample Input:
```
3
20 10 14 3 9
19 17 12 8 10
11 9 8 22 33
```

Sample Output:
```
$13987.50
$15679.76
$16182.54
```

5. Episodes

It is difficult to keep all the Star Wars episodes straight. It is your job to print the table below that list the episode number, episode title, and the release date.

Input: None

Output: A well formatted table exactly as shown. Use the dash character, `'-'`, **not** the underscore `'_'`.

Sample output:
```
Episode       Episode Title       Release Date
-------  ------------------------  ------------
IV       A New Hope                    1977
V        The Empire Strikes Back       1980
VI       Return of the Jedi            1983
I        The Phantom Menace            1999
II       Attack of the Clones          2002
III      Revenge of the Sith           2005
VII      The Force Awakens             2015
```

6. Escape

You are surrounded by First Order warships and must land on a planet to escape. Your best chance is to find the closest planet. Unfortunately the navigation system has been damaged. Your job is to write a program that will find the planet that is closest to your current location. Recall that the distance between two points (x_1, y_1) and (x_2, y_2) is given by the formula

$$dist = ((x_1 - x_2)^2 + (y_1 - y_2)^2)^{1/2}$$

Input: A positive integer, n, followed by n pairs of integers (x,y). Each pair will be on a separate line and there will be a space between x and y. The first pair will be the coordinates of your current location and all subsequent pairs will be the coordinates of the planets that are near you.

Output: Coordinates of your current location, coordinates of a closest planet, and the distance to that planet rounded and formatted to two decimal places.
.

Sample input:
```
7
5 4
-80 9
100 89
67 -40
10 20
15 -5
34 0
```

Sample output:
```
5 4
15 -5
13.45
```

7. Pilot Rating

The Resistance is assigning pilots to new two-person X-wing Starfighters. General Leia has assigned you the task of putting teams together for the Red Squadron. Every pilot must be placed on exactly one 2-person team, and there are an even number of pilots. However, you would like to maintain a high skill level for each team by making sure that each of the teams has some minimum total rating. We define the total rating of a team to be the sum of the ratings of both pilots on the team.
You must determine the maximum value, X, such that you can form teams, each of which have a total rating greater than or equal to X.

Input: The first line of input contains a single positive integer n ($1 \leq 10^5$, n is even), the number of pilots who volunteered for Red Squadron. Each of the following n lines contains one single integer s_i ($1 \leq s_i \leq 106$), the rating of pilot i.

Output: Print, on a single line, the maximum value, X, such that you can form teams where every team has a total rating greater than or equal to X.

Sample input:
```
4
2
1
3
5
```

Sample output:
```
5
```

8. Rhonda

Rhonda is printing processor chips, which can be made from fabricated components inscribed onto thin layers. As she prints the chips, Rhonda stacks two or more layers together to create a final chip made up of multiple layers.

She has several unique layers that can be combined into various numbers of layers, which allows her to create a variety of chips. Each layered component is represented by a 10x10 grid of integers, with each cell containing an integer ranging from 0 to 9. The final chip is also 10x10 grid, with each cell being the sum of all the cells in that position for the layers that were used to create the chip.

For example, if Rhonda has fabricated 3 layers:

```
0123456789          1111111111          0011001100
0123456789          1111111111          1100110011
0123456789          1111111111          0011001100
0123456789          1111111111          1100110011
0123456789          1111111111          0011001100
0123456789          1111111111          1100110011
0123456789          1111111111          0011001100
0123456789          1111111111          1100110011
0123456789          1111111111          0011001100
0123456789          1111111111          1100110011
```

and decides to create a final chip that combines only the **first** and **second layers**, the resulting chip is represented by the 10x10 grid below:

```
01 02 03 04 05 06 07 08 09 10
01 02 03 04 05 06 07 08 09 10
01 02 03 04 05 06 07 08 09 10
01 02 03 04 05 06 07 08 09 10
01 02 03 04 05 06 07 08 09 10
01 02 03 04 05 06 07 08 09 10
01 02 03 04 05 06 07 08 09 10
01 02 03 04 05 06 07 08 09 10
01 02 03 04 05 06 07 08 09 10
01 02 03 04 05 06 07 08 09 10
```

Each layer is indexed by the order given (starting at zero). The data set for this chip would be:
```
0 1
```
since this chip is made by combining the first and second layer in the order given.

Input: The first line of the input will an integer, `i`, representing the number of unique layers Rhonda has fabricated. This is followed by `i` sets of `10x10` grid of integers, each followed by a new line, representing the `i` fabricated layers. The next line will be a single positive integer, n, indication the number of data sets that follow. Each data set is a list of integers, all on one line, separated by spaces, which represent the layers added to create a chip.

**Output:** A `10x10` integer grid with each of the `10x10` cells represented by 2 digits and a space, the whole grid representing the final summed chip.

Assumptions: The cell values of each individual layer will be in the range 0-9, and the cell values of the final chip combined chips will in the range 0-99. All original fabricated layers will be unique.

Sample input and output on next page.

Rhonda (continued)

Sample Input:
```
3
0101010101
0101010101
0101010101
0101010101
0101010101
0101010101
0101010101
0101010101
0101010101
0101010101

0123456789
0123456789
0123456789
0123456789
0123456789
0123456789
0123456789
0123456789
0123456789
0123456789

7386459728
3748244739
8420475820
1938475283
3847520734
5826752039
4230489329
4594890835
2188305727
4320834420

3
0 1
0 1 2
0 0 0 0 0 0 0 0 0 0
```

Sample Output:
```
00 02 02 04 04 06 06 08 08 10
00 02 02 04 04 06 06 08 08 10
00 02 02 04 04 06 06 08 08 10
00 02 02 04 04 06 06 08 08 10
00 02 02 04 04 06 06 08 08 10
00 02 02 04 04 06 06 08 08 10
00 02 02 04 04 06 06 08 08 10
00 02 02 04 04 06 06 08 08 10
00 02 02 04 04 06 06 08 08 10
00 02 02 04 04 06 06 08 08 10

07 05 10 10 08 11 15 15 10 18
03 09 06 12 06 10 10 15 11 19
08 06 04 04 08 13 11 16 10 10
01 11 05 12 08 13 11 10 16 13
03 10 06 11 09 08 06 15 11 14
05 10 04 10 11 11 08 08 11 19
04 04 05 04 08 14 15 11 10 19
04 07 11 08 12 15 06 16 11 15
02 03 10 12 07 06 11 15 10 17
04 05 04 04 12 09 10 12 10 10

00 10 00 10 00 10 00 10 00 10
00 10 00 10 00 10 00 10 00 10
00 10 00 10 00 10 00 10 00 10
00 10 00 10 00 10 00 10 00 10
00 10 00 10 00 10 00 10 00 10
00 10 00 10 00 10 00 10 00 10
00 10 00 10 00 10 00 10 00 10
00 10 00 10 00 10 00 10 00 10
00 10 00 10 00 10 00 10 00 10
00 10 00 10 00 10 00 10 00 10
```

9. Semmy

In the semaphore signaling system, two flags are held, one in each hand, with arms extended, in various positions representing the letters of the alphabet. The pattern resembles a compass rose divided into eight positions: up (U), down (D), out (O), high (H) and low (L), for each hand. The left hand signal is always read first. Additionally, six letters require a hand to be brought across the body so that both flags are on the same side. As an example the letter H has the left hand across the body and held low (AL).
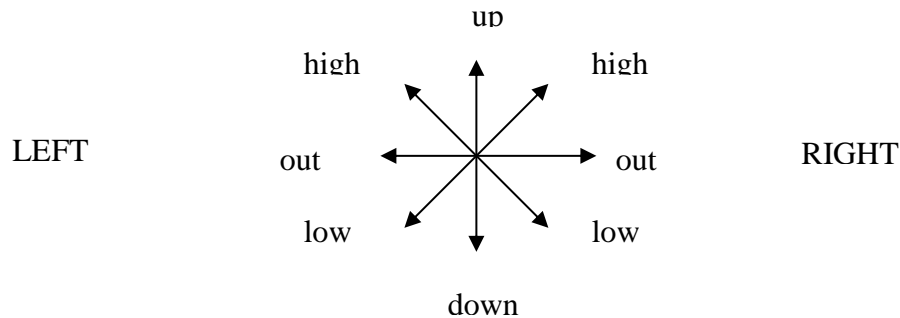
ALPHA	LEFT	RIGHT	ALPHA	LEFT	RIGHT
A	D	L	N	L	L
B	D	O	O	AH	O
C	D	H	P	U	O
D	D	U	Q	H	O
E	H	D	R	O	O
F	O	D	S	L	O
G	L	D	T	U	H
H	AL	O	U	H	H
I	AL	U	V	L	U
J	O	U	W	O	AH
K	U	L	X	L	AH
L	H	L	Y	O	H
M	O	L	Z	O	AL

Input: A data file that contains all letter/signal combinations on the first 26 lines, followed by two sets of data, each starting with an integer N. The first group contains N coded expressions that represent words or phrases, and the second group contains N English words or phrases. In the first group, a # indicates a space between words.

Output: Decode the first group of coded signal expressions into the English word or phrase, and encode the second group into the appropriate signal expression, with any spaces between words represented by the # sign.

Sample input:
```
ADL        EHD        IALU       MOL        QHO        UHH        YOH
BDO        FOD        JOU        NLL        ROO        VLU        ZOAL
CDH        GLD        KUL        OAHO       SLO        WOAH
DDU        HALO       LHL        PUO        TUH        XLAH
2
DLUOHLHHLO
HHALUHL#OOAHODHULLO
2
JAVA JIVE
FUN
```
Sample output:
```
APLUS
UIL ROCKS
OUDLLUDL#OUALULUHD
ODHHLL
```

10. Total Count

Description: Han Solo wants a count of all the enemy fighters he shot down while captain of the Millennium Falcon. The data log has a list of kills but not the totals. You job is to write a program that will read the data log and display the name of the fighter followed by the number shot down and the total number of kills.

Input: Each line of input will contain the name of the fighter that was shot down. The end of input is marked with a 0 on the last line.

Output: The name of the fighter followed immediately by a colon followed by the number shot down. There should be one blank between the colon and the number shot down. The last line of output will be the word "Grand Total" followed immediately by a colon and the grand total of all fighters shot down. There should be one blank between the colon and the grand total. The fighters should be listed in order of first occurrence.

Sample Input:
```
Tie-fighter
V-wing
Starfighter
Starfighter
Tie-fighter
Tri-fighter
V-wing
Starfighter
Tie-fighter
V-wing
Tri-fighter
V-wing
Starfighter
Tie-fighter
0
```
Sample Output:
```
Tie-fighter: 4
V-wing: 4
Starfighter: 4
Tri-fighter: 2
Grand Total: 14
```

11. Triangle

Determine if it is possible to produce two triangles of given side lengths, by cutting some rectangle with a single line segment, and freely rotating and flipping the resulting pieces.
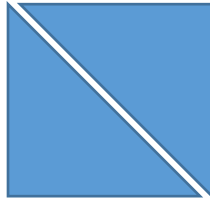
Hint: The Pythagorean Theorem states that for any right triangle $a^2+b^2=c^2$, where c is the length of the hypotenuse and a and b are the lengths of the remaining sides.

Input: The first line of input contains a positive integer n, indicating the number of problem sets. Each problem set consists of two lines. The first line contains three space-separated positive integers, indicating the desired side lengths of the first triangle. Similarly, the second line contains three space-separated positive integers, denoting the desired side lengths of the second triangle. It is not guaranteed that the side lengths produce valid right triangle. All side lengths are less than or equal to 100.

Output: For each problem set print, on a single line, whether there exists a rectangle which could have been cut to form triangles of the given side lengths. If such a rectangle exists, print YES. Otherwise, print NO.

Sample input:
```
3
3 4 5
4 3 5
3 4 6
4 6 3
39 52 65
25 60 65
```

Sample output:
```
YES
NO
NO
```

12. V for Vendetta

In the 2006 Wachowski Brothers movie thriller, starring Hugo Weaving as the main character and Natalie Portman as Evey, V is an anarchist freedom fighter who attempts to ignite a revolution against the brutal neo-fascist regime that has subjugated the dystopian United Kingdom and exterminated its opponents in concentration camps.

To commemorate V and his attempt to complete the failed mission of Guy Fawkes, an 17th century English soldier who attempted to assassinate King James I of England, but was prevented from doing so by his arrest on November 5, 1605, your job is to output the V symbol in large print, using stars to create it.

How you choose to create the output is up to you, either via brute force (fairly easy, but takes time), or some elegant and dynamic technique (more difficult, but a much better, quicker way).

Input: Several integers N, all on one line, ranging in value 2<=N<=9.

Output: A V symbol for each input value N, as shown in examples below, with no blank lines of separation between each V.

Sample input:
```
2  3  4
```

Sample output:
```
*   *
  *
*       *
  *   *
    *
*           *
  *       *
    *   *
      *
```