Bucknell University
Spring Programming Contest
Novice Division, 2015

You'll need a good Gun to fend off enemies at the next spy convention.

The convention will feature logic problems. This problem will get you ready for the convention and arm you with your gun! Read the directions to solve this puzzle. **Give your solution to one of the contest workers and they will carry it to the judges.**

Directions: Place the nine tokens (an X, an O, and a triangle each with dots, stripes, and shading) on a 3x3 grid in a pattern that matches the given clues. Each token must be used exactly once.
The clues are presented as full or partial grid sections which show where the tokens are placed. For each clue, imagine that someone took a finished solution cut away some of the squares, removed some of the tokens, and replaced some of them with the corresponding shape or color symbols. You're left with an accurate but incomplete picture of how the tokens relate to each other.

Here are the nine tokens:

There are two types of clues: Positive Clues and Negative Clues. Positive clues illustrate a pattern of symbols that WILL appear somewhere in the solution. Positive clues are placed on a light background color and are clearly marked on each puzzle. Negative clues illustrate a pattern of symbols that WILL NOT appear anywhere in the solution. Negative clues are placed on a blue background color and are clearly marked on each puzzle. The symbols in a clue indicate the relative location of a token with its given shape and background.

These symbols indicate a specific token shape but not its background.

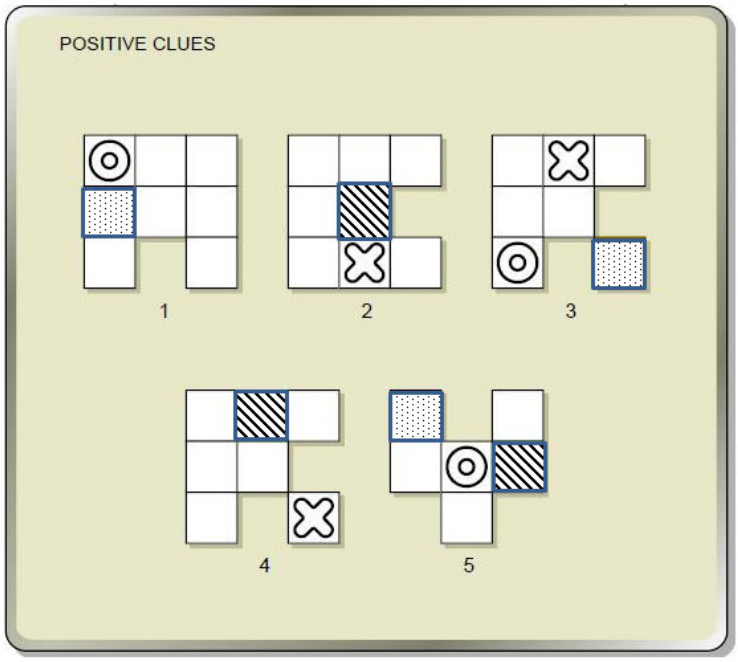
These symbols indicate a specific background but not its shape.

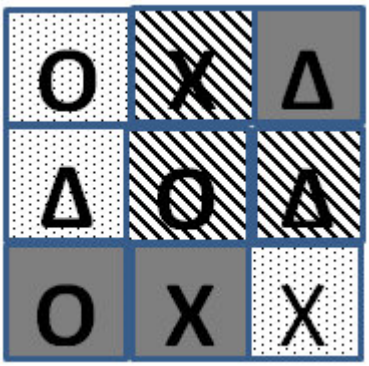
This symbol means that the clue may be rotated in any orientation.

This symbol means that the clue may be flipped over the vertical axis.

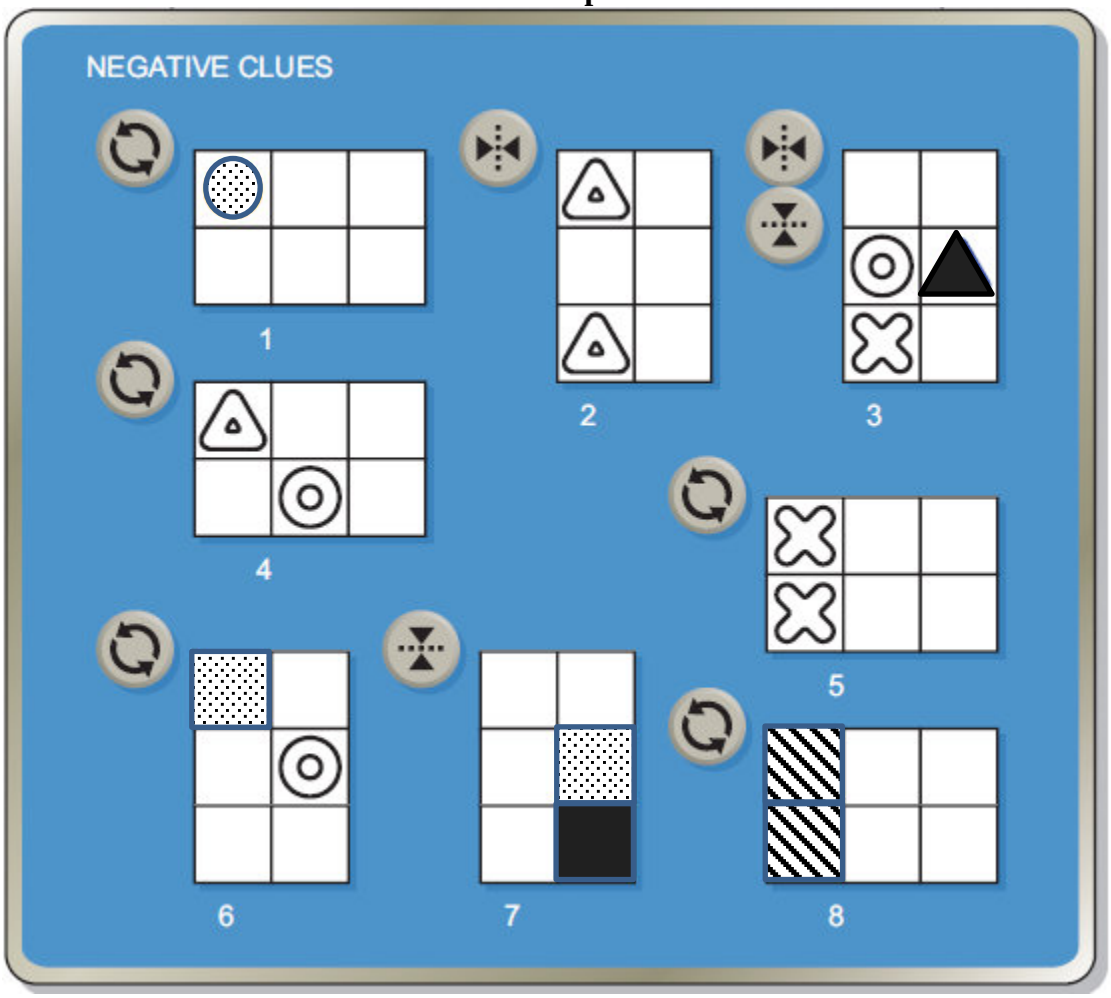
This symbol means that the clue may be flipped over the horizontal axis.

Sample puzzle and its solution





Solve this puzzle

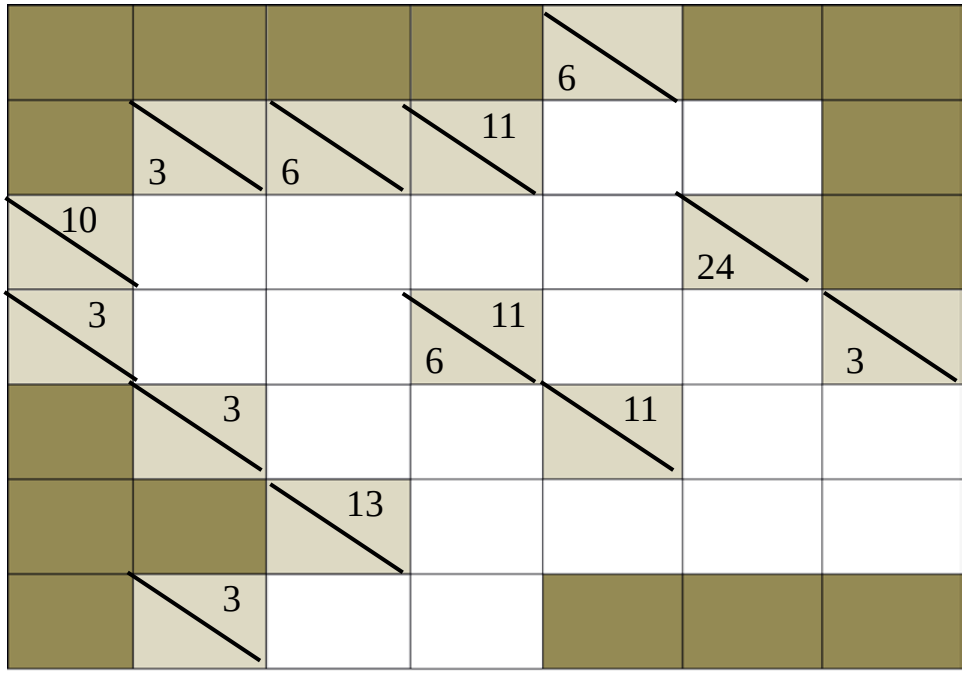


Put answers here

Hold on to your Wig!

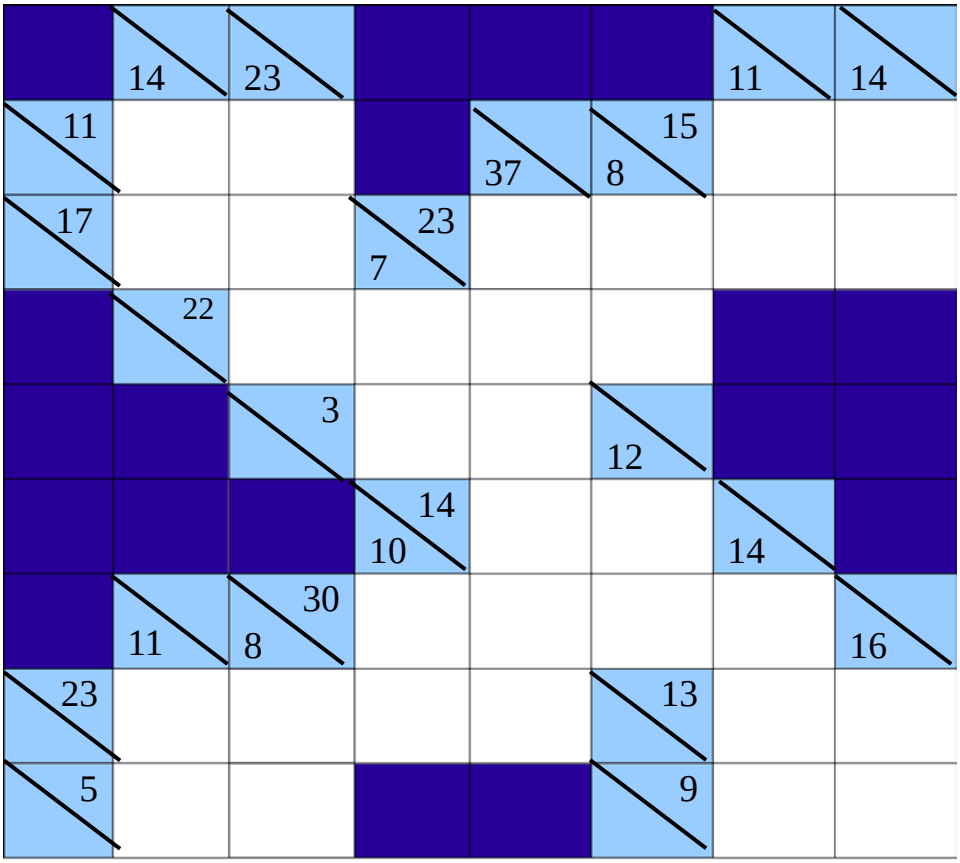
(Spying is dangerous work) Here is another puzzle to prepare you for the upcoming spy convention. Read the directions to solve this puzzle. **Give your solution to one of the contest workers and they will carry it to the judges.**

Directions: This puzzle is similar to a crossword, but instead of letters the board is filled with digits (from 1 to 9). The goal is to fill the white squares to sum up to the specified numbers. A number shown in the bottom left half of a square is sum of the squares below it. A number shown in the top right half of a square is the sum of the squares to its right. You are not allowed to use the same digit more than once to obtain a given sum. If a row or column is broken into 2 areas by a clue, then you can have the same number occurring once in each of the separate areas.
Try this simple example. The answer is given below.



				6		
	3	6	11	2	9	
10	2	3	4	1	24	
3	1	2	11 / 6	3	8	3
	3	1	2	11	9	2
		13	3	2	7	1
	3	2	1			

Here is the contest problem



Gnash your Teeth if you miss!

Name this problem Teeth.

Its Spy vs Spy day at the Spy Academy! Your Spy Ring is armed with super-soakers and the last Ring with any dry players wins the day. Your goal is to shoot other Spy Rings without hitting your own teammates.

Input

Input lines come in the form

Y_x Y_y T_x T_y S_x S_y

where Y_x Y_y are your coordinates, T_x T_y are the coordinates of your teammate, and S_x S_y are the coordinates of the other Spy Ring.

There will be several lines of input since you are attacking other Spy Rings from several different spots. The input is terminated with a line of six zeros.

Output

Print a command (*Hold* or *Fire*) for each set of coordinates. The commands need to be on separate lines. Print *Hold* if the three locations are colinear (all on the same line) and print *Fire* if the three locations are not colinear.

Sample Input

```
1 1 2 2 3 3
1 1 2 2 3 4
0 0 0 0 0 0
```

Output for Sample Input

```
Hold
Fire
```

Follow your Nose across the SpyWeb!

Name this problem Nose.

Spies always keep up with the latest technology. The Spy Academy has its own website and has recently been having troubles with people accessing the wrong links using the academy webserver.

Pages on the SpyWeb are accessed by a unique identier called a URL (Uniform Resource Locator). For example, the URL of one Spy website is http://www.orgs.bucknell.edu/acm/contest/Novice.html

There are three primary parts to a URL: protocol, host, and path. The protocol, http in this case, specifies how the file will be transfered from one computer to another. Other common protocols are ftp, gopher, and file. The host is the name of the computer on which the Web page resides. The contest pages all reside on the machine called www.orgs.bucknell.edu. Finally, the path (acm/contest/Novice.html) indicates where on the host computer the file is located.

The syntax of a URL is as follows: The protocol is the part of the URL up to the colon. The host is the part of the URL following the colon-slash-slash. It ends at a slash. The path starts after the slash ending the host. The path is optional; if it's missing, assume the path is index.html. Also, if the path ends with a slash, append index.html to it.

Links on a Web page p can be specified in one of three ways: in absolute terms, relative to the server hosting p, or relative to page p. An absolute URL starts with a protocol (e.g., http://www.cnn/). This is used to jump to any arbitrary page on the Web. For example, if this page (the one you are reading right now!) contained the link http://www.microsoft.com/, clicking on it would cause you to jump to the Microsoft home page. A relative-to-the-server URL starts with a slash (e.g., /contest/Expert.html). This says to look for the page on the same server as p. Finally, all other URLs are assumed to be relative to the page on which they reside (e.g., Expert.html refers to. http://www.orgs.bucknell.edu/acm/contest/Expert.html) The link ../engineersweek/index.html refers to http://www.orgs.bucknell.edu/engineersweek/index.html. That is, two dots indicates to go up a directory in the path. To make your life easy (see, we're nice spies!), the two dots will only appear at the start of a path. Of course, it might appear a few times (e.g., ../../ieee/index.html).

In this program, you'll be given the URL of a Web page and a link on the page, and you need to find the URL that the link will jump you to.

Input

The input will consist of 10 lines. Each line contains a URL for the current page and the link to follow.

Output

For each line of input, print the complete URL that the link will take you to.

Sample Input

```
http://www.orgs.bucknell.edu/acm/contest/Novice.html   http://www.cnn/
http://www.orgs.bucknell.edu/acm/contest/   http://www.cnn/
http://www.orgs.bucknell.edu/acm/contest/   http://www.cnn/news.html
http://www.orgs.bucknell.edu/acm/contest/Novice.html   /ieee/index.html
http://www.orgs.bucknell.edu/acm/contest/Novice.html   /ieee/
http://www.orgs.bucknell.edu/acm/contest/Novice.html   Expert.html
http://www.orgs.bucknell.edu/acm/contest/   Expert.html
http://www.orgs.bucknell.edu/acm/contest/Novice.html   ../engineeringweek/index.html
http://www.orgs.bucknell.edu/acm/contest/Novice.html   ../engineeringweek/
http://www.orgs.bucknell.edu/acm/contest/Novice.html   ../../ieee/
```

Output for Sample Input

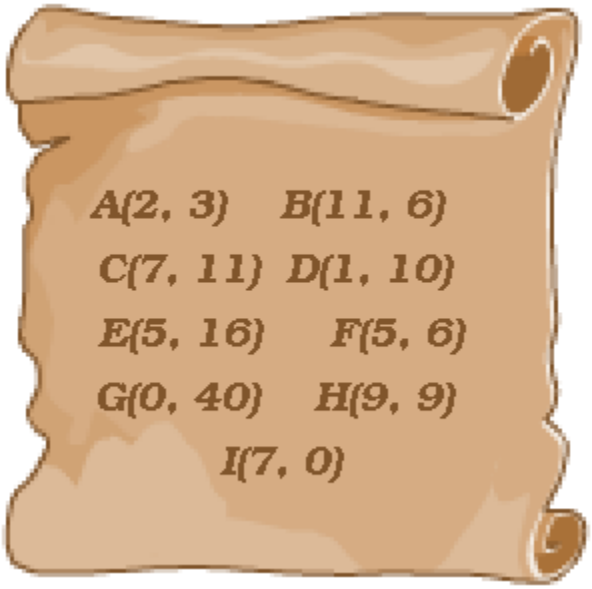
```
http://www.cnn/index.html
http://www.cnn/index.html
http://www.cnn/news.html
http://www.orgs.bucknell.edu/ieee/index.html
http://www.orgs.bucknell.edu/ieee/index.html
http://www.orgs.bucknell.edu/acm/contest/Expert.html
http://www.orgs.bucknell.edu/acm/contest/Expert.html
http://www.orgs.bucknell.edu/acm/engineeringweek/index.html
http://www.orgs.bucknell.edu/acm/engineeringweek/index.html
http://www.orgs.bucknell.edu/ieee/index.html
```

Flash your Badge?

Name this problem Badge.

Your Spy Ring is hot on the trail of Top Secret Information. Your cartographer has figured out that the numbers on the map are part of a puzzle telling you how many steps to walk towards the Top Secret Information which is buried in a rival Spy Academy's yard.

The map shows 9 coordinates A-I.



The coordinates are on the standard X Y plane. At the bottom of the map is a list of rectangles and points. The rectangles are specified using two corners from the set of the A-I points. You need to find the distance from each point to the nearest point on the perimeter of its rectangle. These distances tell you how far to pace in each segment of a larger map.

Input

Each line of input has the form

Letter	Letter	P_x	P_y

where the letter is one of the points A-I on the map and P_x and P_y are the coordinates of the point. The letters form two opposing corners of a rectangle. There is a single zero on the last line of the input.

Output

For each line of input, print the distance from the point to the nearest point on the perimeter of the rectangle. Your answer must be integers.

Sample Input

```
F H 7 8
C B 5 9
0
```

Output for Sample Input

```
1
2
```

Watch you don’t scratch a fellow spy with your Poison Nail!

Name this problem Nail.

Your Spy Ring has come across a set of substitution puzzles that lead to Top Secret Information (everything seems to lead to Top Secret Information lately). Each puzzle has the form

```
ABCD + BDC = EAEA
```

In case you haven't seen this type of puzzle on a Secret Assignment recently, the problem is pretty straightforward: find numbers to replace the A, B, C, ... that make the equation true. The replacements must be consistent; that is, replace all A's by one digit, all B's by a different digit, and so on.

For example, the equation 1538+583 = 2121 solves the equation above. The equation has 5 more solutions: 1547+574 = 2121, 1574+547 = 2121, 1583 + 538 = 2121, 3658 + 685 = 4343, and 3685 + 658 = 4343. The second sample problem below has three solutions: 546 + 54 = 600, 576 + 57 = 633, and 586 + 58 = 644.

Input

Each input line will be of the form shown above. Some of the letters will already be digits. There will be at most 4 different letters in the line. The leading digit of each number will not be a 0. There is a single zero on the last line of the input.

Output

For each line of input, print out the number of solutions and then the solutions in the form

```
4 N1+N2 N3+N4 N5+N6 N7+N8
```

where each solution (N_a+N_b) is in order to match its input and the pairs are sorted from smallest to largest. If there is a case where two pairs have the same N_a, then also sort them by N_b

Sample Input

```
AA + BC = 100
XYZ + XY = 6QQ
0
```

Output for Sample Input

```
7 11+89 22+78 33+67 44+56 66+34 77+23 88+12
3 546+54 576+57 586+58
```

Handcuff yourself to the perfect number!

Name this problem Handcuffs.

You are deep in the lair of guitar loving Master Villain Guattery, better known as The Ax, and you've reached a large safe, so large it has 60,000 buttons on the front. You've heard rumors that the plans to build guitar playing robots that lull people to sleep before taking over the world are found in this safe. In a dusty back corner of the room you find a note left by The Ax reminding himself that the combo is perfect.

If a, b, c are integers such that a = b*c, then b and c are divisors of a. If c is not 1, b is a proper divisor of a. A **perfect** number is a positive integer that is equal to the sum of all its positive, proper divisors; for example, 6, which equals 1+2+3, and 28, which equals 1+2+4+7+14, are perfect numbers. A positive integer that is not perfect is **deficient** or **abundant** according to whether the sum of its positive, proper divisors is smaller or larger than the number itself. Thus, 9, with proper divisors 1 and 3, is deficient; 12, with proper divisors 1, 2, 3, 4, and 6, is abundant.

Given a number, determine if it is perfect, abundant, or deficient.

Input

A list of N positive integers (none greater than 60,000), with 1 < N < 100. A 0 will mark the end of the list.

Output

For each input, print whether it is perfect, deficient, or abundant. Print one output per line.

Sample Input

```
9 6 12 0
```

Output for Sample Input

```
deficient
perfect
abundant
```