CS 121 – Lab #13 – Two practice problems

Program #1 Triangle Island (input file: island.txt)

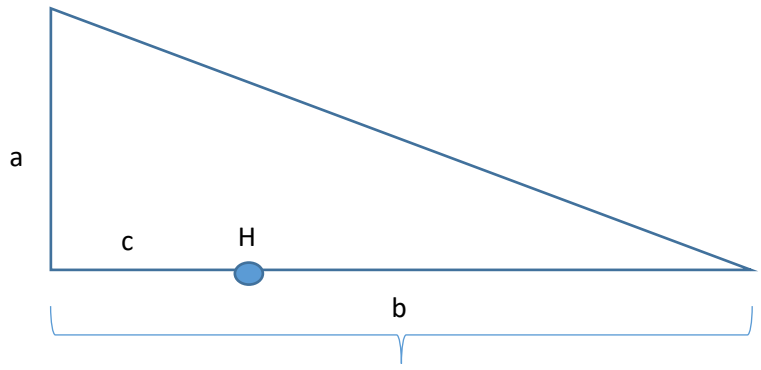
The planet Bliss has an ocean with a large number of triangular shaped islands. Each island is in the shape of a right triangle. The islands are of varying sizes, but the orientation of each island is such that the three vertices are located at the Northern point, the Southwestern point and the Southeastern point of the triangle. The right angle is located at the Southwestern point, which is due south of the Northern point and due west of the Southeastern point. The hypotenuse runs from the Northern point to the Southeastern point, and is of course the longest side of the island. The shortest side of an island may either be the side from Northern point to Southwestern point or from Southwestern point to Southeastern point.

On each island, the seat of government is the Custom House located at Northern point. But all the hotels are located along the southern shore between Southwestern and Southeastern points. The islands are extremely mountainous, and there is only one road on each island, which runs along the coastline around the entire island. There are no roads in the interior of any island. We would like to determine the shortest path to get from a hotel to the Custom House. There are only two realistic alternatives: should we start out going east (i.e. initially towards Southeastern point) or west (initially towards Southwestern point)?

The figure below illustrates the problem. In the figure, H represents the location of the hotel. An instance of this problem is defined by three numbers (a, b, and c) that represent the following distances in miles:

- The first number, a, is the length of the longitudinal side (i.e. distance from Northern point to Southwestern point).
- The second number, b, is the length of the latitudinal side (i.e. distance from Southwestern to Southeastern points).
- The third number, c, is the distance from the hotel to the Southwestern point.

For example, suppose these distances are 3, 4 and 1, respectively. If we leave the hotel going west, we will travel 1 mile to the Southwestern point, and then 3 miles to the Northern point. If we leave the hotel going east, we would travel 3 miles to the Southeastern point and then 5 miles to the Northern point along the hypotenuse. Since 1+3 < 3+5, we are better off starting to go west.



Throughout this problem, you may assume that the two distances will not be equal, so that one direction will definitely be less than the other.

The input will be formatted as follows. The first line will contain a positive integer n, $2 \leq n \leq 100$, indicating the number of islands. Each subsequent line of input will pertain to one island, and will contain the three positive integers representing an instance of the problem.

Your output should give the number of the test case followed by the phrase “go east” or “go west” as appropriate, as advice for how to leave the hotel to follow the shortest path to the Custom House.

Example input:

```
3
6 8 1
6 8 7
3 3 2
```

Corresponding example output:

```
1 go west
2 go east
3 go west
```

Program #2 – Who scored the winning goal? (input file: goal.txt)

In team sports, every player has an essential role to play. But when looking back on an exciting game, one of the greatest highlights is the goal that clinched the victory. In this problem, you will write a program that reads a list of goals scored during several different hockey games. For each game, you are to determine its final score and the name of the player responsible for scoring the winning goal.

Note that the "winning goal" is not necessarily the last goal scored in the game. We define the winning goal of a game as follows. If the winning team scored W goals, and the losing team scored L goals, then the winning goal is the $(L+1)^{st}$ goal scored by the winning team. For example, if Los Angeles beat Phoenix by a score of 6 to 3, then LA's 4^{th} goal is the winning goal. Also note that the order in which the goals are scored does not matter. Phoenix could have scored all of its goals before LA began scoring, or vice versa. The winning goal is always the $(L+1)^{st}$ goal scored by the winning team.

Assumptions: You may assume that there was at least one goal scored in each game, and that no game ended in a tie.

Input format: The first line is of the form

```
<n> games
```

and this indicates the number of games. Each game is introduced by a line of the form

```
Game <n> <team> vs <team>
```

Where <n> is a positive integer, and <team> is a 3-letter abbreviation. Do not assume that the order in which the teams are identified has any bearing on which team won the game.

The remaining lines of a game identify goal events. Each such line has this format:

```
<2 spaces> <team> (<player number>) <player name>
```

These lines will be indented by two spaces, and indicate the name (abbreviation) of the team that scored the goal, followed by the number and name of the scoring player. The player number is given inside parentheses. Note that the player's name may contain several words, but does not extend past the end of the line.

The end of input is signified by an asterisk given at the beginning of a line.

Output: For each game, your program needs to print a line of information, giving the game number, the score, and the name of the player who scored the winning goal. The format must be:

```
Game <n>, <win team> <win score> <lose team> <lose score>, winning goal by <player>
```

Note that your program must determine which team won the game, and output the winning team's abbreviation and score before those of the losing team. At the end of the line, print the player's name but not the player's number. Also note the commas required in the output format.

Example input:

```
2 games
Game 1 TOR vs TBL
  TOR (14) Matt Stajan
  TBL (16) Dixon Ward
  TBL (4) Vincent Lecavalier
Game 2 OTT vs MTL
  MTL (46) Andre Kostitsyn
  MTL (21) Chris Higgins
  MTL (46) Andre Kostitsyn
  OTT (20) Antoine Vermette
  MTL (51) Francis Bouillon
  MTL (79) Andrei Markov
  MTL (54) Mikhail Grabovski
  MTL (6) Tom Kostopoulos
  OTT (15) Dany Heatley
  OTT (28) Martin Lapointe
  OTT (15) Dany Heatley
  OTT (19) Jason Spezza
*
```

Example output corresponding to the example input given above:

```
Game 1, TBL 2 TOR 1, winning goal by Vincent Lecavalier
Game 2, MTL 7 OTT 5, winning goal by Mikhail Grabovski
```