Q9. Ghost Leg Traversing (50 marks):

Ghost leg, known in Japan as "Amidakuji" and in Korea as "Sadaritagi", is a line traversing game designed to create pairs between two sets of things. With reference to Figure Q9(a), a ghost leg pattern consists of vertical lines with horizontal lines connecting two adjacent vertical lines scattered randomly along their length, where the horizontal lines are called "legs".
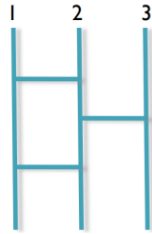

Figure Q9(a): A ghost leg pattern with three vertical lines and three horizontal lines

With reference to the example shown in Figure Q9(b), the rules of traversing the ghost leg will start with a player picking a start point at the top of one of the vertical lines, then following down the ladder. If the player reaches a horizontal "leg", he/she needs to follow it to get to another vertical line and continue downwards. The player needs to repeat this procedure until he/she has reached the end of one of the vertical lines, then the game is over.
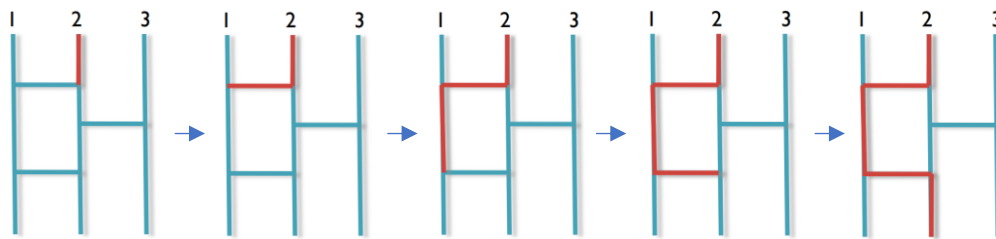

Figure Q9(b): The above shows the example of traversing the ghost leg. If the top of vertical line 2 is the starting point, then the last diagram shows the result of the ghost leg traversing.

For this question, the ghost leg pattern with 5 rows and 5 vertical lines is illustrated in Figure Q9(c). The row names are indicated from A to E, where the vertical line names are indicated from 1 to 5. The horizontal "legs" are not shown in this figure because they will be added into the ghost leg ladder later, dynamically according to the requirement.
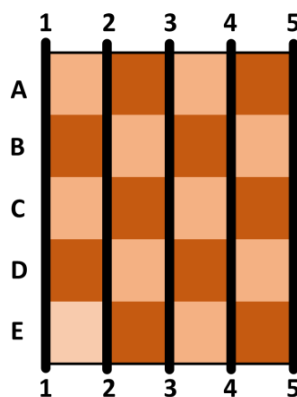

Figure Q9(c): The grid of ghost leg ladder.

The above ghost leg pattern will be used in a treasure hunting game, where a treasure with an amount of gold is placed at one of the ends of the ghost leg. At the same time, The treasure hunter needs to pick a starting point at the top of the ghost leg and then follows the rules of traversing to reach the treasure. When the treasure hunter traversing the horizontal "leg", there will be an event that the hunter will gain extra gold or lose some gold.

For instance, two horizontal "legs" are added to the ghost leg ladder as shown in Figure 9(d). The first leg is positioned at row A, between vertical lines 2 and 3, with an extra gold gain value of 10. Another leg is positioned at row D, between vertical lines 1 and 2, with a gold loss value of -5. The treasure with 100 golds is located at the end of vertical line 1. So, in this example, if the player chooses to start from the top of vertical line 3, he/she will eventually obtain the gold with a total amount of 105.
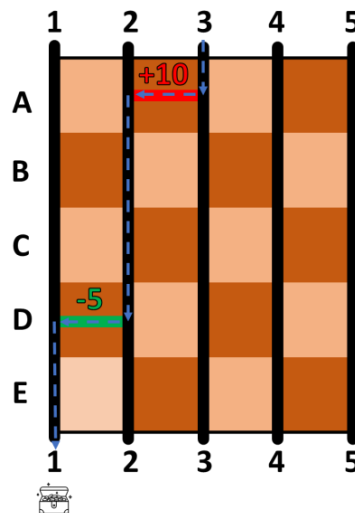

Figure 9(d): A complete ghost leg ladder with two legs.

Write a program to

Input, in sequence,

(1) Three positive integers, P, G and N, separated with spaces, where
P is the location of the treasure at the end of the ghost leg, for $1 \leq P \leq 5$,
G is the amount of gold inside the above treasure, for $1 \leq G \leq 5000$,
N is the number of horizontal "legs", for $1 \leq N \leq 10$.

(2) Subsequent N lines: For each line, the position of a horizontal leg and the corresponding gold gain/loss are given in the following format: $H \ V_1 \ V_2 \ X$, where
H is the row of the horizontal leg, for $H \in \{A, B, C, D, E\}$
V_1, V_2 are the two adjacent vertical lines that the leg is connecting,
for $1 \leq V_1 \leq 4$ and $V_2 = V_1 + 1$
X is the extra gold gain/loss that the player may get while traversing this leg,
for $-5000 \leq X \leq 5000$.

Output, in sequence, S and T, separated with a single space, where S is the starting point of the player in order to get the treasure at the end of the ghost leg, for $1 \leq S \leq 5$; and, T is the total amount of gold obtained by the player after the he/she successfully gets the treasure, where T is an integer (the value can be positive, zero, or negative).

试题 9. 鬼脚穿越（50 分）：

画鬼脚（Ghost leg），在日本被称为"Amidakuji"，在韩国则被称为"Sadaltagi"，是一种沿线穿越的游戏，旨在为两组事物创建配对。参考图 Q9(a)，鬼脚图是由纵线和横线所组成。所有纵线皆是从图的顶部一直延申至底部，而横线是用以连接两条相邻的纵线，所以横线也被称为"脚"。
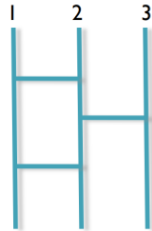

图 Q9(a): 包含了三纵线以及三横线的鬼脚图

参考图 Q9(b) 所示的例子，鬼脚穿越的规则是，玩家一开始须选择其中一条纵线的顶部作为起点，然后沿着梯子向下走。如果玩家碰到横向的"脚"时，他/她必须跟随这个"脚"去到另一条纵线并继续向下走。玩家需要重复此过程，直到他/她到达其中一条纵线的末端，然后游戏就结束了。
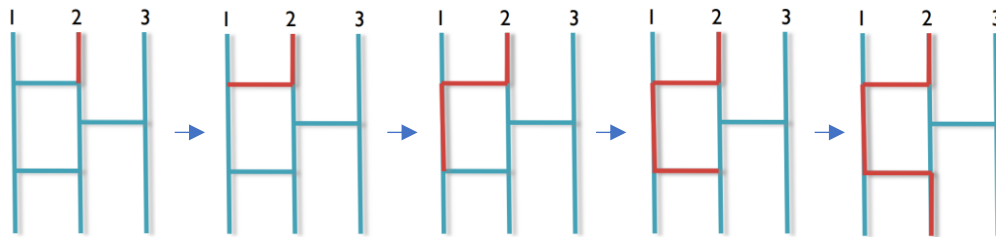

图 Q9(b): 以上示意一个鬼脚穿越的例子。倘若纵线 2 的顶部是起点，则最后一个图就显示了鬼脚穿越的结果

如图 Q9(c) 所示，这道题采用了 5 行以及 5 纵线的鬼脚原型图。其中各行是以 A 到 E 来命名，而纵线则以 1 到 5 来表示。图中并没有显示横向的"脚"，因为它们将在之后根据需求、动态地添加到鬼脚图中。
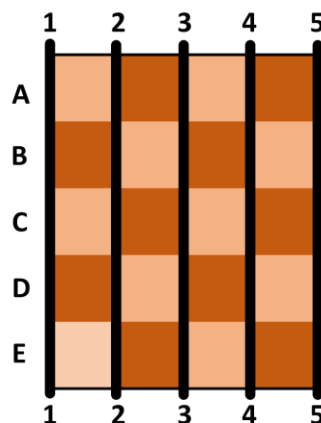

图 Q9(c): 鬼脚图的原型网格。

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上述鬼脚原型图将用于一个寻宝游戏中。一个藏有一定数量金币的宝藏被放置在鬼脚图的末端。寻宝者需要在鬼脚图的顶部选择一个起点，然后按照穿越规则到达可取得宝藏的终点。当寻宝者穿越横向的"脚"时，有可能会获得额外的、或损失一些金币。

例如，如图 9(d) 所示，两条横向的"脚"被添加到鬼脚图中。第一条脚位于 A 行，在纵线 2 和 3 之间，而通过这条脚可得到额外的 10 枚金币。另一条脚则位于 D 行，纵线 1 和 2 之间，但通过这条脚则会蒙受 5 枚金币的损失。宝藏则位于纵线 1 的末端，其中有 100 枚金币。在这个例子中，如果玩家选择从纵线 3 的顶部开始，他/她最终将获得总计 105 的金币。
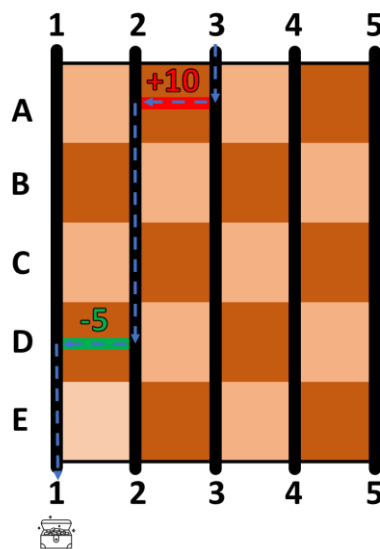

图 Q9(d): 有两条"脚"的鬼脚图

试写一程式以

依序输入

（1） 三个正整数 P，G 和 N，其中
P 是鬼脚图末端宝物的位置，已知 $1 \leq P \leq 5$，
G 为上述宝物内的金币数量，已知 $1 \leq G \leq 5000$，
N 是横向"脚"的数量，已知 $1 \leq N \leq 10$。

（2） 随后的 N 行：每行以 H V_1 V_2 X 的格式显示了以下信息
H 是横向脚所在的行，其中 $H \in \{A, B, C, D, E\}$
V_1，V_2 是脚连接的两条相邻的纵线，其中 $1 \leq V_1 \leq 4$ 以及 $V_2 = V_1 + 1$
X 是玩家在穿越这条脚时可能获得或损失的金币，其中 $-5000 \leq X \leq 5000$。

依序输出 S 和 T（以空格隔开），其中 S 是玩家为了得到鬼脚末端宝藏必须选择的起点，已知 $1 \leq S \leq 5$；而 T 则是玩家在成功穿越鬼脚、获得宝藏后所得到的金币总数量，已知 T 为整数（其值可正、可零、亦可负）。

Example (例子)

Input (输入)	Output (输出)
1 100 2 D 1 2 -5 A 2 3 10	3 105
2 300 4 C 3 4 -5 D 2 3 10 A 2 3 20 B 3 4 -11	2 314
4 20 5 A 4 5 -66 B 3 4 22 C 3 4 35 D 4 5 -22 E 4 5 50	5 39
3 200 6 A 1 2 10 B 2 3 5 A 3 4 -10 C 4 5 30 D 2 3 -20 E 4 5 -2	4 175
5 150 7 D 3 4 20 E 2 3 -5 C 1 2 100 A 1 2 -62 E 4 5 88 C 4 5 -168 B 2 3 123	1 319