

## Epic Fight

Ruffus the notorious, Bitland pirate has just become a prisoner. Charles Xorvier led a team of Mutexes and Pirates and arrested Ruffus. Isaac Mederios loves watching heroes fight. Sadly, the fight of Xorvier versus Ruffus was not televised.

Isaac likes to imagine how the fight played out. Luckily Isaac knows all of Xorvier's and Ruffus's special moves. Isaac also knows how long the fight lasted, since Xorvier mentioned it in one of his interviews. Help Isaac find out how many distinct possible ways in which the fight could have occurred.

Each contender has some amount of maximum stamina, which they will start at. At every even second Xorvier and Ruffus will begin a move that will expend (or restore) some of their stamina initially, and then after one second, they will remove a different amount of stamina from their opponent. Note that Xorvier and Ruffus will execute moves at the same time. After performing a move the two will wait exactly one second to recover.

- Any stamina that would take them over their initial amount is lost.
- When Xorvier or Ruffus reaches 0 or less stamina then they are defeated instantly and the fight ends.
- Once Xorvier or Ruffus uses a move they cannot perform another move until their move finishes, at which point they must wait one second and will immediately begin a new move.
- Assume that at  $t = 0$  both Xorvier and Ruffus began using a move.
- If two or more different moves will knock out someone by initially using them, then each move is a different way in which a fight can end.
- At the end of the fight Ruffus has 0 or less stamina and Xorvier has some positive amount of stamina.

Since the number of possible outcomes can be quite large, print out the number of outcomes' remainder when divided by 10,007.

### Input Specification

The first line of input will contain 1 integer,  $t$  ( $1 \leq t \leq 120$ ), representing the time the fight took in seconds.

The next line contains 2 integers,  $m_x$  and  $s_x$  ( $1 \leq m_x \leq 10$ ,  $10 \leq s_x \leq 100$ ), representing the number of moves Xorvier knows and his maximum stamina. The next  $m_x$  lines describe Xorvier's moves. The  $i$ -th line contains 3 integers,  $a_i$  and  $b_i$ , ( $-100 \leq a_i \leq 100$ ,  $-100 \leq b_i \leq 100$ ) representing Xorvier's initial stamina cost and Ruffus's ending stamina reduction, respectively.

The next line contains 2 integers,  $m_r$  and  $s_r$  ( $1 \leq m_r \leq 10$ ,  $10 \leq s_r \leq 100$ ), representing the number of moves Ruffus knows and his maximum stamina. The next  $m_r$  lines describe Ruffus's moves. The  $i$ -th line contains 2 integers,  $a_i$  and  $b_i$ , ( $-100 \leq a_i \leq 100$ ,  $-100 \leq b_i \leq 100$ ) representing Ruffus's initial stamina cost and Xorvier's ending stamina reduction, respectively.

### Output Specification

The first and only line of output should contain the remainder of the number of distinct possible fight sequences when divided by 10,007.

### Input Output Example

Input	Output
2 3 100 10 10 -10 0 1 1 1 100 90 99	1
3 3 100 10 10 -10 0 1 1 1 100 90 99	0
1 10 100 1 1 2 2 3 3 4 4 5 5 6 6 7 7 8 8 9 9 10 10 10 10 1 10 2 20 3 30 4 40 5 50 6 60 7 70 8 80 9 90 10 100	53
11 2 100 1 1 2 2 1 10 0 0	20

## Explanation

### Case 1:

At time -1, both Xorvier and Ruffus have 100 stamina.

In this case Ruffus will always sacrifice 90 stamina to remove 99 stamina from Xorvier. If Xorvier uses any other first move than his 10 stamina regeneration, Xorvier will faint at time = 1. For this reason Xorvier uses his regeneration.

At time 0, Xorvier has 100 stamina and Ruffus has 10 stamina. (Payment for moves at time 0)

At time 1, Ruffus has 10 stamina and Xorvier has 1. (Outcome of moves at time 0)

Xorvier and Ruffus will use a move at time 2. The only move Xorvier can use without fainting is his 10 stamina regeneration. Xorvier will reach 11 stamina, while Ruffus will sacrifice a second chunk of 90 stamina and faints.

So at time 2, Ruffus has -80 stamina and Xorvier has 11. (Payment for moves at time 2)

This was the only possible way for Xorvier to win.

### Case 2:

At time -1, both have 100 stamina.

In this case Ruffus will always sacrifice 90 stamina to remove 99 stamina from Xorvier. If Xorvier uses any other first move but his 10 stamina regeneration, Xorvier will faint at time = 1.

At time 0, Xorvier has 100 stamina and Ruffus has 10 stamina. (Payment for moves at time 0)

At time 1, Ruffus has 10 stamina and Xorvier has 1. (Outcome of moves at time 0)

Xorvier and Ruffus will use a move at time 2. The only move Xorvier can use without fainting is his 10 stamina regeneration. Xorvier will reach 11 stamina, while Ruffus will sacrifice a second chunk of 90 stamina and faints.

So at time 2, Ruffus has -80 stamina and Xorvier has 11. (Payment for moves at time 2)

Xorvier could not prevent Ruffus from self-destructing, so there is no way for the fight to take 3 seconds.

### Case 3:

There Xorvier needs to win at the end of the first move ( $t = 1$ ). Ruffus could not have used his 10<sup>th</sup> move, otherwise Ruffus would have lost at  $t = 0$ .

So if Ruffus used his 9<sup>th</sup> move Xorvier has 9 ways to win (Xorvier's 10<sup>th</sup> move would reduce his stamina to 0).

Ruffus's 8<sup>th</sup> move give Xorvier 9 different ways to win.

Ruffus's 7<sup>th</sup> move gives Xorvier 8 different ways to win.

6<sup>th</sup> = 7, 5<sup>th</sup> = 6, 4<sup>th</sup> = 5, 3<sup>rd</sup> = 4, 2<sup>nd</sup> = 3, 1<sup>st</sup> = 2.

$2 + 3 + 4 + 5 + 6 + 7 + 8 + 9 + 9 = 53$ .

**Case 4:**

If Xorvier uses 5 2-cost moves, Ruffus would lose at  $t = 9$ .

So Xorvier had to use a 1-cost move prior to his 5<sup>th</sup> move.

Suppose Xorvier used 1 1-cost and 5 2-costs, then Xorvier has  $(5 \text{ choose } 1) = 5$  (last move cannot be the 1-cost) ways to win at time 11.

If Xorvier used 2 1-cost and 4 2-costs, then Xorvier has  $(6 \text{ choose } 2) = 15$  ways to win at time 11.

The total number of outcomes is  $5 + 15$ .

## **Grading Information**

Reading from and writing to standard input – 10 points

Comments, white space usage, and reasonable variable names – 10 points

Use Dynamic Programming – 10 points

Devise some way to represent the state of the fight – 10 points

Your program will be tested on 20 test cases – 3 points each

*No points will be awarded to programs that do not compile.*

*Only cases that finish within the maximum of {5 times my solution, 10 seconds} will be graded.*

*Programs that use a package will most likely receive 0 points*

*Files that do not have the same name as their class's main function will most likely receive 0 points (e.g. file "epic.java" should contain a "public class epic" which contains the "main" function)*