2554. Minimum Total Distance Traveled

Difficulty : Hard

https://leetcode.com/problems/minimum-total-distance-traveled

There are some robots and factories on the X-axis. You are given an integer array `robot` where `robot[i]` is the position of the i^{th} robot. You are also given a 2D integer array `factory` where `factory[j] = [position_j, limit_j]` indicates that $position_j$ is the position of the j^{th} factory and that the j^{th} factory can repair at most $limit_j$ robots.

The positions of each robot are **unique**. The positions of each factory are also **unique**. Note that a robot can be **in the same position** as a factory initially.

All the robots are initially broken; they keep moving in one direction. The direction could be the negative or the positive direction of the X-axis. When a robot reaches a factory that did not reach its limit, the factory repairs the robot, and it stops moving.

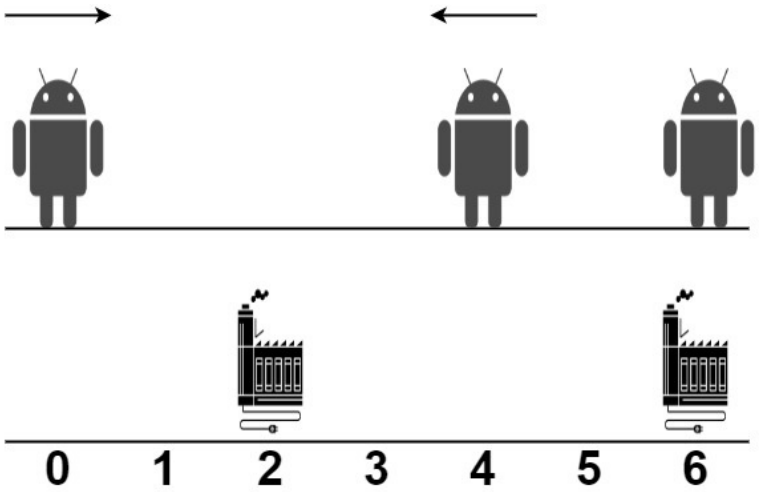
At any moment, you can set the initial direction of moving for **some** robot. Your target is to minimize the total distance traveled by all the robots.

Return *the minimum total distance traveled by all the robots*. The test cases are generated such that all the robots can be repaired.

Note that

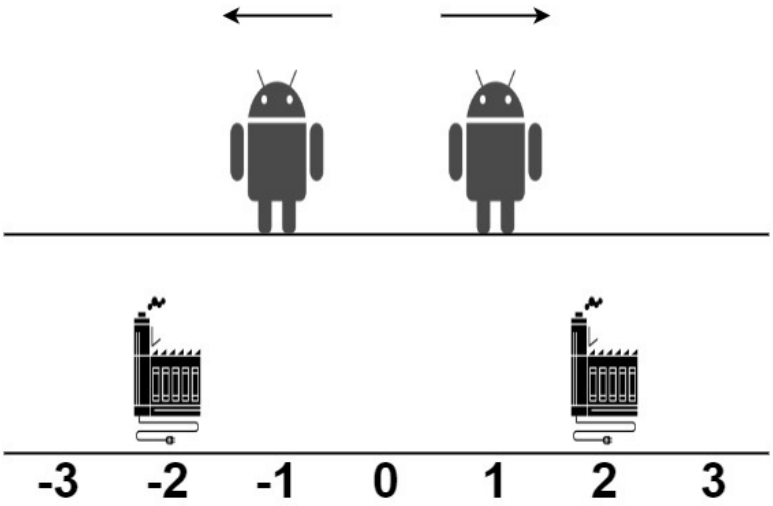
- All robots move at the same speed.
- If two robots move in the same direction, they will never collide.
- If two robots move in opposite directions and they meet at some point, they do not collide. They cross each other.
- If a robot passes by a factory that reached its limits, it crosses it as if it does not exist.
- If the robot moved from a position `x` to a position `y`, the distance it moved is `|y - x|`.

Example 1:




```
Input: robot = [0,4,6], factory = [[2,2],[6,2]]
Output: 4
Explanation: As shown in the figure:
- The first robot at position 0 moves in the positive direction. It will be repaired at the first factory.
- The second robot at position 4 moves in the negative direction. It will be repaired at the first factory.
- The third robot at position 6 will be repaired at the second factory. It does not need to move.
The limit of the first factory is 2, and it fixed 2 robots.
The limit of the second factory is 2, and it fixed 1 robot.
The total distance is |2 - 0| + |2 - 4| + |6 - 6| = 4. It can be shown that we cannot achieve a better total distance than 4.
```

Example 2:



Input: robot = [1,-1], factory = [[-2,1],[2,1]]
Output: 2
Explanation: As shown in the figure:
- The first robot at position 1 moves in the positive direction. It will be repaired at the second factory.
- The second robot at position -1 moves in the negative direction. It will be repaired at the first factory.
The limit of the first factory is 1, and it fixed 1 robot.
The limit of the second factory is 1, and it fixed 1 robot.
The total distance is |2 - 1| + |(-2) - (-1)| = 2. It can be shown that we cannot achieve a better total distance than 2.

Constraints:

- 1 <= robot.length, factory.length <= 100
- factory[j].length == 2
- -10^9 <= robot[i], position$_j$ <= 10^9
- 0 <= limit$_j$ <= robot.length
- The input will be generated such that it is always possible to repair every robot.