Problem I. Automatic Teleportation

In the case $n = 1$, the answer is $2a_1 - s$.

In the case $n = 2$, there are only two possible orders of using the mirrors.

- If mirror 1 is used first, the final position is: $2a_2 - (2a_1 - s)$.
- If mirror 2 is used first, the final position is: $2a_1 - (2a_2 - s)$.

You need to print the larger of these two values.

By analyzing the optimality condition for using mirror 2 in the situation of subtask 1, we get $2a_1 - 2a_2 + s \geq 2a_2 - 2a_1 + s$, that is, $a_1 \leq a_2$. Therefore, when only two mirrors are used, it is better to use the mirror located farther to the right later.

Moreover, from the form of the formula for the position after using two mirrors, it is clear that the farther to the right the initial position is, the farther to the right the final position after using two mirrors will also be.

Under the conditions of subtask 2, only two types of mirror positions are available. Let the position of the left mirror a_1 be denoted by l, and the position of the right mirror a_n by r. To move as far to the right as possible by choosing two suitable types of mirrors, it is optimal to first use a mirror at position l, and then — at position r. (Since for initial position s the final position is $2a_2 - 2a_1 + s$, the smaller a_1 and the larger a_2, the better the result.)

Thus, when only these two types of mirrors are available, it is optimal to use the left mirror on odd-numbered steps and the right mirror on even-numbered steps. Since each mirror occurs exactly $n/2$ times, this case already gives the answer. This process can be simulated directly, yielding the answer in $O(n)$.

Subtask 3

n is even. Let the order of using the n mirrors be $x_1, x_2, \ldots, x_n$. Then the final position relative to the initial position s is expressed as follows:

After using the 1st mirror: $2x_1 - s$
After using the 2nd mirror: $2x_2 - (2x_1 - s) = 2x_2 - 2x_1 + s$
After using the 3rd mirror: $2x_3 - (2x_2 - 2x_1 + s) = 2(x_1 + x_3) - 2x_2 - s$
After using the 4th mirror: $2x_4 - (2(x_1 + x_3) - 2x_2 - s) = 2(x_2 + x_4) - 2(x_1 + x_3) + s$
$\ldots$
After using the n-th mirror: $2(x_2 + x_4 + \ldots + x_n) - 2(x_1 + x_3 + \cdots + x_{n-1}) + s$

(where n is even)

From the form of the formula, one can see that it is optimal to use the $n/2$ leftmost mirrors on the $n/2$ odd-numbered moves, and the $n/2$ rightmost mirrors on the $n/2$ even-numbered moves. (You may notice that permuting mirrors within the odd moves or within the even moves does not affect the final result.)

Since the mirror positions are given in sorted order, the answer can be obtained in $O(n)$.

In addition, there may exist other solutions using the condition $a_{n/2} < s < a_{n/2+1}$.

Subtask 4

In subtask 3, a solution for even n was described. In the case of odd n, for an order of using mirrors $x_1, x_2, \ldots, x_n$, the final position is $2(x_1 + x_3 + \cdots + x_n) - 2(x_2 + x_4 + \cdots + x_{n-1}) - s$.

From the form of the formula, one can see that it is optimal to use the $(n+1)/2$ rightmost mirrors on the $(n+1)/2$ odd-numbered moves, and the $(n-1)/2$ leftmost mirrors on the $(n-1)/2$ even-numbered moves.

Since the mirror positions are given in sorted order, the answer can be obtained in $O(n)$.

Problem J. Is Equality Reachable?

Consider the pairwise differences between a, b, and c. After any move, one of the differences does not change, while the other two change by 3, so the remainders of these differences modulo 3 are invariant. Therefore, if at least one of the differences is not divisible by 3, the answer is 0. We will show that if all differences are divisible by 3, then the answer is always 1.

Suppose all differences are divisible by 3; note that then the sum $a+b+c$ is also divisible by 3 (that is, if $a = b+3k = c+3l$, then $a+b+c = a+a-3k+a-3l = 3(a-k-l)$). Sort a, b, and c in nondecreasing order. If the smallest and the middle values are equal, do nothing; otherwise, the robot with the middle number of coins gives coins away until they become equal (in one operation the difference decreases by exactly 3, and since the difference is divisible by 3, at some moment the robots will become equal). Then the robot with the largest number of coins starts giving coins away; the other two robots keep having equal numbers of coins, while the difference between the number of coins of the giving robot and that of each of the other two robots decreases by 3 with each move, so since this difference is divisible by 3, at some moment it will become zero and the goal will be achieved.

Problem K. ICPC-like Contest

If all $9-s_i$ problems are solved at the current moment, then $(9-s_i)\cdot t$ penalty minutes are added, plus 20 for each penalty attempt (since all problems will be solved, all penalty attempts will count toward solved problems). If this total time is strictly less than p_0, then the answer is 0; otherwise, the answer is 1.

Problem L. King and Fires

Let us transform the inequality: $x_i - x_j - y_i + y_j \geq 0$, or $x_i - y_i \geq x_j - y_j$. That is, we need to find all cities for which the difference between the x and y coordinates is maximal. We iterate through all cities, maintaining the maximum difference and the number of cities for which this maximum is attained. We output the number of cities.

Then we iterate through all cities a second time, checking for which cities the difference is maximal, and output their indices.