Problem C.
Starlight on the Stage

Time limit: 4 seconds

Recently, talent shows become very popular worldwide. This year, in a small isle country on the Pacific Ocean, a talent contest called '*Internatinoal Classic Performance Competition* (*ICPC*)' is held, with the main topic 'musical drama'. During the contest, the participants will be paired to perform *duets* (i.e., duo dances) against their partners on the stage. The top two winners recieve the prize, including an invitation to participate real musical concerts as an actor/actress.

Flora and Claire are best friends of each other since childhood. They are currently studying in an academy for performing arts. After some discussions, Flora and Claire decided to participate the competition and aim at becoming the top stars among all the participants.

The competition is formed in a two-phase schedule, and there are N participants in total. (Flora is the first participant; Claire is the N-th participant.) The first phase has ended several days ago, where the judges have annouced the initial *scores* evaluated based on the proposed resumes. The score of the i-th participant is denoted as s_i, and its initial value is available from the official announcement. Then, the second phase will be processed with following rules:

- There are N rounds that will be held.
- In the i-th round, the i-th participant will be paired with every other participant exactly once. That is, $(N-1)$ duet stages will be performed in each round.
- For each duet stage, to make the problem easier, we assume that the winner will always be the participant who has the higher score at that time point. That is, for the duet stage involving the x-th participant and the y-th participant, if $s_x > s_y$, then the x-th participant always win against the y-th participant. If the scores are same, the stage will be tied (i.e., draw game).
- After the i-th round, suppose that the result of the i-th participant is W wins, L losses and D tied games (draws), then the score of the i-th

participant will be updated as $s_i^{\text{new}} := s_i + W - L$. (Note that only s_i will be updated for the i-th round.)

- The N rounds will be held strictly in order, from $i = 1, 2, \ldots$ to N.
- After all the N rounds, the winners will be the two participants having highest final scores.

(Note that, the score of each participant will be changed *exactly once* after the procedure.)

Before the second phase of competition, Flora and Claire decide to conduct additional dancing training so that they can result in top two scores after all the N rounds of stages. However, Flora also do not want to waste her stamina too much since the second phase competition is nearing the date (while it is not an issue for Claire).

Assume that after the training, the initial score of Flora (i.e., initial s_1) will be increased by α, and the initial score of Claire (i.e., initial s_N) will be increased by β. Please help Flora and Claire to achieve the goal with minimum α, where α and β must be non-negative integers.

Moreover, we only consider the cases that Flora and Claire result in top scores *strictly higher than all the other participants* as valid cases.

Input

The first line of input contains an integer T indicating the number of test cases. The following lines describe T cases in order.

For each test case, the first line will contains an integer N, indicating the number of participants. Then, each of the following N lines will contain an integer denoting the initial value of s_i based on the official announcement, for $i = 1, \ldots, N$, respectively.

- $1 \leq T \leq 10$
- $3 \leq N \leq 10000$
- All the initial values of s_i are positive integers no larger than 10^8, $\forall i$.

Output

For each test case, please output one line containing an integer indicating the minimum valid α.

Sample Input	Sample Output
1 3 100 101 105	2

Sample Input	Sample Output
2 5 99999 2018 11 10 99999 3 10000007 10000009 10000005	0 3

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