

## 2819. Minimum Relative Loss After Buying Chocolates Premium

Hard Topics Hint

You are given an integer array `prices`, which shows the chocolate prices and a 2D integer array `queries`, where `queries[i] = [ki, mi]`.

Alice and Bob went to buy some chocolates, and Alice suggested a way to pay for them, and Bob agreed.

The terms for each query are as follows:

- If the price of a chocolate is **less than or equal to** `ki`, Bob pays for it.
- Otherwise, Bob pays `ki` of it, and Alice pays the **rest**.

Bob wants to select **exactly** `mi` chocolates such that his **relative loss** is **minimized**, more formally, if, in total, Alice has paid `ai` and Bob has paid `bi`, Bob wants to minimize `bi - ai`.

Return *an integer array* `ans` *where* `ans[i]` *is Bob's* **minimum relative loss** *possible for* `queries[i]`.

### Example 1:

**Input:** `prices = [1,9,22,10,19]`, `queries = [[18,4],[5,2]]`  
**Output:** `[34,-21]`  
**Explanation:** For the 1<sup>st</sup> query Bob selects the chocolates with prices `[1,9,10,22]`. He pays `1 + 9 + 10 + 18 = 38` and Alice pays `0 + 0 + 0 + 4 = 4`. So Bob's relative loss is `38 - 4 = 34`.  
For the 2<sup>nd</sup> query Bob selects the chocolates with prices `[19,22]`. He pays `5 + 5 = 10` and Alice pays `14 + 17 = 31`. So Bob's relative loss is `10 - 31 = -21`.  
It can be shown that these are the minimum possible relative losses.

### Example 2:

**Input:** `prices = [1,5,4,3,7,11,9]`, `queries = [[5,4],[5,7],[7,3],[4,5]]`  
**Output:** `[4,16,7,1]`  
**Explanation:** For the 1<sup>st</sup> query Bob selects the chocolates with prices `[1,3,9,11]`. He pays `1 + 3 + 5 + 5 = 14` and Alice pays `0 + 0 + 4 + 6 = 10`. So Bob's relative loss is `14 - 10 = 4`.  
For the 2<sup>nd</sup> query Bob has to select all the chocolates. He pays `1 + 5 + 4 + 3 + 5 + 5 + 5 = 28` and Alice pays `0 + 0 + 0 + 0 + 2 + 6 + 4 = 12`. So Bob's relative loss is `28 - 12 = 16`.  
For the 3<sup>rd</sup> query Bob selects the chocolates with prices `[1,3,11]` and he pays `1 + 3 + 7 = 11` and Alice pays `0 + 0 + 4 = 4`. So Bob's relative loss is `11 - 4 = 7`.  
For the 4<sup>th</sup> query Bob selects the chocolates with prices `[1,3,7,9,11]` and he pays `1 + 3 + 4 + 4 + 4 = 16` and Alice pays `0 + 0 + 3 + 5 + 7 = 15`. So Bob's relative loss is `16 - 15 = 1`.  
It can be shown that these are the minimum possible relative losses.

### Example 3:

**Input:** `prices = [5,6,7]`, `queries = [[10,1],[5,3],[3,3]]`  
**Output:** `[5,12,0]`  
**Explanation:** For the 1<sup>st</sup> query Bob selects the chocolate with price 5 and he pays 5 and Alice pays 0. So Bob's relative loss is `5 - 0 = 5`.  
For the 2<sup>nd</sup> query Bob has to select all the chocolates. He pays `5 + 5 + 5 = 15` and Alice pays `0 + 1 + 2 = 3`. So Bob's relative loss is `15 - 3 = 12`.  
For the 3<sup>rd</sup> query Bob has to select all the chocolates. He pays `3 + 3 + 3 = 9` and Alice pays `2 + 3 + 4 = 9`. So Bob's relative loss is `9 - 9 = 0`.  
It can be shown that these are the minimum possible relative losses.

### Constraints:

- `1 <= prices.length == n <= 105`
- `1 <= prices[i] <= 109`
- `1 <= queries.length <= 105`
- `queries[i].length == 2`
- `1 <= ki <= 109`
- `1 <= mi <= n`

Seen this question in a real interview before? 1/5

Yes No

Accepted 416 | Submissions 842 | Acceptance Rate 49.4%

### Topics

Array Binary Search Sorting Prefix Sum

### Hint 1

First sort `prices`.

### Hint 2

For one query, imagine `mi` is 1. It can be shown that Bob should select either the first one (the cheapest one) or the last one (the most expensive).

### Hint 3

Now if `mi > 1`, separate the chocolates into two parts. The first part is chocolates having a price less than or equal to `k`, the rest would be in the second part.

### Hint 4

Knowing how many chocolates Bob should pick from the first part is sufficient. Of course, Bob should select a prefix from this part and a suffix from the second part.

### Hint 5

To find the number of chocolates from the first part, do a binary search on the first part.

### Discussion (1)