Radio Towers

There are N radio towers in Jakarta. The towers are located along a straight line and numbered from 0 to $N-1$ from left to right. For each i such that $0 \leq i \leq N-1$, the height of tower i is $H[i]$ metres. The heights of the towers are **distinct**.

For some positive interference value δ, a pair of towers i and j (where $0 \leq i < j \leq N-1$) can communicate with each other if and only if there is an intermediary tower k, such that

- tower i is to the left of tower k and tower j is to the right of tower k, that is, $i < k < j$, and
- the heights of tower i and tower j are both at most $H[k] - \delta$ metres.

Pak Dengklek wants to lease some radio towers for his new radio network. Your task is to answer Q questions of Pak Dengklek which are of the following form: given parameters L, R and D ($0 \leq L \leq R \leq N-1$ and $D > 0$), what is the maximum number of towers Pak Dengklek can lease, assuming that

- Pak Dengklek can only lease towers with indices between L and R (inclusive), and
- the interference value δ is D, and
- any pair of radio towers that Pak Dengklek leases must be able to communicate with each other.

Note that two leased towers may communicate using an intermediary tower k, regardless of whether tower k is leased or not.

Implementation Details

You should implement the following procedures:

```
void init(int N, int[] H)
```

- N: the number of radio towers.
- H: an array of length N describing the tower heights.
- This procedure is called exactly once, before any calls to `max_towers`.

```
int max_towers(int L, int R, int D)
```

- L, R: the boundaries of a range of towers.
- D: the value of δ.

- This procedure should return the maximum number of radio towers Pak Dengklek can lease for his new radio network if he is only allowed to lease towers between tower L and tower R (inclusive) and the value of δ is D.
- This procedure is called exactly Q times.

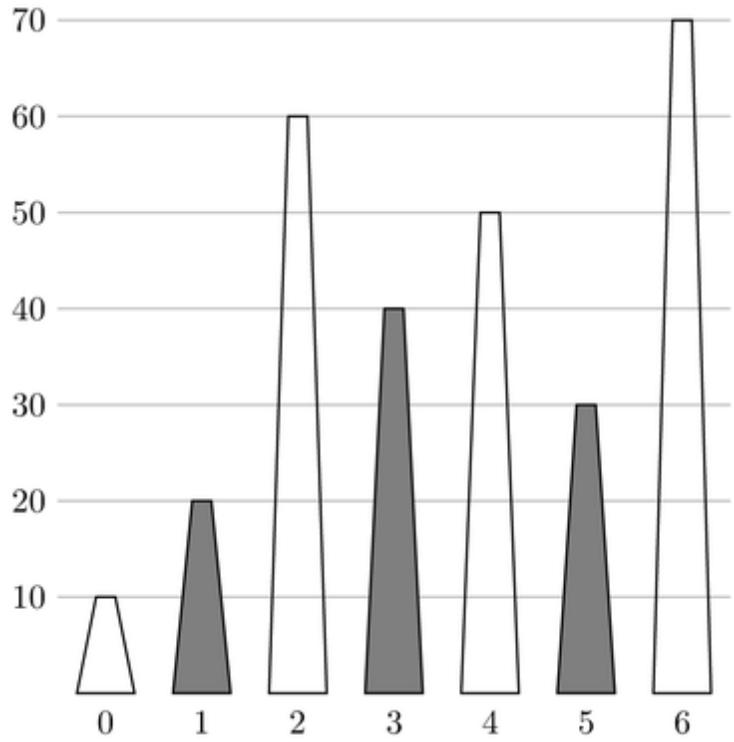
Example

Consider the following sequence of calls:

```
init(7, [10, 20, 60, 40, 50, 30, 70])
```

```
max_towers(1, 5, 10)
```

Pak Dengklek can lease towers 1, 3, and 5. The example is illustrated in the following picture, where shaded trapezoids represent leased towers.



Towers 3 and 5 can communicate using tower 4 as an intermediary, since $40 \leq 50 - 10$ and $30 \leq 50 - 10$. Towers 1 and 3 can communicate using tower 2 as an intermediary. Towers 1 and 5 can communicate using tower 3 as an intermediary. There is no way to lease more than 3 towers, therefore the procedure should return 3.

```
max_towers(2, 2, 100)
```

There is only 1 tower in the range, thus Pak Dengklek can only lease 1 tower. Therefore the procedure should return 1.

```
max_towers(0, 6, 17)
```

Pak Dengklek can lease towers 1 and 3. Towers 1 and 3 can communicate using tower 2 as an intermediary, since $20 \leq 60 - 17$ and $40 \leq 60 - 17$. There is no way to lease more than 2 towers, therefore the procedure should return 2.

Constraints

- $1 \leq N \leq 100\,000$
- $1 \leq Q \leq 100\,000$
- $1 \leq H[i] \leq 10^9$ (for each i such that $0 \leq i \leq N - 1$)
- $H[i] \neq H[j]$ (for each i and j such that $0 \leq i < j \leq N - 1$)
- $0 \leq L \leq R \leq N - 1$
- $1 \leq D \leq 10^9$

Subtasks

1. (4 points) There exists a tower k ($0 \leq k \leq N - 1$) such that
    - for each i such that $0 \leq i \leq k - 1$: $H[i] < H[i + 1]$, and
    - for each i such that $k \leq i \leq N - 2$: $H[i] > H[i + 1]$.
2. (11 points) $Q = 1$, $N \leq 2000$
3. (12 points) $Q = 1$
4. (14 points) $D = 1$
5. (17 points) $L = 0$, $R = N - 1$
6. (19 points) The value of D is the same across all `max_towers` calls.
7. (23 points) No additional constraints.

Sample Grader

The sample grader reads the input in the following format:

- line 1: N Q
- line 2: $H[0]$ $H[1]$ $\ldots$ $H[N - 1]$
- line $3 + j$ ($0 \leq j \leq Q - 1$): L R D for question j

The sample grader prints your answers in the following format:

- line $1 + j$ ($0 \leq j \leq Q - 1$): the return value of `max_towers` for question j