

Problem B

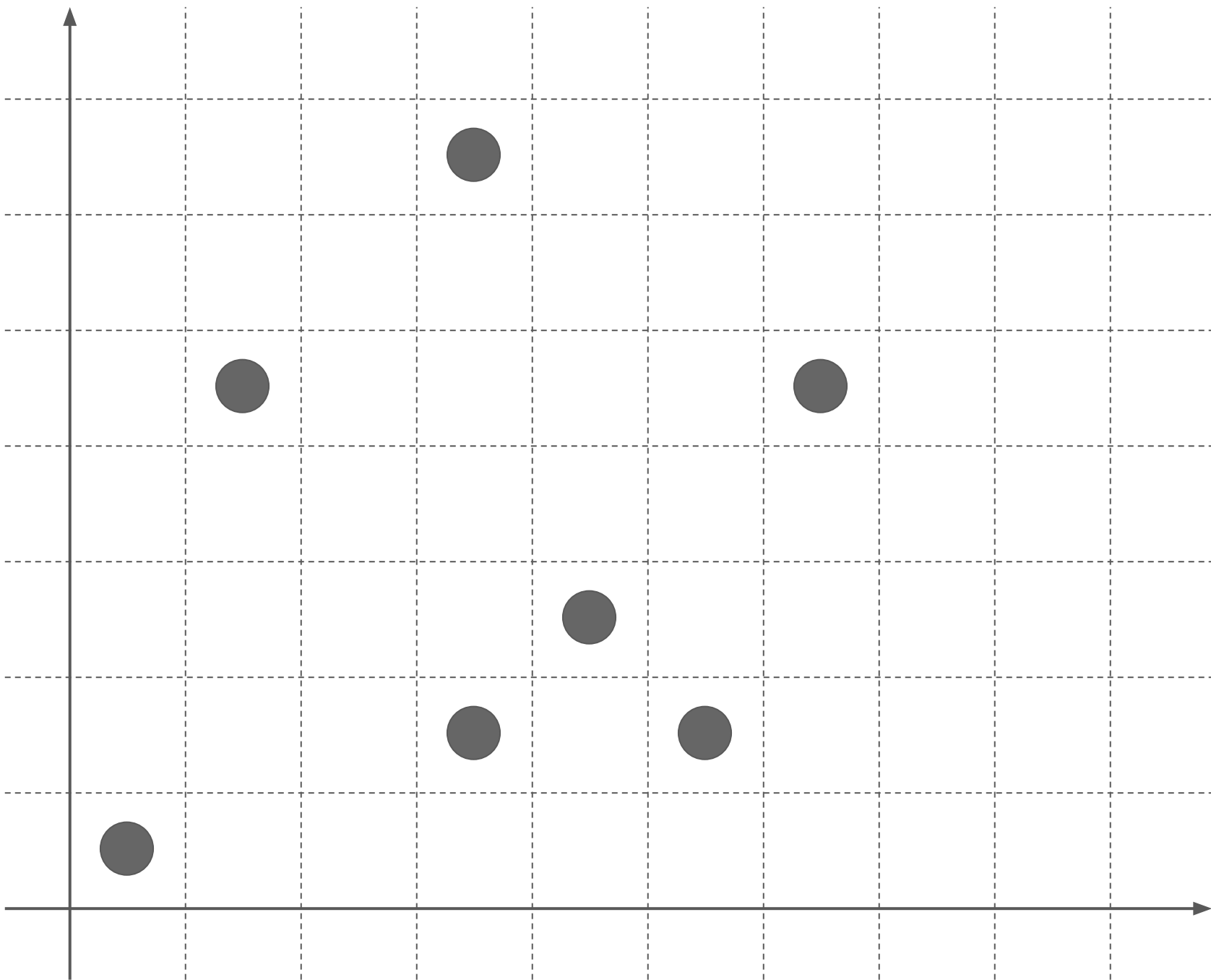
Buffalo Barricades

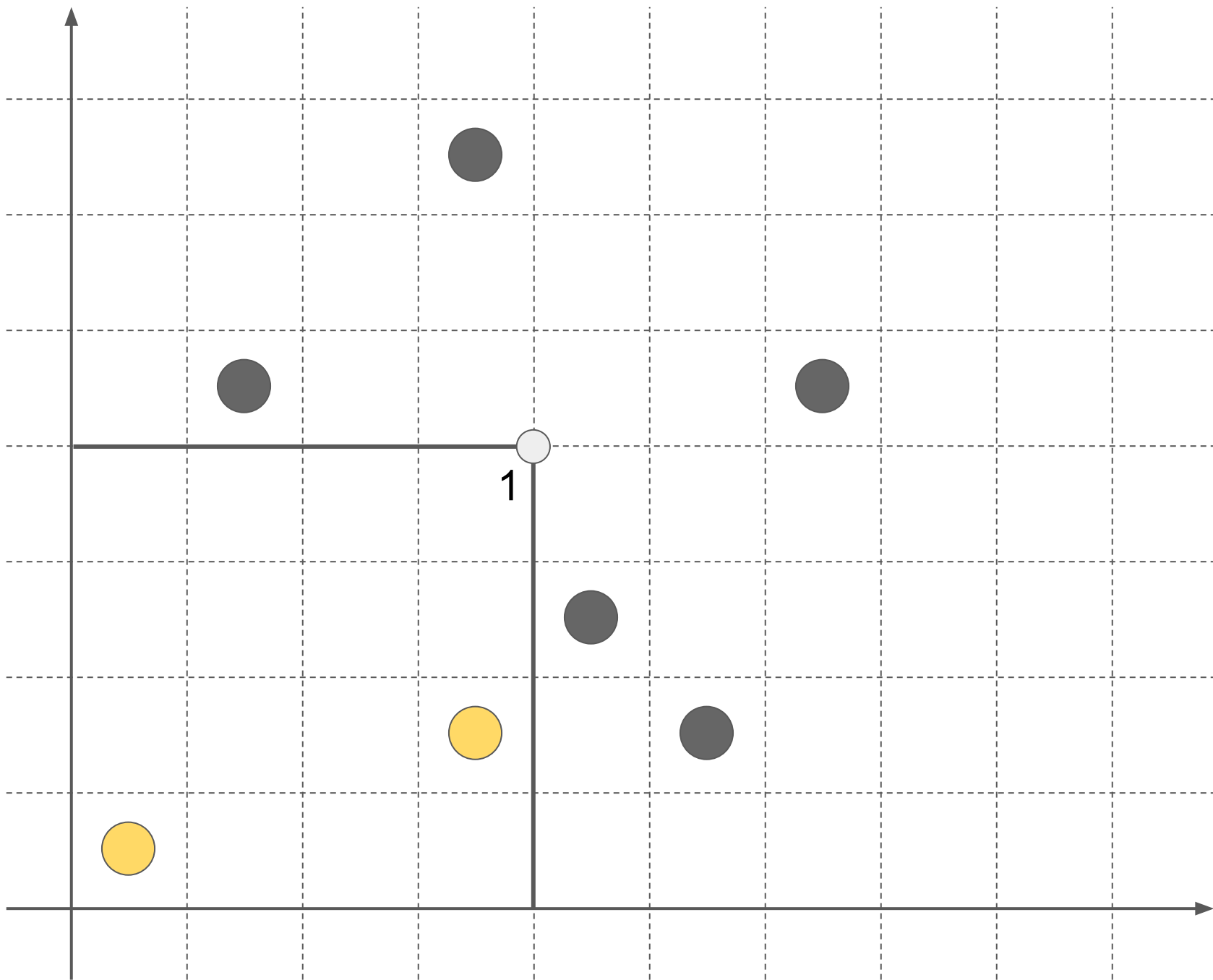
Submits: 17

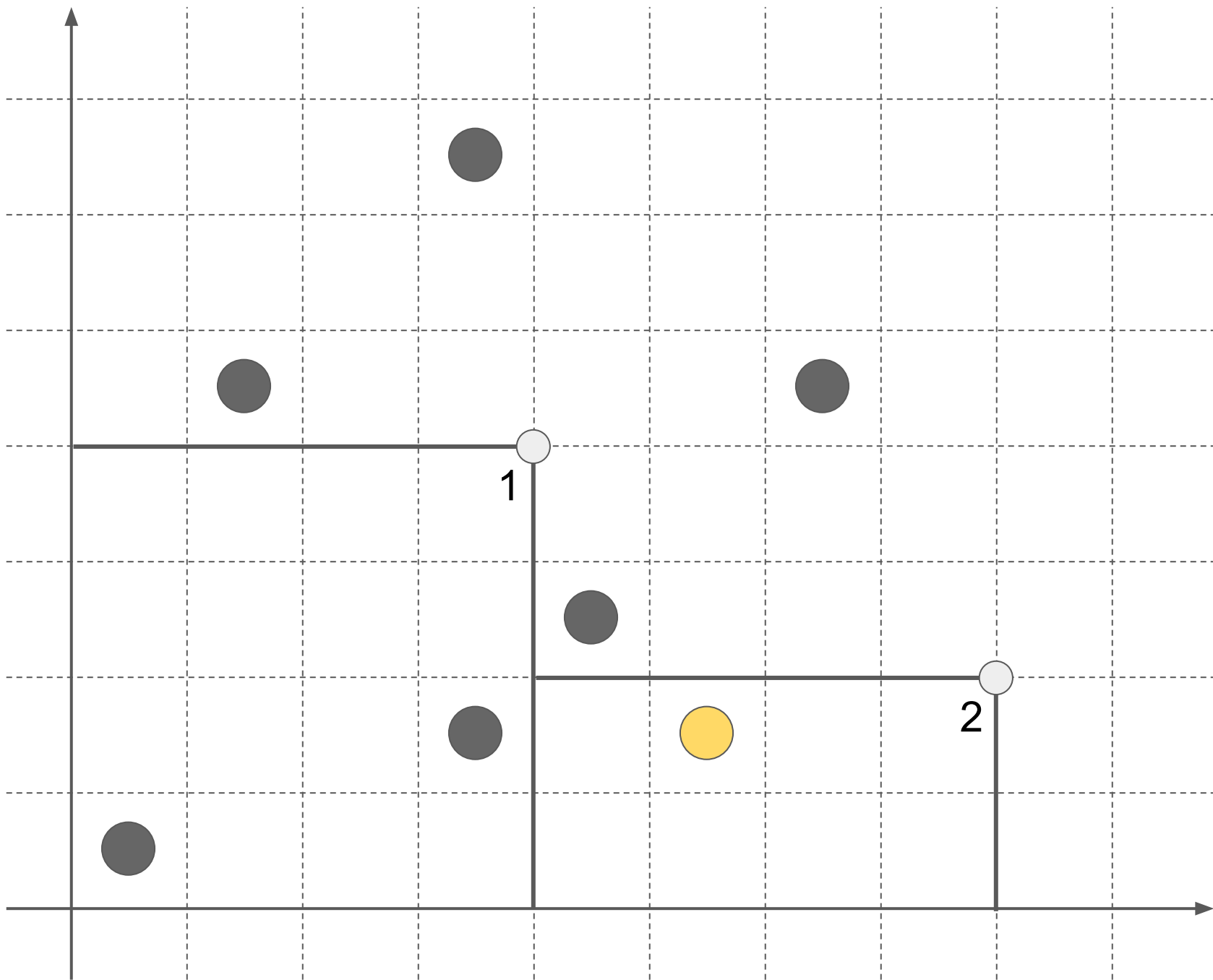
Accepted: at least 1

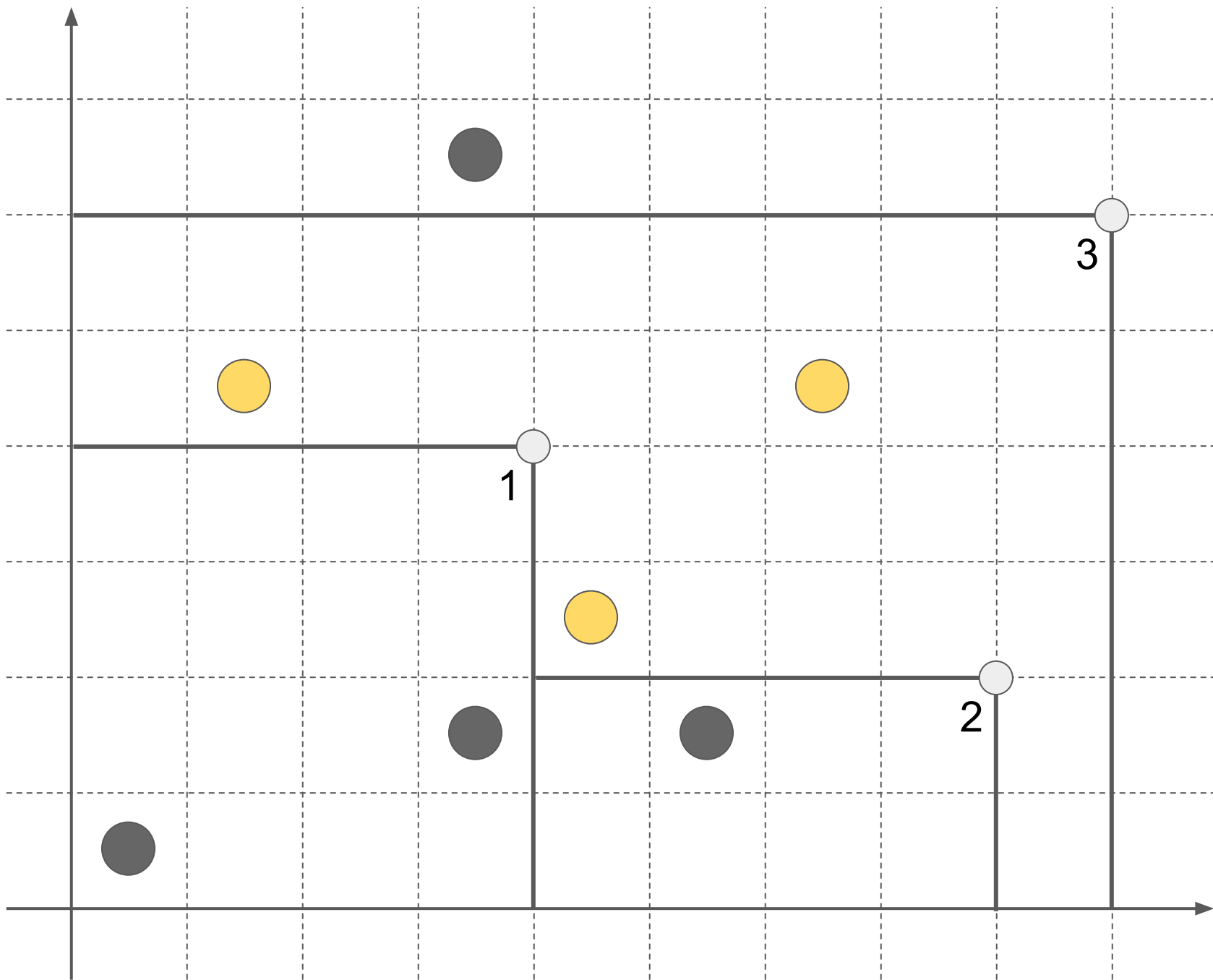
First solved by: UW1
University of Warsaw
(Dębowski, Radecki, Sommer)
02:40:43

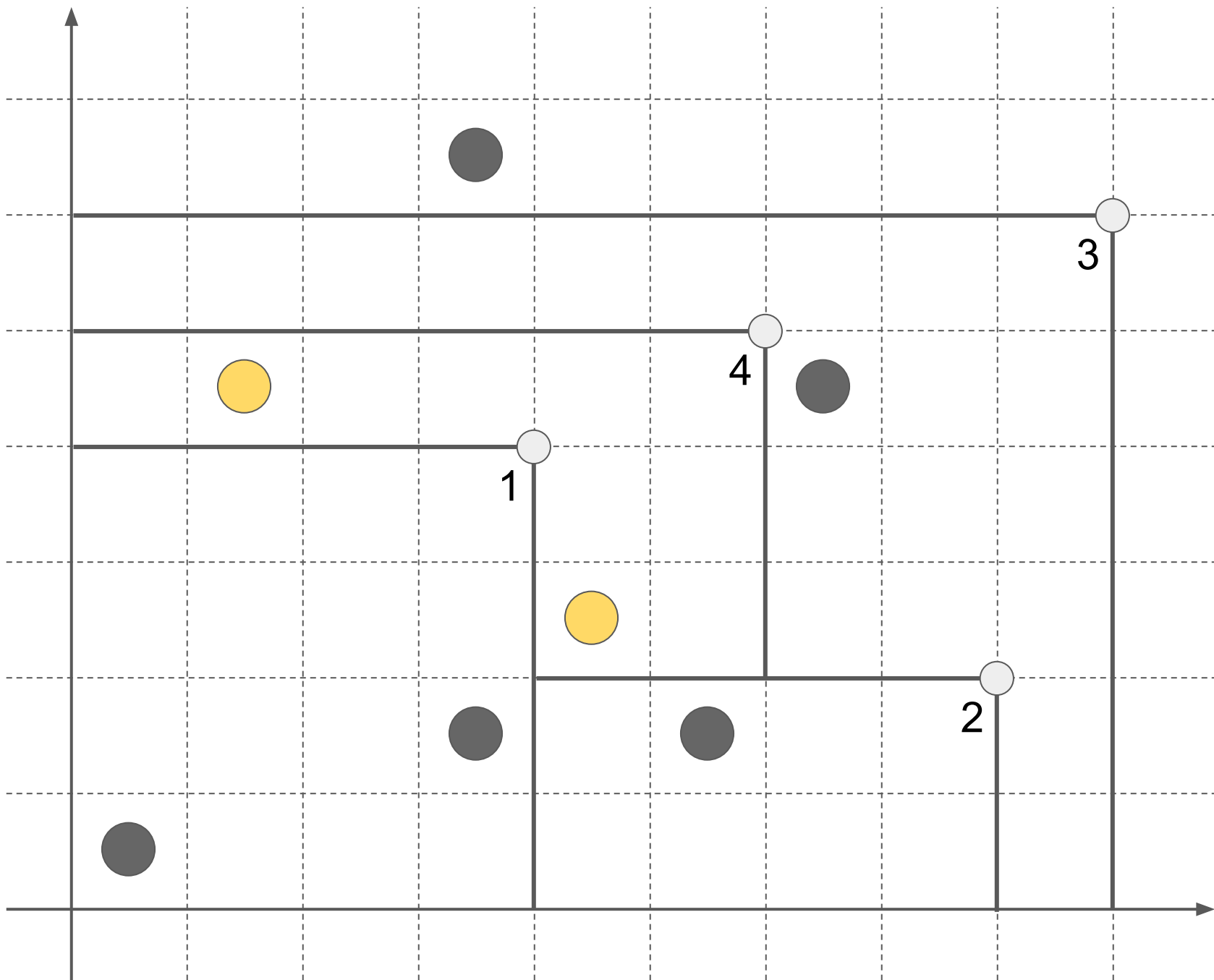
Author: Luka Kalinović











High level algorithm:

- 1) Identify the regions at the end, when all fences are up.
- 2) Count the buffalos in each region.
- 3) Work backwards, removing fences and merging the two regions that become one (using the standard union-find algorithm). Prior to the fence removal we simply record the current number of buffalos in the region to output later.

We'll do 1) and 2) together in a single pass of a sweep-line algorithm. In addition to that, we'll also compute the ids of regions that need to be merged in step 3) at each fence removal.

Sweep-line algorithm overview:

We process fence posts and buffalos in order of decreasing y coordinate.

At each step we maintain a set of "active" vertical fences that have not yet hit another horizontal fence.

a) When we encounter a buffalo, we find the closest active fence to the right, that's the fence of a region containing the buffalo at the end.

Sweep-line algorithm overview:

We process fence posts and buffalos in order of decreasing y coordinate.

At each step we maintain a set of "active" vertical fences that have not yet hit another horizontal fence.

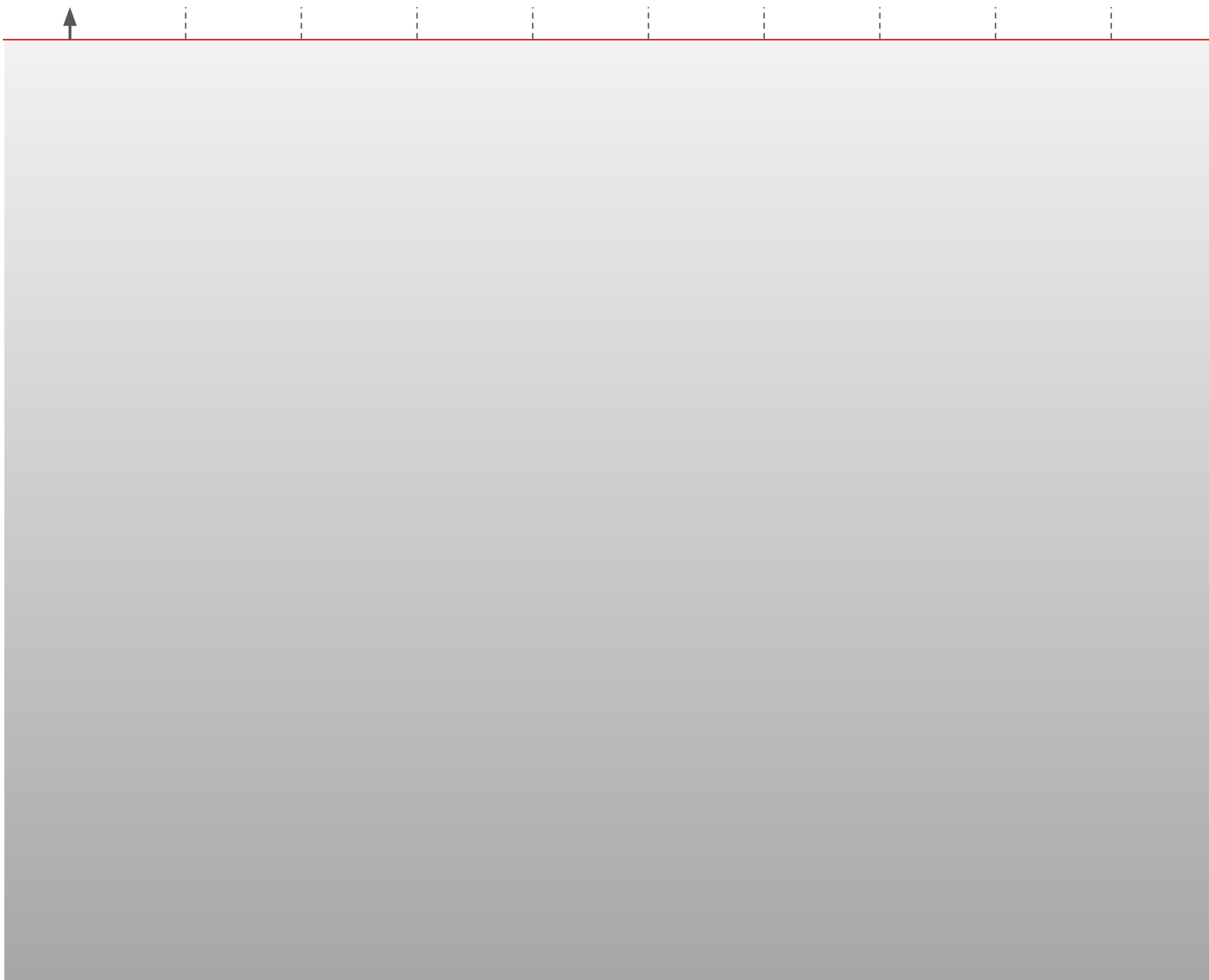
b) When we encounter a fence, we find the neighboring region that it will get merged with when the fence is removed the same way: it's the first active fence to the right.

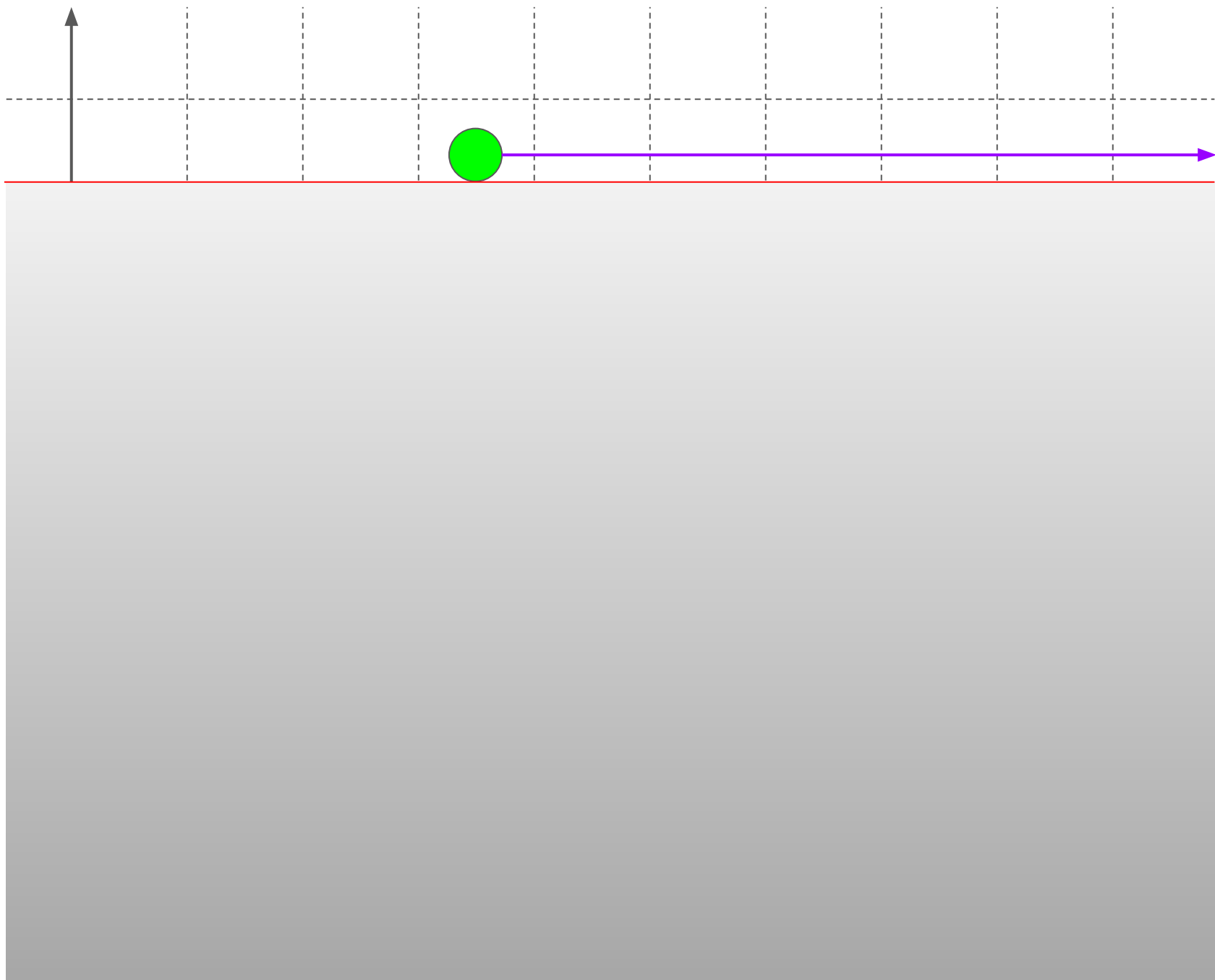
Sweep-line algorithm overview:

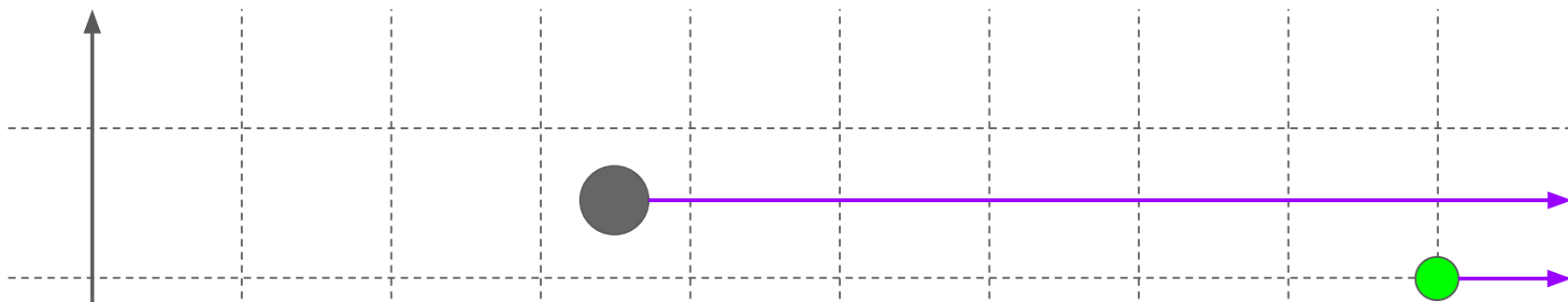
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At each step we maintain a set of "active" vertical fences that have not yet hit another horizontal fence.

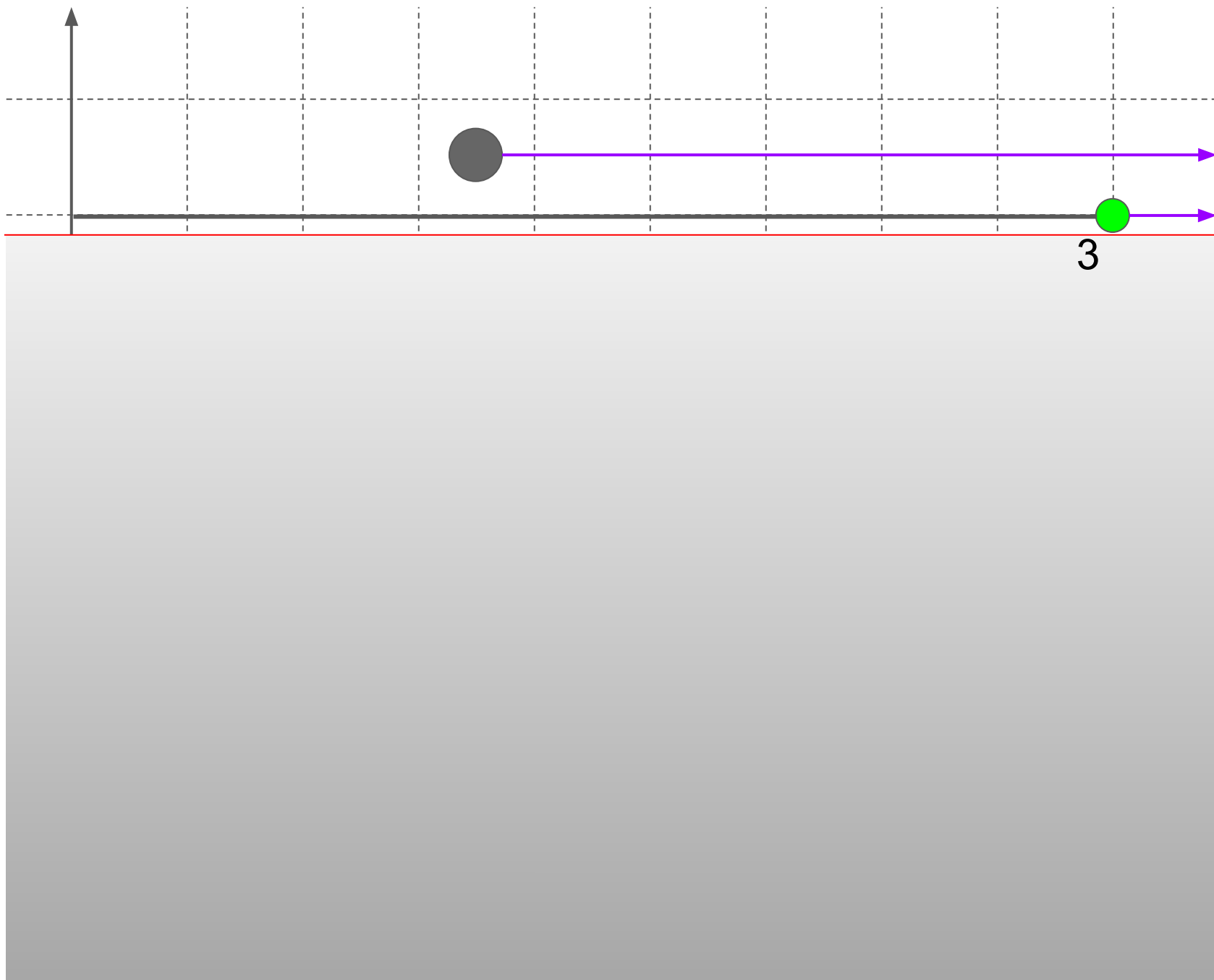
c) We also erect the horizontal fence starting from the fence post going to the left. Our fence will hit the first active fence to the left that has a smaller index (i.e. was erected prior to this fence). Other vertical fences we encounter along the way will, in turn, hit the horizontal fence we are building, so we remove them from the active set.

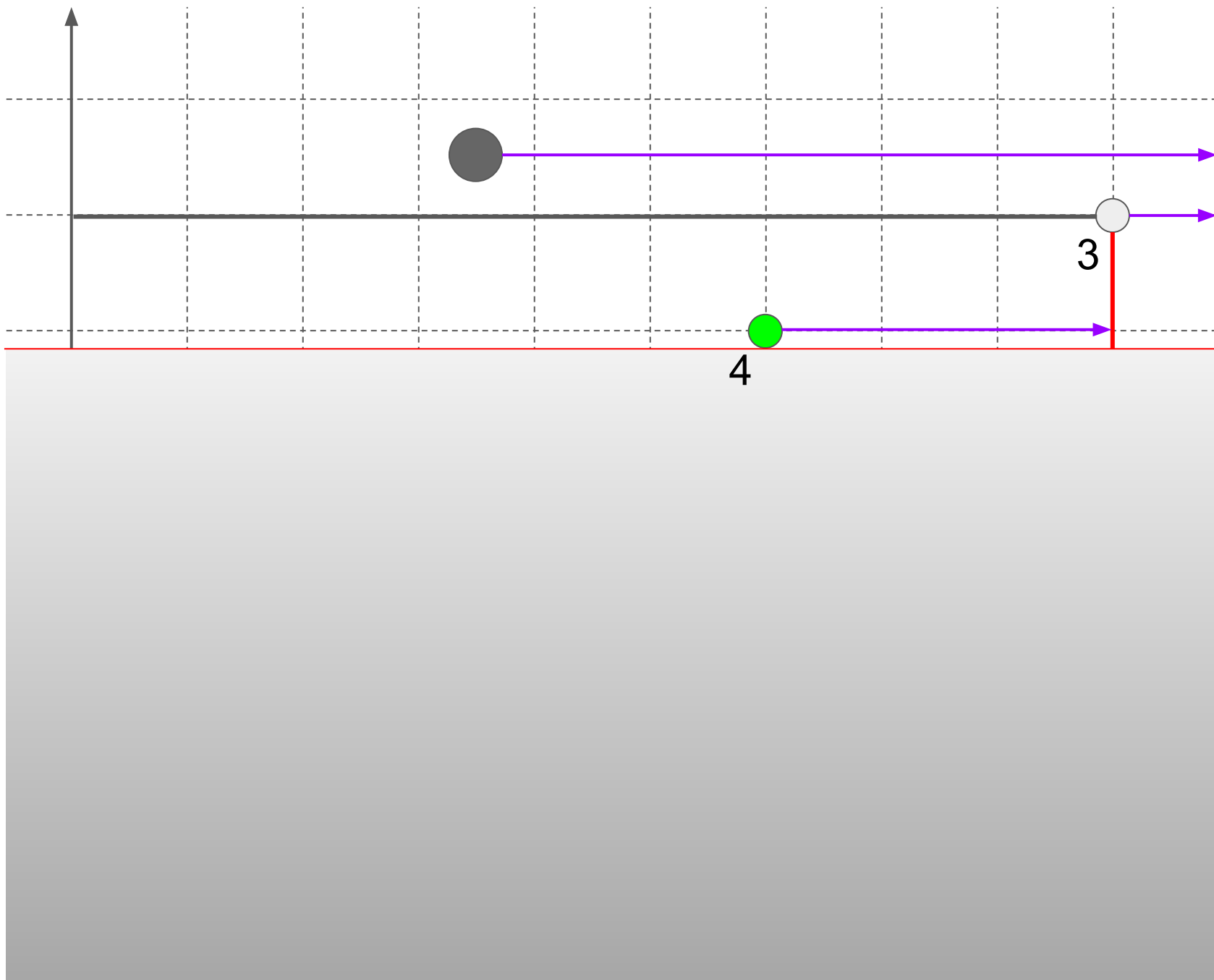


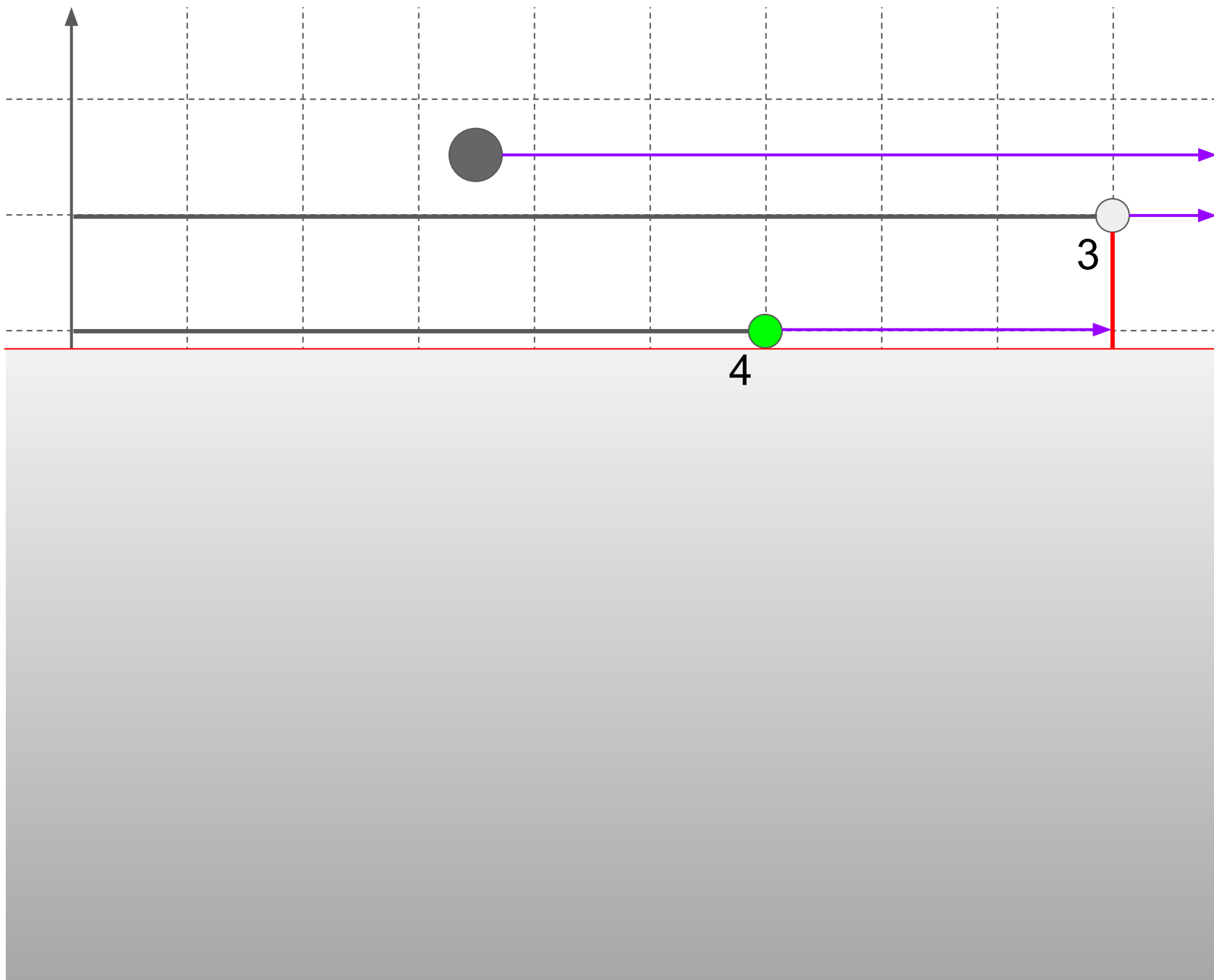


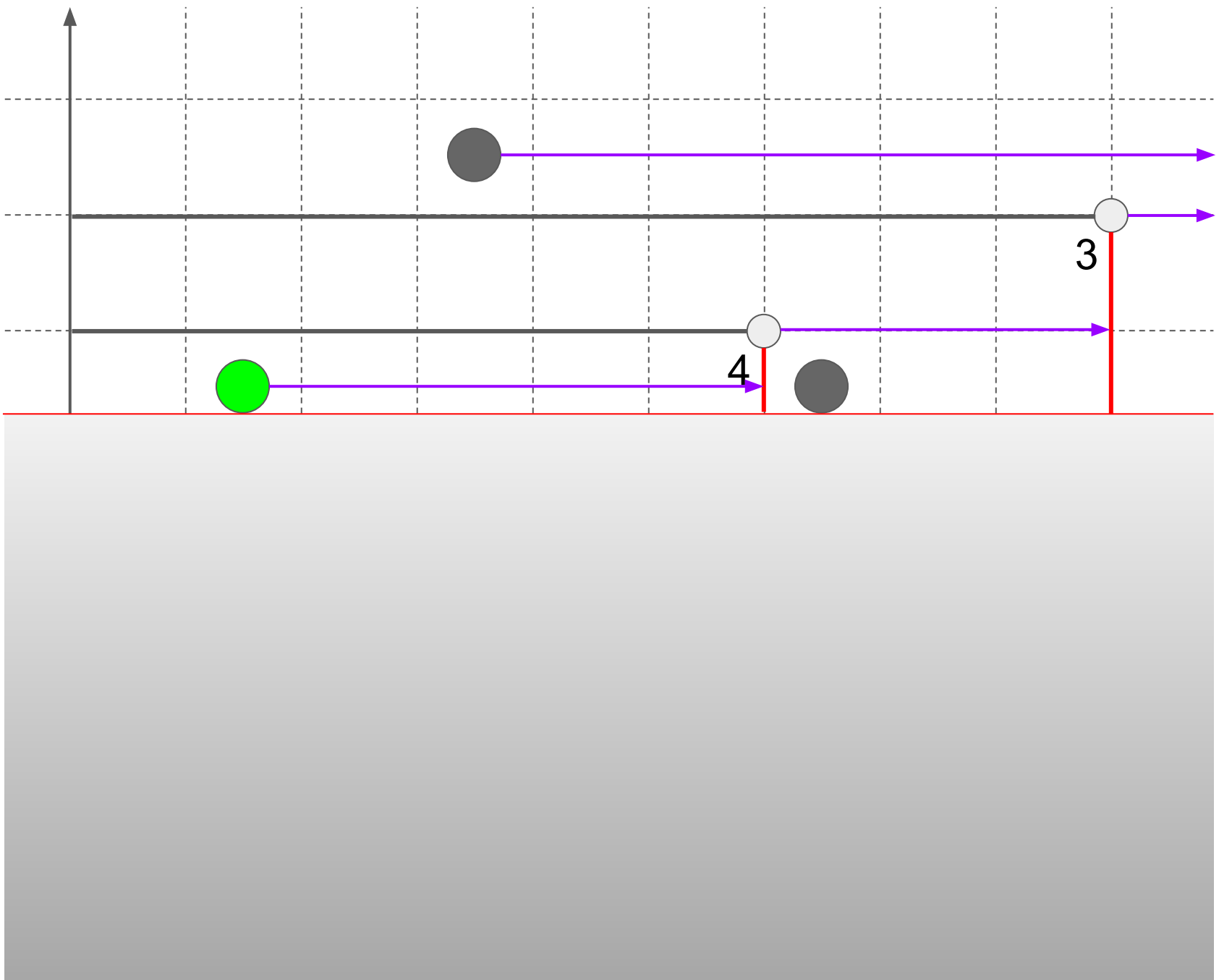


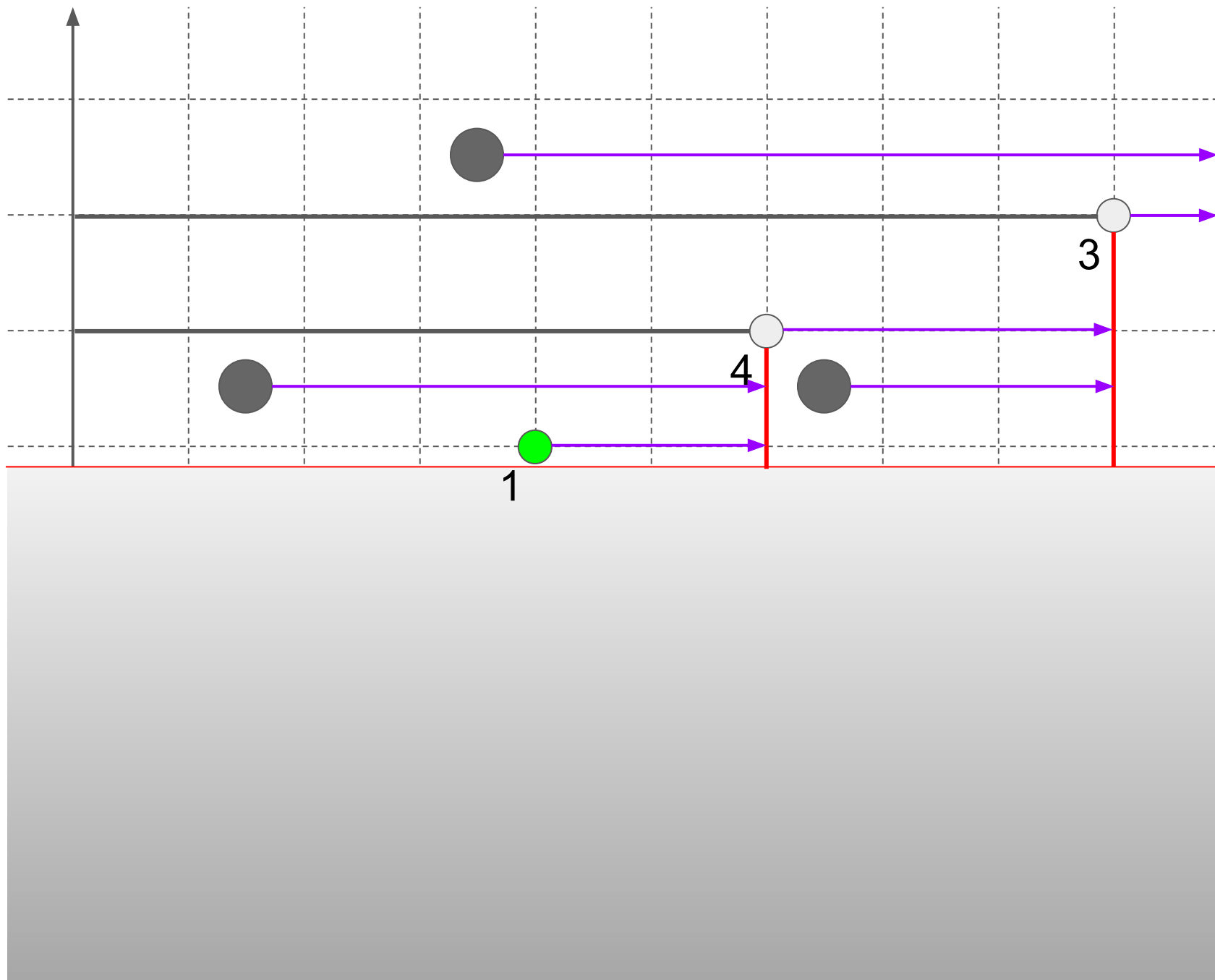
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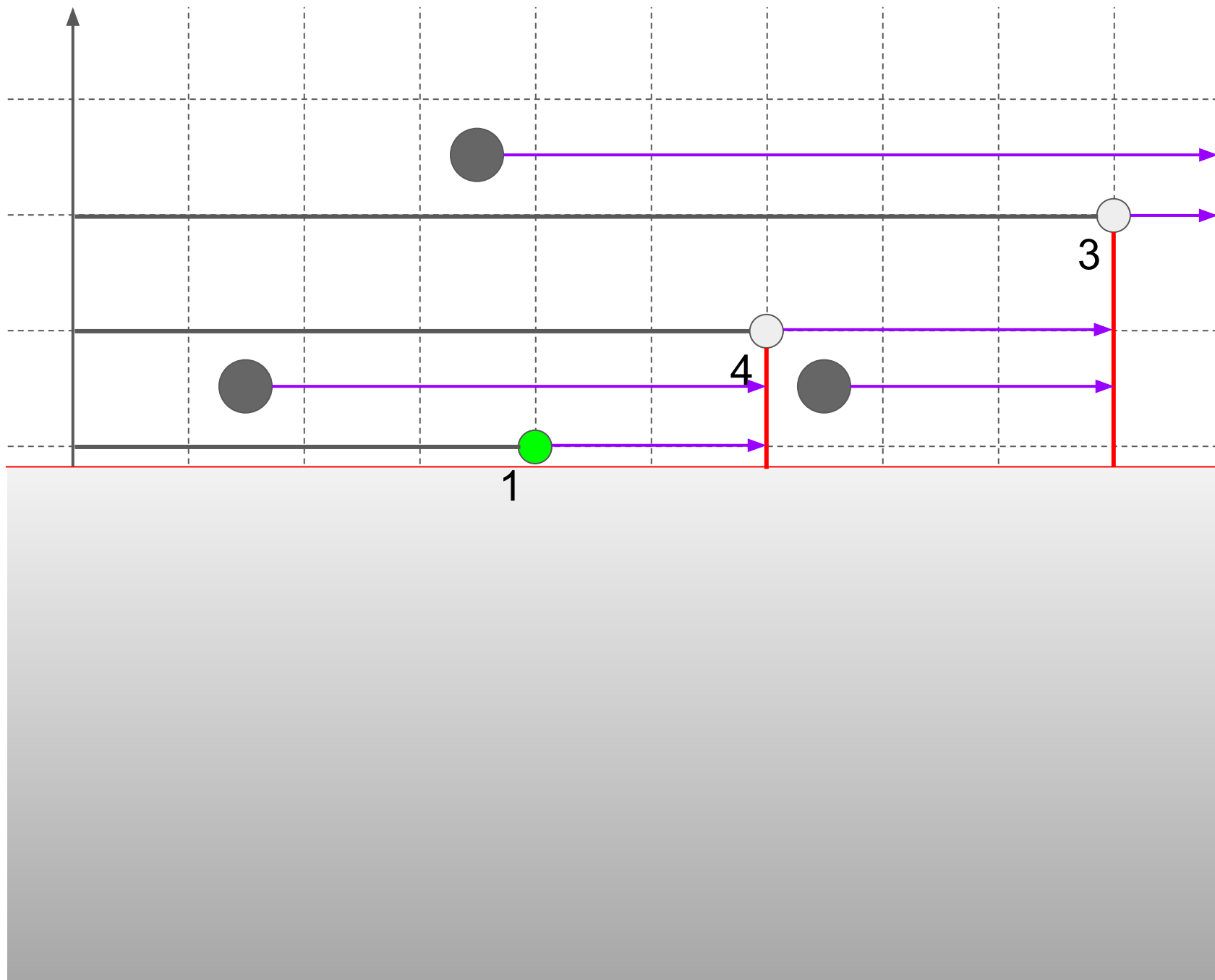


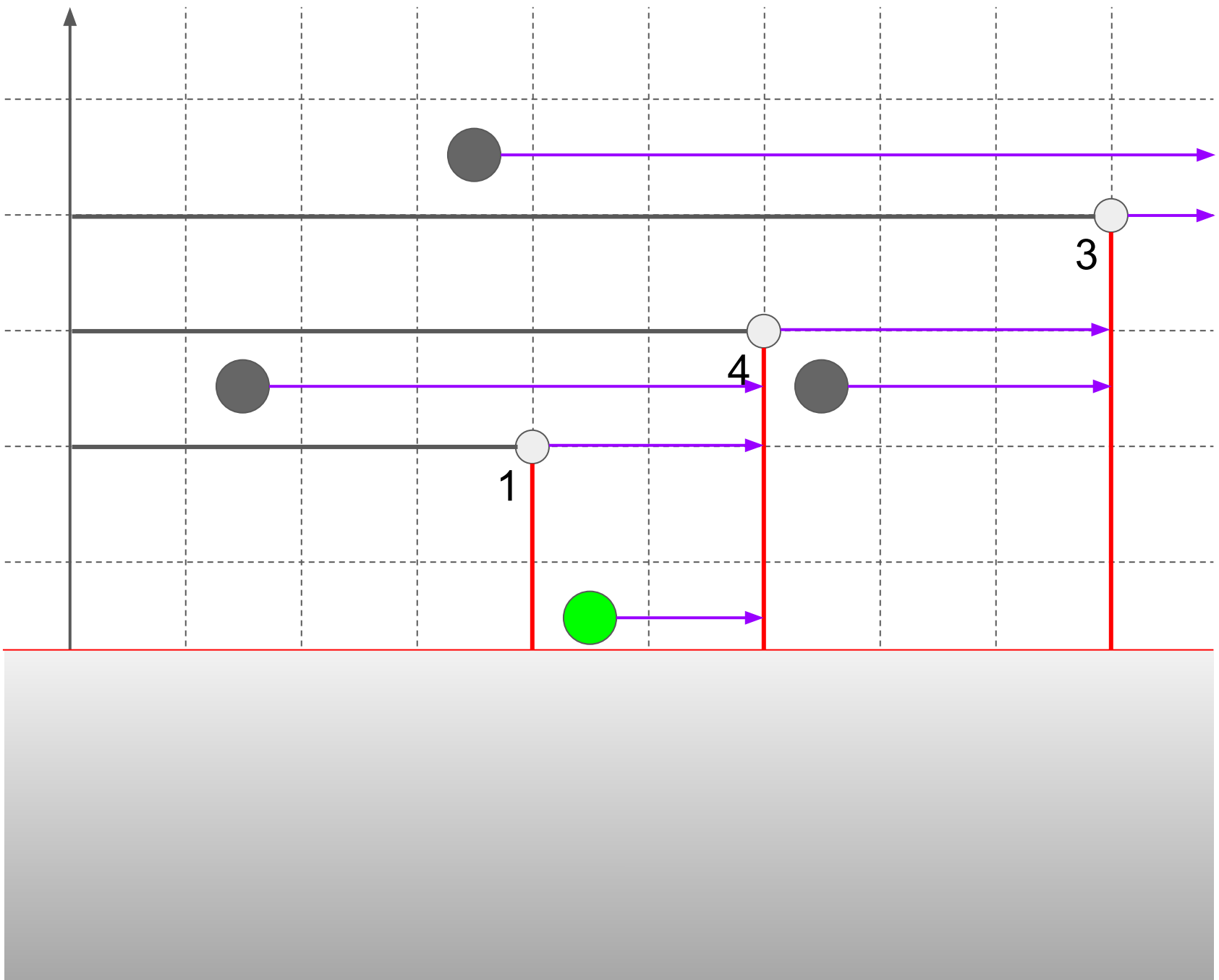


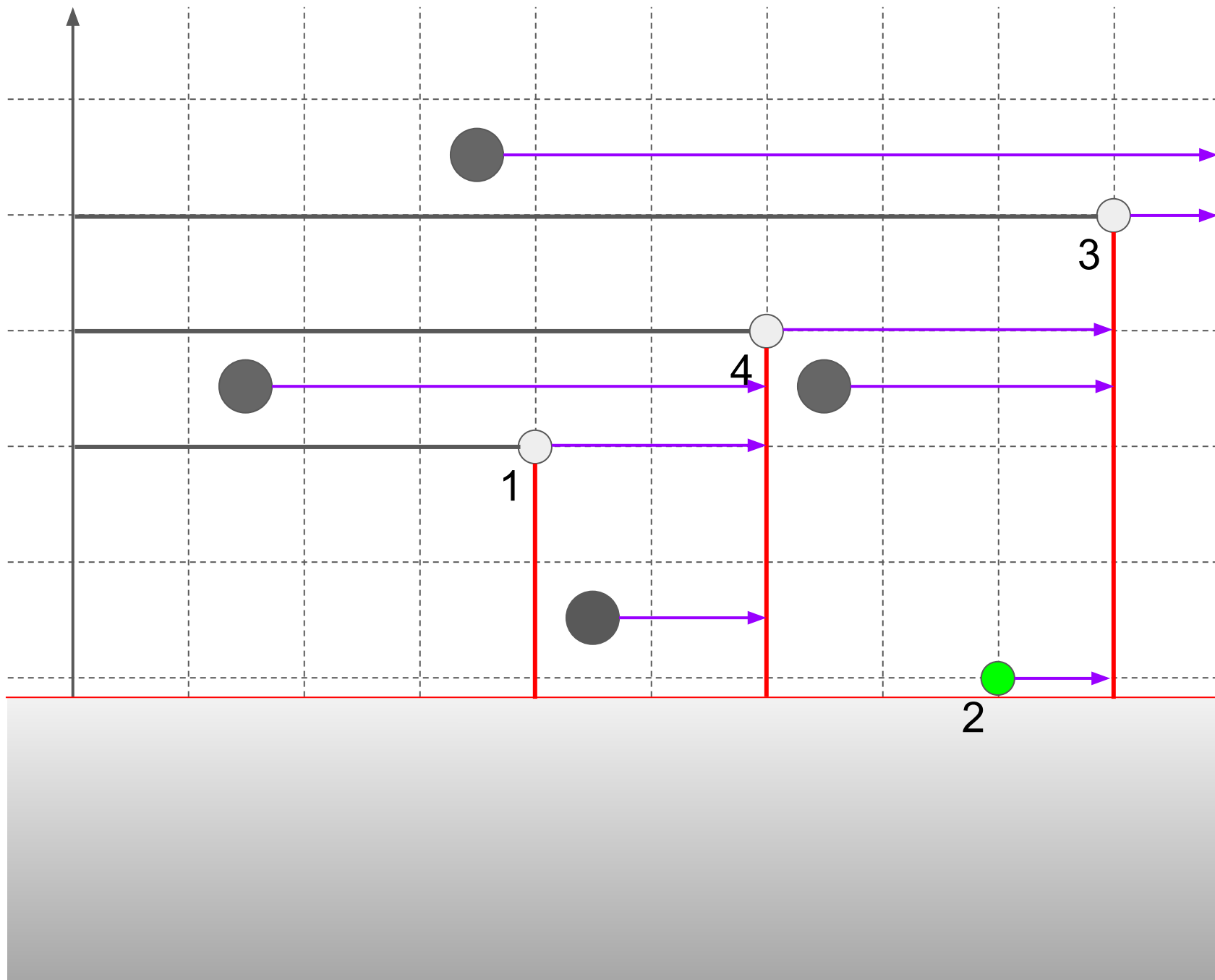


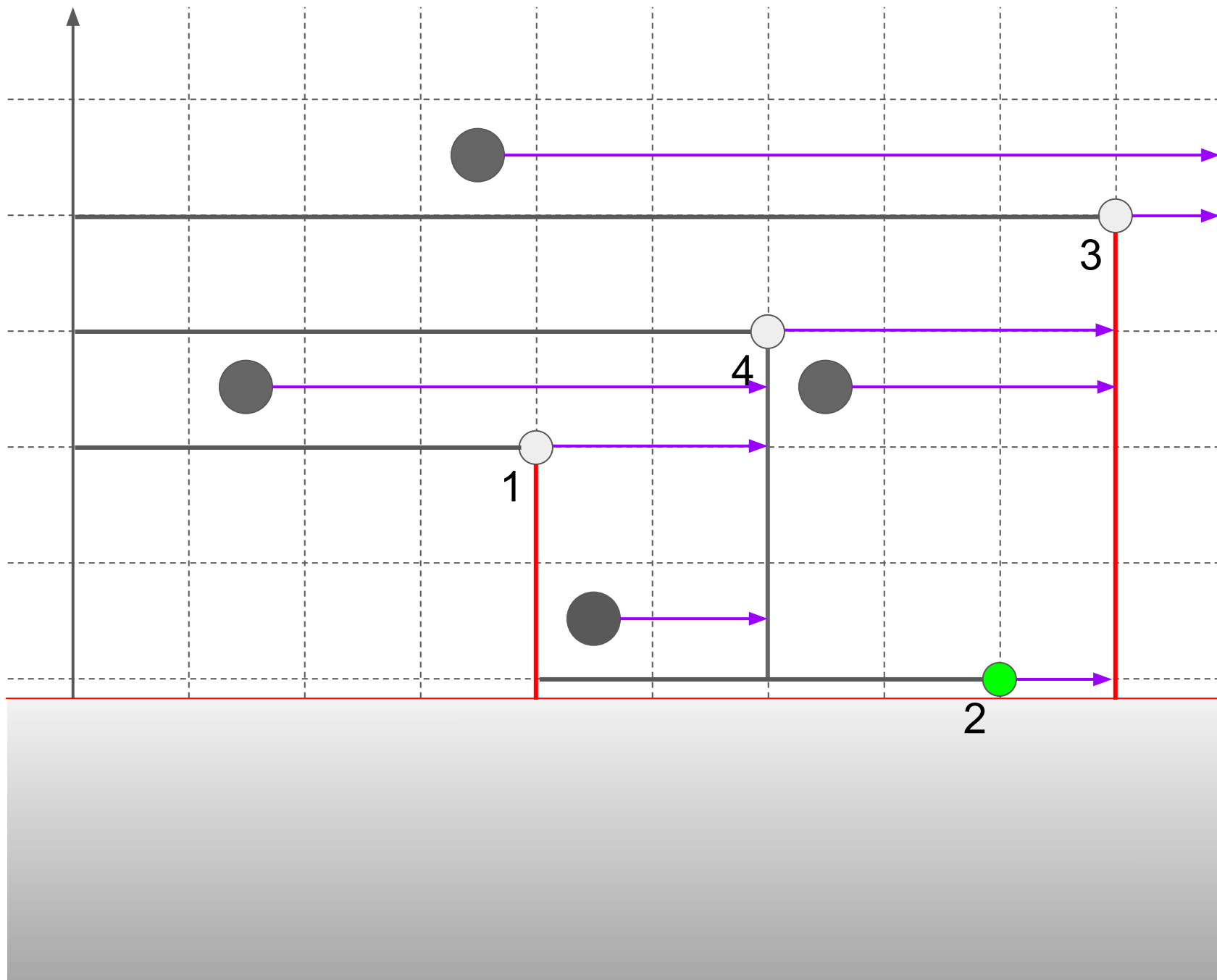


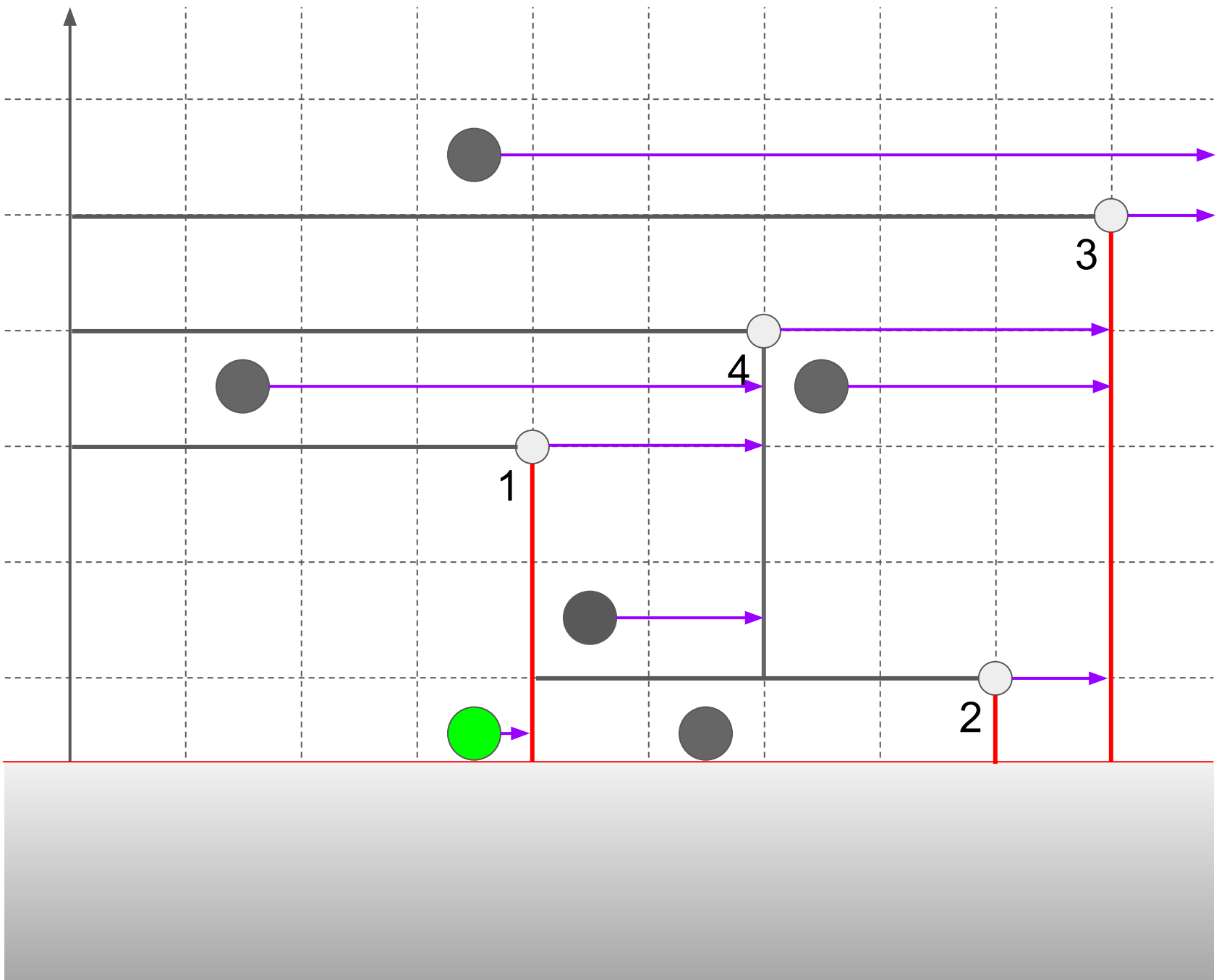


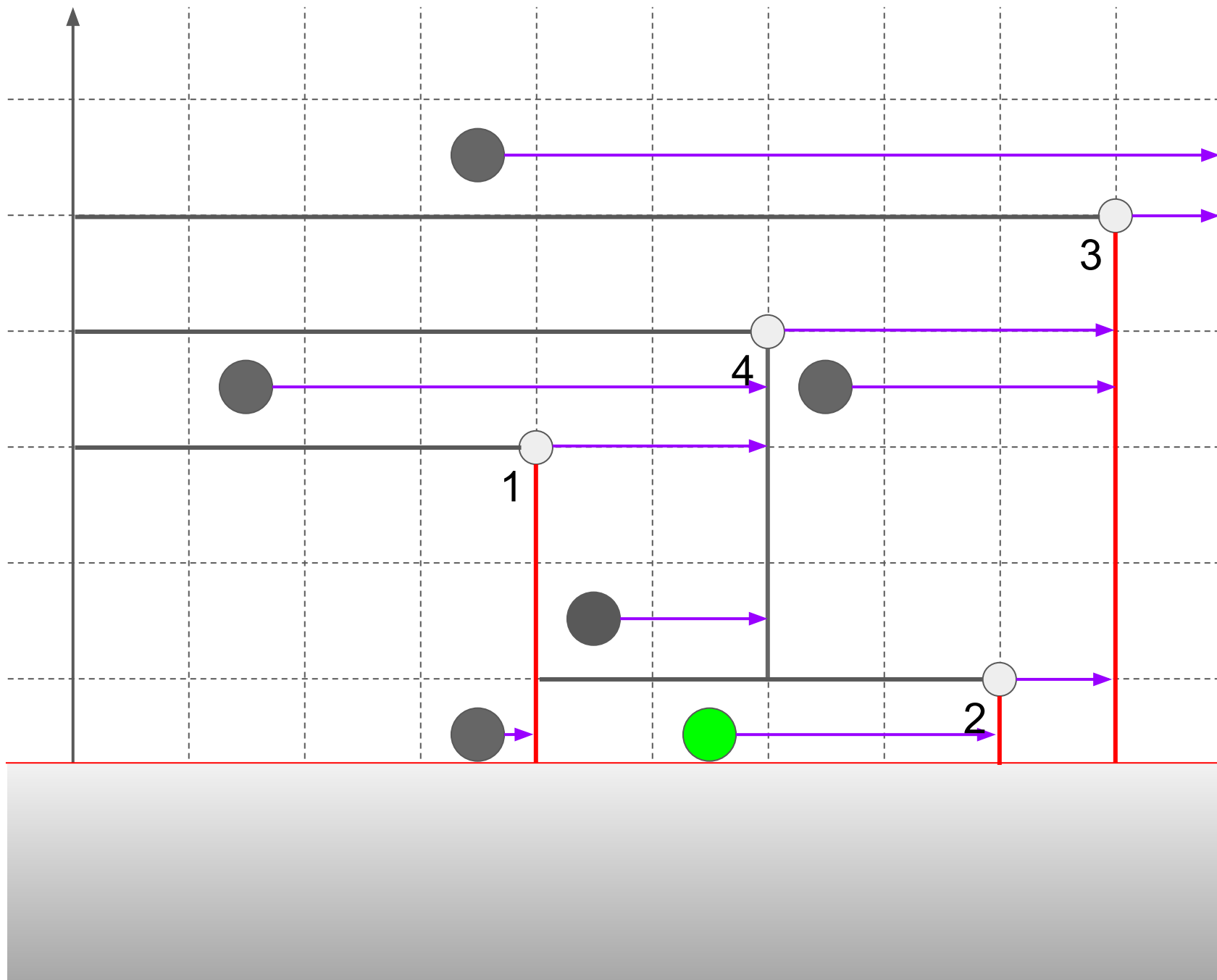


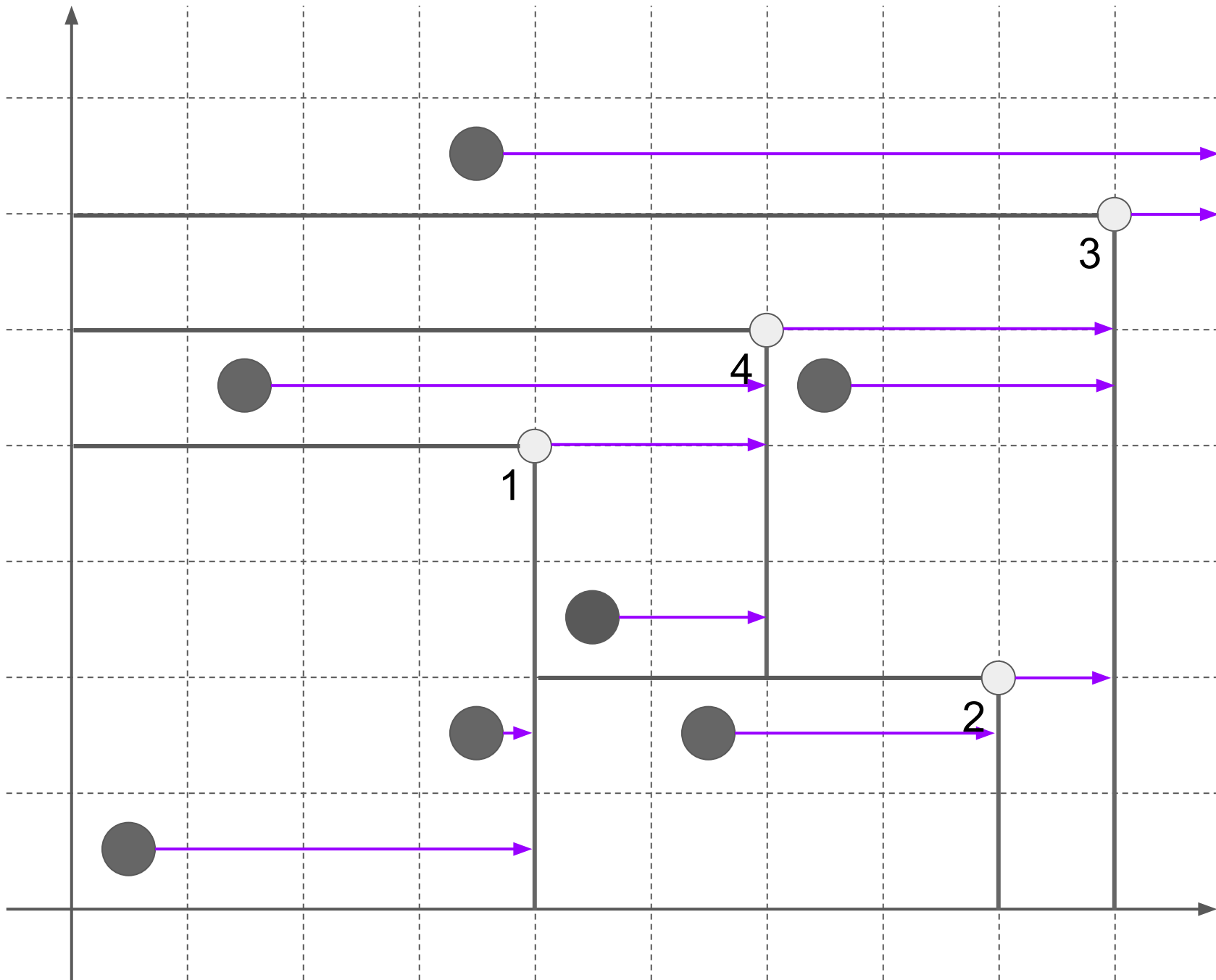












Complexity $O((N + M) \log (N + M))$