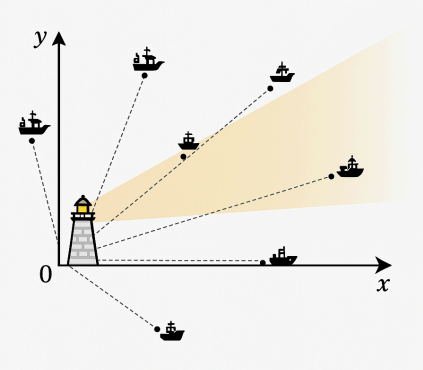
# Lighthouses

After decades of operating his lighthouse, your grandfather decides to pass its operations down to you. You gratefully accept and become the new primary keeper of the lighthouse. But this is no ordinary lighthouse. As you start your first day of work, you find a set of symbols scrawled on a worn piece of paper that looks as though it has been passed down for ages: a triangle, an arrow, and a line of ships. When you ask your grandfather about it, he reveals that, “This lighthouse doesn’t just shine light. It decides who sails home first.”




You soon discover the lighthouse beam rotates counterclockwise from a fixed starting direction, and it must be used to signal docking priority to incoming ships. The ships’ positions are scattered across the sea, and the docking sequence must be carefully determined based on precise rules.

The area around the lighthouse is also subject to varying levels of fog and visibility. As such, the beam’s strength will vary. The lighthouse will always be positioned at (0,0) with varying strengths of its beam $R$ which describes the radius in which a ship can be detected. Due to fog and equipment constraints, the lighthouse can only process a limited number of ships at a time. The beam sweeps through ships in small batches called “runs”, and within each run, it determines the local docking order.

Your task is to rotate the lighthouse beam counterclockwise starting from its initial position, and determine the correct docking order of all ships based on:

- **Angle from the beam** — Ships are ordered by the direction they appear in, rotating counterclockwise from where the lighthouse beam starts. As ships are revealed, they are placed in order to dock.
- **Distance to the lighthouse** — If two ships are discovered on the same angle, the one that is physically closer to the lighthouse should dock first. If a ship is outside of the radius of the beam, it will not be detected.
- **Original order (stability)** — If two ships are in the exact same position, they should dock in the same order they appeared in the list. Never change their order unless you absolutely need to.

In order to honor your grandfather and the generations of lighthouse keepers before you, you prepare the beacon for its first night at work. Will you be a worthy keeper of the light?

**Input**

The first line of input will contain the number of ships at sea, $s \leq 2^{20}$, and the number of queries $q \leq 2^{20}$.

The next *s* lines will contain *x*, *y*, *n* which are the coordinates and name associated with each ship respectively.

The final *q* lines will contain a search radius *r* which describes the strength of the lighthouse beam.

**Output**

For each query, output only the ships detected by the beam within the query area ordered by: Angle from the starting beam direction (counterclockwise), Distance to the lighthouse (closer ships first for the same angle), Original input order (if exact position is the same).

If a ship is outside the beam radius, it should be ignored.
If a ship lies exactly on the border of the query area, it is considered inside.

For each query, output the names of the qualifying ships in one line, comma-separated, in the correct docking order.

If there are no qualifying ships, output -1

**Sample Input:**

```
5 3
1 3 The Salty Minnow
-2 3 Ol' Nellie
3 1 Baitshop
5 0 Flipper
3 5 Lady of the Sea
4
5
3.5
2
```

**Sample Output:**

```
Baitshop, The Salty Minnow, Ol' Nellie
Flipper, Baitshop, The Salty Minnow, Ol' Nellie
Baitshop, The Salty Minnow
-1
```