Problem G
Goal-line Technology

The 2022 FIFA World Cup is ongoing in Qatar. This year, a lot of new technologies are used to assist referees in eliminating most controversal decisions.

Figure G.1: World Cup 2010 incident

English fans will never forget the incident in the match against Germany in 2010. The shot of Frank Lampard made the ball crossed the goal-line but the referees did not realize it and did not give a goal to England. This incident also led to the developement of the goal-line technology. This technology determines whether the whole of the ball has crossed the goal-line.

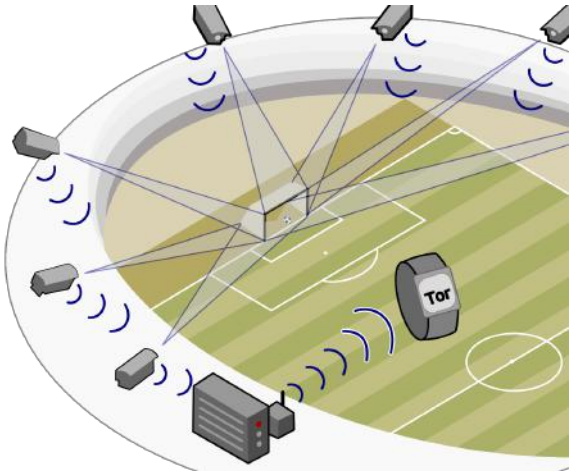


Figure G.2: Goal-line Technology Settings

The technology consists of 14 high-speed cameras mounted around the stadium. The high-speed cameras track the ball with high accuracy and use *triangulation* to calculate its precise position relative to the goal-line. Triangulation is a geometric technique of calculating the distance and position to and of, respectively, an unknown point with the help of two known points. As the name suggests, the system forms a triangle between these three points and uses the angles between them to determine the whereabouts of the third unknown. The system software then creates a 3D image of the ball relative to the line.

In the football law, it is stated that:

> A goal is scored when the whole of the ball passes over the goal-line, between the goalposts and under the crossbar, provided that no offence has been committed by the team scoring the goal.

Mathematically speaking, consider the top-down projection of the ball and the goal. The ball should be a circle B. The goal-line is the area S bounded by 2 parallel lines $x = x_1$ and $x = x_2$ ($x_1 \neq x_2$). These 2 lines split the whole plane into 3 parts:

- The *goal-line* is the area bounded by these 2 lines;
- The *in-goal side* is the area adjacent to line $x = x_1$;
- The remaining one is the *in-play side*.

It is a goal if there is a moment where the ball is completely inside the *in-goal side*. In other words, these conditions hold:

- The common area of B and the *goal-line* is 0;
- The common area of B and the *in-play side* is 0.

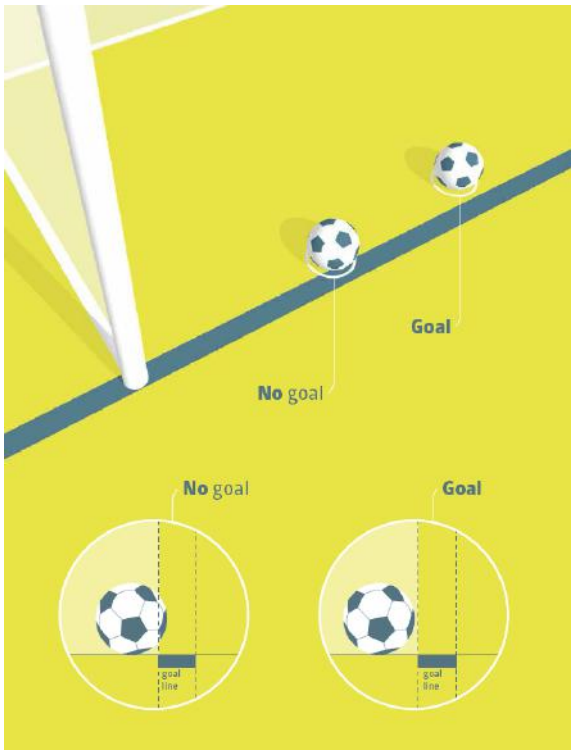


Figure G.3: No Goal vs Goal

In this problem, we only care about the relative position of the ball to the goal line, thus we only consider the x coordinate and ignore the y and z coordinates. The movement of the ball was tracked by the 14 cameras during some time-frames, resulting in a list of n coordinates $p_1, p_2, \cdots, p_n$ where p_i is the x coordinate of the center of the ball captured at the i-th frame.

You are given the list p, the radius r of the ball, the position of the goal-line. Your task is to determine if it is a goal.

Input

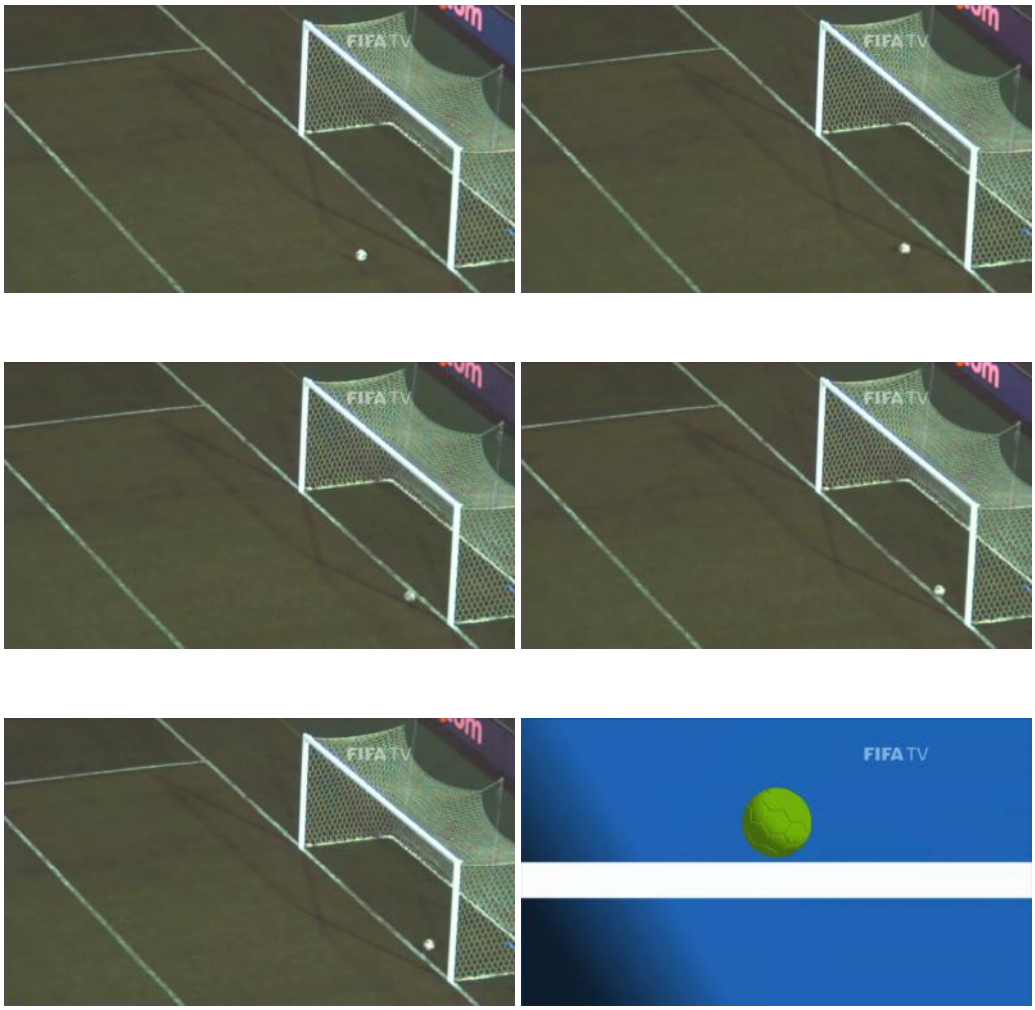
- The first line consists of 4 integers n, r, x_1, x_2 ($1 \leq n \leq 10^4$, $1 \leq r \leq 111$, $|x_1| \leq 10^6$, $|x_2| \leq 10^6$, $x_1 \neq x_2$).
- The second line consists of n integers $p_1, p_2, \cdots, p_n$ ($|p_i| \leq 10^6$).

Output

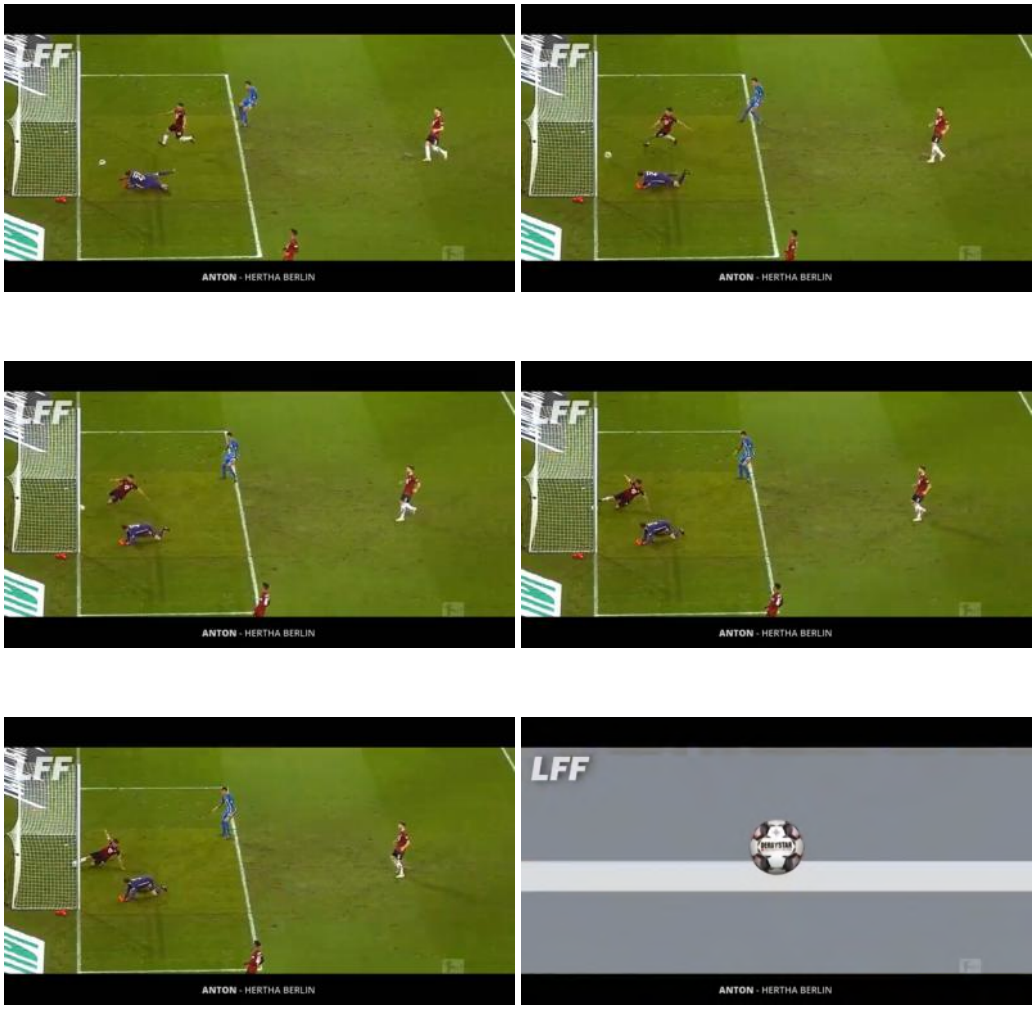
You should print `GOAL` if it is a goal, and print `NO GOAL` otherwise.

Explanation of the samples

In the first sample, the ball slowly rolls into the goal.



In the second one, the ball rolls into the empty goal but a defender has an exellent clearance.



In the last one, the ball does not move but it is inside the goal.

Sample Input 1

```
6 10 120 110
90 100 110 120 130 140
```

Sample Output 1

```
GOAL
```

Sample Input 2

```
8 10 0 10
10 4 -2 -8 -1 5 10 15
```

Sample Output 2

```
NO GOAL
```

Sample Input 3

```
1 1 2 3
1
```

Sample Output 3

```
GOAL
```