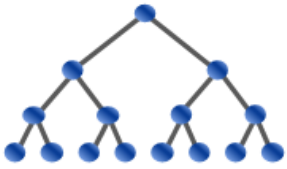

USACO 2024 US OPEN CONTEST, PLATINUM
PROBLEM 3. ACTIVATING ROBOTS

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Contest has ended.

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English (en)

You and a single robot are initially at point 0 on a circle with perimeter L ($1 \leq L \leq 10^9$). You can move either counterclockwise or clockwise along the circle at 1 unit per second. All movement in this problem is continuous.

Your goal is to place exactly $R-1$ robots such that at the end, every two consecutive robots are spaced L/R away from each other ($2 \leq R \leq 20$, R divides L). There are N ($1 \leq N \leq 10^5$) activation points, the ith of which is located a_i distance counterclockwise from 0 ($0 \leq a_i < L$). If you are currently at an activation point, you can instantaneously place a robot at that point. All robots (including the original) move counterclockwise at a rate of 1 unit per K seconds ($1 \leq K \leq 10^6$).

Compute the minimum time required to achieve the goal.

INPUT FORMAT (input arrives from the terminal / stdin):

The first line contains L, R, N, and K.

The next line contains N space-separated integers $a_1, a_2, \ldots, a_N$.

OUTPUT FORMAT (print output to the terminal / stdout):

The minimum time required to achieve the goal.

SAMPLE INPUT:

```
10 2 1 2
6
```

SAMPLE OUTPUT:

```
22
```

We can reach the activation point at 6 in 4 seconds by going clockwise. At this time, the initial robot will be located at 2. Wait an additional 18 seconds until the initial robot is located at 1. Now we can place a robot to immediately win.

SAMPLE INPUT:

```
10 2 1 2
7
```

SAMPLE OUTPUT:

```
4
```

We can reach the activation point at 7 in 3 seconds by going clockwise. At this time, the initial robot will be located at 1.5. Wait an additional second until the initial robot is located at 2. Now we can place a robot to immediately win.

SAMPLE INPUT:

```
32 4 5 2
0 23 12 5 11
```

SAMPLE OUTPUT:

```
48
```

SAMPLE INPUT:

```
24 3 1 2
16
```

SAMPLE OUTPUT:

```
48
```

SCORING:

- Inputs 5-6: $R = 2$
- Inputs 7-12: $R \leq 10, N \leq 80$
- Inputs 13-20: $R \leq 16$
- Inputs 21-24: No additional constraints.

Problem credits: Benjamin Qi

Contest has ended. No further submissions allowed.