

Contest Duration: 2025-09-20(Sat) 22:00 (<http://www.timeanddate.com/worldclock/fixedtime.html?iso=20250920T2100&p1=248>) - 2025-09-20(Sat) 23:40 (<http://www.timeanddate.com/worldclock/fixedtime.html?iso=20250920T2240&p1=248>) (local time) (100 minutes)

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E - Cut in Half

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Time Limit: 2 sec / Memory Limit: 1024 MiB

Score : 475 points

Problem Statement

There are N sticks in a bag, with lengths A_1, \dots, A_N .

You repeat the following operation K times.

- Take out any one of the longest sticks in the bag, split it into two equal halves, and put the two sticks back into the bag.

After K operations, among the $N + K$ sticks in the bag, find the length of the X -th longest one.

You are given T test cases; answer each of them.

Constraints

- $1 \leq T \leq 10^5$
- For each test case:
 - $1 \leq N \leq 10^5$
 - $1 \leq A_i \leq 10^9$
 - $1 \leq K \leq 10^9$
 - $1 \leq X \leq N + K$
- The sum of N over all test cases does not exceed 10^5 .
- All input values are integers.

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Input

The input is given from Standard Input in the following format:

```
T
testcase1
testcase2
⋮
testcaseT
```

testcase_{*i*} represents the *i*-th test case and is given in the following format:

```
N K X
A1 ... AN
```

Output

Print *T* lines. In the *i*-th line ($1 \leq i \leq T$), output the answer for the *i*-th test case.

Your answer will be judged correct if the absolute or relative error is at most 10^{-9} .

Sample Input 1

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```
2
3 4 5
40 20 30
10 100 50
1 2 3 4 5 6 7 8 9 10
```

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Sample Output 1

[Copy](#)

```
10.000000000000000000
0.500000000000000000
```

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In the 1-st test case, initially the bag contains 3 sticks of lengths 20, 30, 40. The operations proceed as follows.

- Take out the stick of length 40 from the bag, split it into two sticks of length 20, and put them back. The stick lengths in the bag become 20, 20, 20, 30.
- Take out the stick of length 30 from the bag, split it into two sticks of length 15, and put them back. The stick lengths in the bag become 15, 15, 20, 20, 20.
- Take out a stick of length 20 from the bag, split it into two sticks of length 10, and put them back. The stick lengths in the bag become 10, 10, 15, 15, 20, 20.

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- Take out a stick of length 20 from the bag, split it into two sticks of length 10, and put them back. The stick lengths in the bag become 10, 10, 10, 10, 15, 15, 20.

After the operations, the 5-th longest stick has length 10.

[/#telegram](#))

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