Unilever Coding Test

In a realm of ancient magic, a fearsome basilisk lurks in the shadows, spreading terror across the land. There are N fighters that are eager to protect the land. Each fighter possesses unique abilities: their vitality represented by their health Hi, and their prowess in combat, represented by their damage output per second Di. Two fighters will pair together to fight the basilisk. One fighter forth as the first line of defense, while the other stands as their backup. Both fighters will fight to their death. The basilisk attacks fighters at B units per second and has infinite health. As the basilisk strikes with venomous fury, it attacks the frontline fighter first until he falls, then attacks the second fighter. Despite the grim odds, the fighters strive to maximize their damage against the basilisk, aiming to weaken its grip on the realm and restore peace to their troubled land.

With different scenarios, please help the people find the ideal two fighters that can cause the most damage to the basilisk.

Constraints

$2 \le N \le 500{,}000$

$1 \le Hi \le 1{,}000{,}000{,}000$

$1 \le Di \le 1{,}000{,}000{,}000$

$1 \le B \le 1{,}000{,}000{,}000$

Sample test case #1

```
N = 3
H = [2, 1, 4]
D = [3, 1, 2]
B = 4
```

```
Expected Return Value = 6.500000
```

Sample test case #2

```
N = 4
H = [1, 1, 2, 100]
D = [1, 2, 1, 3]
B = 8
```

```
Expected Return Value = 62.750000
```

Sample test case #3

```
N = 4
H = [1, 1, 2, 3]
D = [1, 2, 1, 100]
```

```
B = 8

  Expected Return Value = 62.750000
```

Sample Explanation

In the first case, there are 3 fighters with health of [2,1,4] units, and the ability to deal [3, 1, 2] units of damage respectively. The basilisk does *B*=4 units of damage per second.
The optimal solution is to choose fighter 3 as the front line and fighter 1 as backup. Fighter 3 will be defeated after 1 second, dealing 2 units of damage during this time (meanwhile, fighter 1 will have dealt 3 units of damage). Fighter 1 will then step up and last for 0.5 seconds, while dealing another 1.5 units of damage along the way. The total damage dealt will then be 2 + 3 + 1.5 = 6.5 units.

In each of the second and third cases, it's possible for 62.75 units of damage to be dealt to the basilisk, though with different combinations of fighters.

Requirements:

1. Please use Python to write a function and solve this problem. Submit your code in a python file.

```
def getMaxDamage(N: int, H: list[int], D: list[int], B: int) -> float:

    # Write your code here

  return 0.0
```

2. Besides accuracy, execution time is another key evaluation. Due to the computer performance difference, your execution time will be compared against the Brute-force search execution time. Write some explanations about your algorithm on why it can find the best solution. You can submit your explanation in pdf, text, or as a commentary in the python file.