

Problem 4: Coding 90s in Loot Lists

7 Points

Problem ID: `fortnite`

Rank: 2



Introduction

Falling out of the [battle bus](#), [Fortnite Jonesy](#) drops into the warzone known as [Tilted Towers](#). After [cranking 90s](#) and [default dancing](#) on the bodies of [Ninja](#) and [Nick Eh 30](#), he realizes [the storm](#) is setting onto him. [Remembering](#) that he has to [never back down, never give up](#), Jonesy decides to rush towards the [reboot van](#) outside the storm in order to get a [#1 Victory Royale](#).

Problem Statement

You start with N health and you need to travel a distance of D meters to exit the storm, which continuously damages you at a rate of P health per second.

While inside the storm, you can perform any one of following two actions:

1. Run continuously at a rate of S meters per second towards the storm's exit.
2. Heal continuously to gain H health per second. While healing, you **can't move** and you **still take damage** from the storm.

Find the minimum time needed to exit the storm while keeping your health at or above 0. It's **not guaranteed** that the minimum time will be an integer.

If there is no way to exit while keeping your health at or above 0, output -1 .

Input Format

The first line of the input contains an integer **T** denoting the number of test cases that follow. Each test case is described in a single line containing five space separated integers denoting:

- **N**: starting health
- **H**: healing per second
- **D**: distance to exit storm (in meters)
- **S**: running speed (in meters per second)
- **P**: storm damage per second

Output Format

For each test case, output a single number denoting the minimum time needed to get out of the storm alive. This number can be an integer or a decimal.

Your answer must be within an absolute error of 0.1 to be considered correct.

Constraints

Time limit: **1 second**

Memory limit: **256 MB**

$$1 \leq T \leq 100$$

$$1 \leq N \leq 100$$

$$1 \leq H \leq 100$$

$$1 \leq D \leq 100$$

$$1 \leq S \leq 100$$

$$1 \leq P \leq 100$$

Sample Test Cases

Sample Input

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```
5
100 15 50 10 10
20 15 50 10 10
20 15 50 10 30
100 15 50 10 20
42 17 73 9 14
```

Sample Output

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```
5
11.0
-1
5.000
31.96296296296296
```

Note that due to rounding, this is one of many possible correct outputs. If there are multiple solutions, you may output any of them.

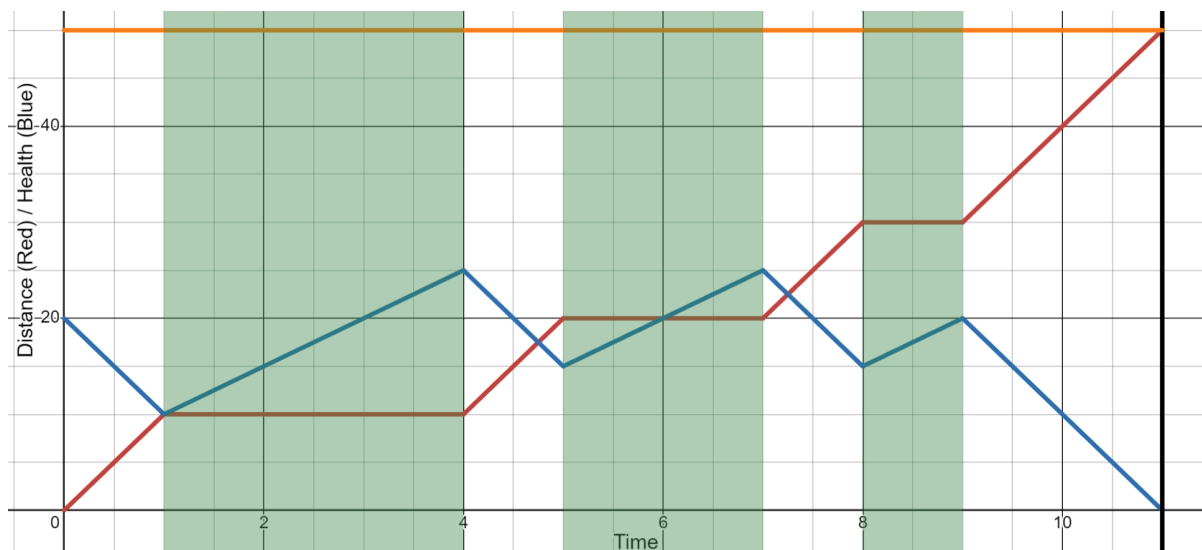
Sample Explanations

Test Case #1:

The minimum time to exit the storm is achieved by running directly out of the storm. Since you run at a speed of $S = 10$ meters per second and you need to run $D = 50$ meters, it takes 5 seconds to escape the storm. This solution works because the health remaining is at or above 0 as you have $N = 50$ health and the total damage taken would be 50 ($P = 10$ damage from storm per second * 5 seconds). Thus the minimum time needed is 5 seconds.

Test Case #2:

One possible strategy to exit is to run for 1 second, heal for 3 seconds, run for 1 second, heal for 2 seconds, run for 1 second, heal for 1 second, run for 2 seconds, then exit. The minimum time needed is 11 seconds. Here's [a Desmos plot](#) that illustrates this strategy in action:



Test Case #3

It is impossible to exit the storm given these values so we print -1.

Test Case #4

This is the same as Test Case #1, but now the damage from the storm **P** is higher. However, the minimum time to exit the storm is still a straight line out. We still run for 5 seconds, but this time we take 100 damage. However, since we exit the storm as we take 100 damage, this is still the minimum time. Therefore, we return 5.000.