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Stack Stabilization (Chapter 2)

Level 3 Time limit: 5s In progress

Note: Chapter 1 is an easier version of this puzzle.

There's a stack of N inflatable discs, with the ith disc from the top having an initial radius of R_i inches.

The stack is considered *unstable* if it includes at least one disc whose radius is larger than or equal to that of the disc directly under it. In other words, for the stack to be *stable*, each disc must have a strictly smaller radius than that of the disc directly under it.

As long as the stack is unstable, you can repeatedly choose a disc and perform one of the following operations:

- Inflate the disc, increasing its radius by 1 inch. This operation takes A seconds and may be performed on discs of any radius (even those that exceed 10^9 inches).
- Deflate the disc, decreasing its radius by 1 inch. This operation takes B seconds and may only be performed if the resulting radius is a positive integer number of inches (that is, if the disc has a radius of at least 2" before being deflated).

Determine the minimum number of seconds needed in order to make the stack stable.

Constraints

$1 \le N \le 50$
$1 \le R_i \le 1{,}000{,}000{,}000$
$1 \le A, B \le 100$

Sample test case #1

```
N = 5
R = [2, 5, 3, 6, 5]
A = 1
B = 1
```

```
Expected Return Value = 5
```

Sample test case #2

```
N = 3
R = [100, 100, 100]
A = 2
B = 3
```

```
Expected Return Value = 5
```

Sample test case #3

```
N = 3
R = [100, 100, 100]
A = 7
B = 3
```

```
Expected Return Value = 9
```

Sample test case #4

```
N = 4
R = [6, 5, 4, 3]
A = 10
B = 1
```

```
Expected Return Value = 19
```

Sample test case #5

```
N = 4
R = [100, 100, 1, 1]
A = 2
B = 1
```

```
Expected Return Value = 207
```

Sample test case #6

```
N = 6
R = [6, 5, 2, 4, 4, 7]
A = 1
B = 1
```

```
Expected Return Value = 10
```

Sample Explanation

In the first case, the discs (from top to bottom) have radii of $[2", 5", 3", 6", 5"]$. It takes $A = B = 1$ second to inflate or deflate a disc radius by $1"$. One optimal way to stabilize the stack is by deflating disc 2 from $5"$ to $3"$ (taking 2 seconds), inflating disc 3 from $3"$ to $4"$ (taking 1 second), deflating disc 4 from $6"$ to $5"$ (taking 1 second), and inflating disc 5 from $5"$ to $6"$ (taking 1 second). This yields final radii of $[2", 3", 4", 5", 6"]$, taking a total of $2 + 1 + 1 + 1 = 5$ seconds.

In the second case, it takes $A = 2$ seconds to inflate a disc by $1"$, and $B = 3$ seconds to deflate a disc by $1"$. One optimal way to stabilize the stack is by deflating disc 1 from $100"$ to $99"$ (taking 3 seconds) and inflating disc 3 from $100"$ to $101"$ (taking 2 seconds), for a total of 5 seconds.

In the third case, an optimal stabilization strategy is to deflate the first two discs to $98"$ and $99"$ respectively, taking $2 * 3 + 1 * 3 = 9$ seconds.

In the fourth case, an optimal stabilization strategy is to arrive at disc radii $[1", 2", 3", 4"]$ in $(6 - 1) * 1 + (5 - 2) * 1 + (4 - 3) * 1 + (4 - 3) * 10 = 19$ seconds.

In the fifth case, it's possible to stabilize the stack in 207 seconds.

In the sixth case, it's possible to stabilize the stack in 10 seconds.

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