Landscaping - 2012 March Silver, problem 3

Friday, October 6, 2023 4:34 PM

Landscaping
Farmer John is building a nicely-landscaped garden, and needs to move a large amount of dirt in the process.
The garden consists of a sequence of N flowerbeds (1 <= N <= 100), where flowerbed i initially contains A_i units of dirt. Farmer John would like to re-landscape the garden so that each flowerbed i instead contains B_i units of dirt. The A_i's and B_i's are all integers in the range 0..10.
To landscape the garden, Farmer John has several options:

- He can purchase one unit of dirt and place it in a flowerbed of his choice for $X.
- He can remove one unit of dirt from a flowerbed of his choice and have it shipped away for $Y.
- He can also transport one unit of dirt from flowerbed i to flowerbed j at a cost of $Z times |i-j|.

Please compute the minimum total cost for Farmer John to complete his landscaping project.
PROBLEM NAME: landscape
INPUT FORMAT:

- Line 1: Space-separated integers N, X, Y, and Z (0 <= X, Y, Z <= 1000).
- Lines 2..1+N: Line i+1 contains the space-separated integers A_i and B_i.

SAMPLE INPUT:
4 100 200 1
1 4
2 3
3 2
4 0
INPUT DETAILS:
There are 4 flowerbeds in a row, initially with 1, 2, 3, and 4 units of dirt. Farmer John wishes to transform them so they have 4, 3, 2, and 0 units of dirt, respectively. The costs for adding, removing, and transporting dirt are 100, 200, and 1.
OUTPUT FORMAT:

- Line 1: A single integer giving the minimum cost for Farmer John's landscaping project.

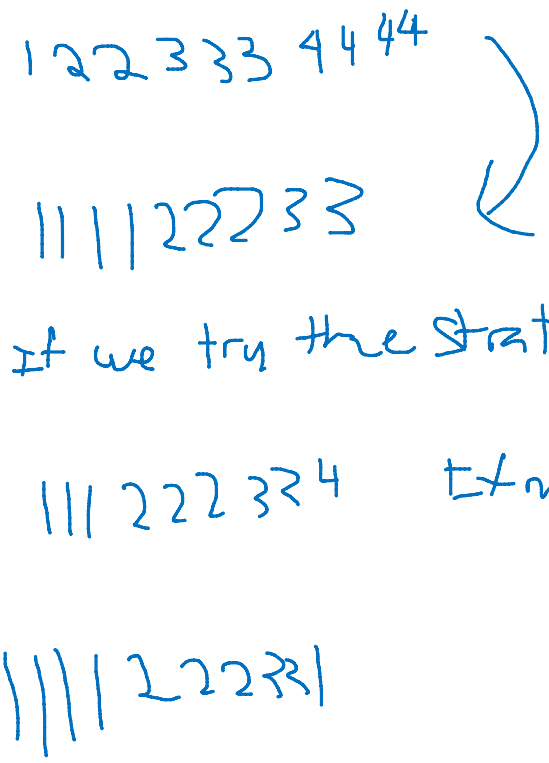
SAMPLE OUTPUT:
210
OUTPUT DETAILS:
One unit of dirt must be removed (from flowerbed #4), at a cost of 200. The remaining dirt can be moved at a cost of 10 (3 units from flowerbed #4 to flowerbed #1, 1 unit from flowerbed #3 to flowerbed #2).

From <https://lms.alphastar.academy/mod/quiz/attempt.php?attempt=462705&cmid=85505>

Ok let's begin, what a mess right?
My life has been absolute hell for the last five weeks since school started, not because of school ofc but a large amount of other problems.
Anyways, here were some ideas I wrote down a few minutes ago:
//the strange idea:

```
/*
We have the 2 standard SED operations - insertion & deletion. However,
the transportation throws a pretty large screw into our plans.
However, a **big brain** play:
1. We have at most 100 flowerbeds. We can treat moving from each one to
the current and vice versa as an operation.
2. We can represent this situation with a string. For flowerbed 1 of 4
dirt, we represent as 1111. This is the string we're editing.
3. We can treat our third operation (moving from 1 bed to another) as
follows:
    a. insert one more of the number we're moving the dirt from inside
    the string, to simulate removal.
    b. delete one of the number we're moving the dirt to inside the
    string, simulating addition.
    (note, the "string" refers to the "reference" or "endgoal" string.)
4. I guess we could also think of this as a replacement operation, and
not worry about order. In this case we just replace one character with
another (if move one from 4 to 1, replace a 4 with a 1 in the string)
This is really a stupid idea.
*/
```

Let's try and draw this out!



Ok turns out problem was pretty simple, we really just needed to change up the "costs" of the SED operations. Read my code comments for more.