Area Under Curves and Volume of Revolving a Curve

HackerRank

Definite Integrals via Numerical Methods

This relates to definite integration via numerical methods.

Consider the algebraic expression given by:

$$(a_1)x^{b_1} + (a_2)x^{b_2} + (a_3)x^{b_3} \ldots\ldots (a_n)x^{b_n}$$

For the purpose of numerical computation, the area under the curve $y = f(x)$ between the limits a and b can be computed by the Limit Definition of a Definite Integral.

Here is some background about **areas and volume computation**.

Using equal subintervals of length $= 0.001$, you need to:

1. Evaluate the area bounded by a given polynomial function of the kind described above, between the given limits of L and R.
2. Evaluate the volume of the solid obtained by revolving this polynomial curve around the x-axis.

A relative error margin of 0.01 will be tolerated.

Input Format

The first line contains N integers separated by spaces, which are the values of $a_1, a_2 \ldots a_N$.
The second line contains N integers separated by spaces, which are the values of $b_1, b_2 \ldots b_N$.
The third line contains two space separated integers, L and R, the lower and upper range limits in which the integration needs to be performed, respectively.

Constraints

$-1000 <= a <= 1000$
$-20 <= b <= 20$
$1 <= L < R <= 20$

Output Format

The first line should contain the area between the curve and the x-axis, bound between the specified limits.
The second line should contain the volume of the solid obtained by rotating the curve around the x-axis, between the specified limits.

Sample Input

```
1 2 3 4 5
6 7 8 9 10
1 4
```

Explanation

The algebraic expression represented by:

$$(1)x^6+(2)x^7+(3)x^8+(4)x^9+(5)x^{10}$$

We need to find the area of the curve enclosed under this curve, between the limits $x = 1$ and 4. We also need to find the volume of the solid formed by revolving this curve around the x-axis between the limits $x = 1$ and 4.

Sample Output

```
2435300.3
26172951168940.8
```

Scoring

All test cases are weighted equally. You need to clear all the tests in a test case.