# Area Under Curves and Volume of Revolving a Curve



# **Definite Integrals via Numerical Methods**

This relates to definite integration via numerical methods.

Consider the algebraic expression given by:

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

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  $\boldsymbol{L}$  and  $\boldsymbol{R}$ .
- 2. Evaluate the volume of the solid obtained by revolving this polynomial curve around the x-axis.

An absolute error margin of 0.02 will be tolerated.

## **Input Format**

The first line contains N integers separated by spaces, which are the values of  $a_1, a_2 \dots a_N$ . The second line contains N integers separated by spaces, which are the values of  $b_1, b_2 \dots b_N$ . 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**

$$-1000 \le a \le 1000$$
  
 $-20 \le b \le 20$   
 $1 \le L \le R \le 20$ 

### **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

## **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.