



**Islamic University of Technology**  
Department of Computer Science and Engineering

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## Lab 1: Introduction

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**CSE 4404: Algorithms Lab**  
Section 2B

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## Task A. Triple Sort

*Time Limit: 5 minutes | Memory Limit: 512 MB*

Given an array  $a$  of integers, you need to sort and print it in three different ways:

1. Ascending order.
2. Descending order.
3. Ascending order based on absolute values (if two numbers have the same absolute value, the negative one should come first).

### Input Format

The first line of the input contains an integer  $n$  ( $1 \leq n \leq 100000$ ) — the size of the array.

The second line contains  $n$  space-separated integers  $a_1, a_2, \dots, a_n$  ( $-100 \leq a_i \leq 100$ ) — the elements of the array.

### Output Format

Output three lines:

- First line: the array sorted in ascending order.
- Second line: the array sorted in descending order.
- Third line: the array sorted in ascending order of absolute values.

### Examples

Sample Input	Sample Output
5 1 -3 5 0 -2	-3 -2 0 1 5 5 1 0 -2 -3 0 1 -2 -3 5

### Notes

For this task, make 4 submissions with 4 different sorting algorithms:

1. Selection Sort
2. Bubble Sort
3. Insertion Sort
4. Merge Sort (using the `sort` function in C++ STL)

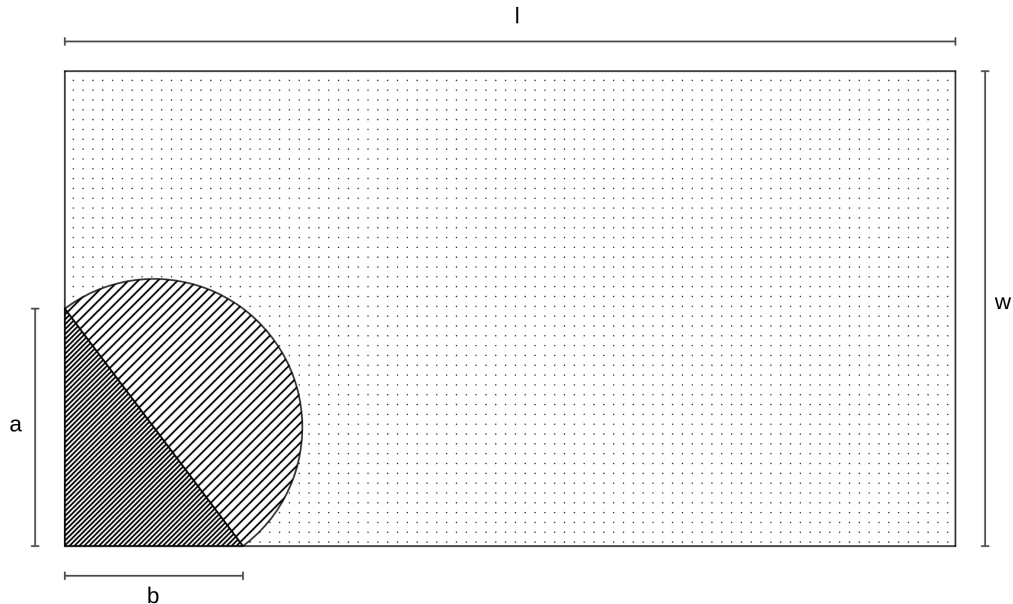
Afterwards, run the local judge to execute the submissions. Test 1 has an array of 10000 elements, Test 2 has 20000 elements, ... up to Test 10, which has 100000 elements.

Record the runtime for each test case in the sheet provided in Google Classroom assignment and observe the shape of the runtime vs. input size graphs.

Task B. Simple Mensuration Problem

Time Limit: 1 second | Memory Limit: 256 MB

Find the area of the dotted zone in the following figure:



Input Format

The input consists of four space-separated integers in a line  $l$  ( $2 \leq l \leq 100$ ),  $w$  ( $2 \leq w \leq 100$ ),  $a$  ( $1 \leq a \leq \min(\frac{l}{2}, \frac{w}{2})$ ) and  $b$  ( $1 \leq b \leq \min(\frac{l}{2}, \frac{w}{2})$ ) — the length of the rectangle, the width of the rectangle and the two side lengths of the triangle respectively.

Output Format

Output a single number — the area of the dotted zone rounded to *exactly* two decimal places.

Examples

Sample Input	Sample Output
15 8 4 3	104.18

Notes

Area of a rectangle =  $length \times width$   
Area of a triangle =  $\frac{1}{2} \times base \times height$   
Area of a circle =  $\pi \times radius^2$   
Hypotenuse of a right triangle =  $\sqrt{base^2 + height^2}$   
 $\pi = 3.14159$

## Marks Distribution

Everyone gets 100% marks for this lab.

## Practice Problems

Problem	Links
Game	Codeforces: <a href="https://codeforces.com/contest/984/problem/A">https://codeforces.com/contest/984/problem/A</a> Vjudge: <a href="https://vjudge.net/problem/CodeForces-984A">https://vjudge.net/problem/CodeForces-984A</a>
Gravity Flip	Codeforces: <a href="https://codeforces.com/contest/405/problem/A">https://codeforces.com/contest/405/problem/A</a> Vjudge: <a href="https://vjudge.net/problem/CodeForces-405A">https://vjudge.net/problem/CodeForces-405A</a>
Valid Anagram	LeetCode: <a href="https://leetcode.com/problems/valid-anagram/">https://leetcode.com/problems/valid-anagram/</a>
Jagged Swaps	Codeforces: <a href="https://codeforces.com/contest/1896/problem/A">https://codeforces.com/contest/1896/problem/A</a> Vjudge: <a href="https://vjudge.net/problem/CodeForces-1896A">https://vjudge.net/problem/CodeForces-1896A</a>
Unforgivable Curse (Easy)	Codeforces: <a href="https://codeforces.com/contest/1800/problem/E1">https://codeforces.com/contest/1800/problem/E1</a> Vjudge: <a href="https://vjudge.net/problem/CodeForces-1800E1">https://vjudge.net/problem/CodeForces-1800E1</a>
Unforgivable Curse (Hard)	Codeforces: <a href="https://codeforces.com/contest/1800/problem/E2">https://codeforces.com/contest/1800/problem/E2</a> Vjudge: <a href="https://vjudge.net/problem/CodeForces-1800E2">https://vjudge.net/problem/CodeForces-1800E2</a>