# Basic Syntax – Homework Exercises

Write C++ code for solving the tasks on the following pages.

Code should compile under the C++03 or the C++11 standard.

Please submit a single.cpp file for each task.

.cpp files for the tasks should be named with the task number followed by what you feel describes the exercise in a few words.

E.g. a good name for task 2 of this homework would be:  
2.string-formatter.cpp

Don’t worry about the name too much, just make sure the number and the file extension are correct.

# Problem 1 – Order Two Numbers

Write a program that reads two integers from the console and prints them in increasing order.

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| 1 2 | 1 2 |
| 1 -1 | -1 1 |
| 4242 1313 | 1313 4242 |

# Problem 2 – Product Sign

Write a program that shows the sign (+ or -) of the product of three real numbers without calculating it.

The program should read 3 real numbers from the console (on a single line, separated by spaces) and should print the sign of their product (i.e. the sign of the number resulting from the multiplication of the 3 numbers). If the product is 0, print +.

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| 1 2 0 | + |
| 1 -1 1 | - |
| -411531.13 123123 -8673.24 | + |

# Problem 3 – Quadratic Equation

Write a program that enters the coefficients **a**, **b** and **c** of a quadratic equation **a\*x2 + b\*x + c = 0** and calculates and prints its real roots. Note that quadratic equations may have **0**, **1** or **2** real roots. You can check your program against this: <https://www.mathsisfun.com/quadratic-equation-solver.html>

The numbers **a**, **b**, and **c** will be entered on a single line from the console, separated by spaces.

If the quadratic equation has no real roots (e.g. if the Discriminant is less than 0), print "**no roots**", if it has one real root print it, if it has two roots, print them on a single line, separated by a single space

### Examples

|  |  |  |
| --- | --- | --- |
| **Input** | **Output** | **Explanation** |
| 2 5 -3 | -3 0.5 | *Equation: 2x2 + 5x - 3 = 0* |
| 10 1 3 | no roots | *Equation: 10x2 + x + 3 = 0* |
| 0.5 5 12.5 | -5 | *Equation: 0.5x2 + 5x + 12.5 = 0* |

# Problem 4 – 1 to N

Write a program that that reads the integer number N from the console and prints all numbers from 1 to N (i.e. in the range [1, N]) to the console on a single line. The number N will always be larger than or equal to 1.

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| 1 | 1 |
| 10 | 1 2 3 4 5 6 7 8 9 10 |

# Problem 5 – Min and Max

Write a program that reads an integer number N, then reads a line of N integers, and prints the minimum and maximum of those integers.

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| 2  -1 5 | -1 5 |
| 7  5 3 44 21 69 2 10 | 2 69 |

# Problem 6 – Greatest Common Divisor

### Write a program that calculates the greatest common divisor (GCD) of given two numbers. Hint: you can use the Euclidean algorithm.

The two integer numbers will be entered on a single line from the console, separated by a single space.

Find and print their GCD.

### Examples

|  |  |  |
| --- | --- | --- |
| **Input** | **Output** | **Explanation** |
| 25 10 | 5 | 5 is the largest number that divides both 25 and 10 (without a remainder) |
| 50 50 | 50 | Both numbers are 50, so GCD is 50 |
| 7 13 | 1 | 7 and 13 are prime numbers, meaning they only divide by 1 and themselves, so their GCD is 1 |

# Problem 7 – Factorial Trailing Zeroes

Write a program that reads the integer number N and prints how many trailing zeros are present at the end of the number N! (N factorial). Make sure your program works for N up to 50 000. Hint: you don’t need to calculate the actual factorial to count the number of trailing zeroes.

### Examples

|  |  |  |
| --- | --- | --- |
| **Input** | **Output** | **Explanation** |
| 1 | 0 | 1 != 1, no trailing zeroes |
| 5 | 1 | 5 != 120, 1 trailing zero |
| 20 | 4 | 20 != 2432902008176640000, 4 trailing zeroes |