# Classes and Objects – 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.distance.cpp

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

Tasks 4 to 6 in this homework require you to be creative about the implementation. They simulate real-world examples of non-strict and sometimes vague descriptions of client requirements. Part of the exercise is to learn to convert paragraphs of text into classes which solve the needs described in the paragraphs, and writing code which is easily modified if, for example, the format of the input/output data changes slightly. Also note that some of these exercises mention e.g. “array” or “string” and so on – do not take these literally, you can use any data structures you find appropriate.

# Task 1 – Distance

Write a program to calculate the (Euclidean) distance between two points **p1** {**x1**, **y1**} and **p2** {**x2**, **y2**}. You should write a class to represent such points and a method in it which calculates the distance from the point to another point.

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| 3 4  6 8 | 5.000 |
| 3 4  5 4 | 2.000 |
| 8 -2  -1 5 | 11.402 |

**Task 2 - Area and Perimeter of Rectangle**

Write a program, make a Class Rectangle. For a given numbers the program should calculate the area and the perimeter of the Rectangle.

**EXAMPLE**:

The numbers are 3,4 ( Area is 12, Perimeter is 14 )

**Examples**

|  |  |
| --- | --- |
| **Input** | **Output** |
| 3  4 | 12  14 |
| 1  2 | 2  6 |

**Task 3 – Time Calculation**

Write a program, use a class for a given HOURS:MINUTES:SECOND the program should calculate the TIME in

HOURS

MINUTES

SECONDS

**EXAMPLE:**

If we have 1 HOUR 1 MINUTE 1 SECONDS

In HOUR is – 1

in MINUTES is – 61

in SECONDS is - 3661

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| 1  1  1 | 1  61  3661 |
| 1  2  3 | 1  62  3723 |

**Task 4 – Students Information**

Write a program, use a class that has params:

Student Name

Student Surname

Total Average

The class should have Print method that for a given object prints all the information

Make a vector in main that for a given number ( passed thru user ) saves the objects

**EXAMPLE:**

Number of students – 2

Name – Maria

Surname – Ivanova

Average – 3.5

Name – Dragan

Surname – Ivanov

Average – 4.5

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| 2  Maria  Ivanova  3.5  Dragan Ivanov  4.5 | Maria Ivanova 3.5  Dragan Ivanov 4.5 |

# Task 5 – Total average of students

Write a program, use a class that has params:

Student Name

Student Surname

Total Average

The class should have Print method that for a given object prints all the information

Make a vector in main that for a given number ( passed thru user ) saves the objects

Make a function that calculates the Total AVERAGE of ALL students

**EXAMPLE:**

Number of students – 2

Name – Maria

Surname – Ivanova

Average – 3.5

Name – Dragan

Surname – Ivanov

Average – 4.5

**TOTAL AVERAGE** – ( 3.5 + 4.5 ) / 2 = 4

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| 2  Maria  Ivanova  3.5  Dragan  Ivanov  4.5 | Maria Ivanova 3.5  Dragan Ivanov 4.5  4 |

# Task 6 – Sentence Shifter

You are given a **list of words** in one line. On the other line you are given a **simple integer**.

Your role is to **shift the words** in the sentance **according to that integer**.

For example if a sentence has 10 words and you receive a shift number 2 - the first word should become the third, the second word should become the fourth and so on, ..., the word before the last should become the first and the last word should become the second.

Implement this task with a class that is initialized with a **linear container** (array, vector, etc.) of words and which has a **getShiftedSentence()** method which returns the words shifted.

Each word is printed on a different line.

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| Welcome to SoftUni and have fun learning programming  2 | learning  programming  Welcome  to  SoftUni  and  have  fun |

# Task 7 – Sales

Write a class Sale holding the following data: **town**, **product**, **price**, **quantity**. Read a **list of sales** and calculate and print the **total sales by town** as shown in the output. Order the towns **alphabetically** in the output.

### Examples

|  |  |  |
| --- | --- | --- |
| **Input** | **Output** | **Comments** |
| 5  Sofia beer 1.20 160  Varna chocolate 2.35 86  Sofia coffee 0.40 853  Varna apple 0.86 75.44  Plovdiv beer 1.10 88 | Plovdiv -> 96.80  Sofia -> 533.20  Varna -> 266.98 | Plovdiv -> 1.10 \* 88 = 96.80  Sofia -> 1.20 \* 160 + 0.40 \* 853 = 533.20  Varna -> 2.35 \* 86 + 0.86 \* 75.44 = 266.98 |