
Quiz I

Name:

ID:

Do not open this booklet until you are told to do so

- You have 2 hours 45 minutes to complete the quiz.
- There are 3 problems on this quiz. The problems are not in order of difficulty. Please read fully the problems before starting.
- The exam is open book. You can use also all the material on Moodle: lecture notes, programming assignments, etc. You are **NOT** allowed to use the **web**, (**imail** included). You are not allowed to use **USB's** or files previously stored in your **account**.
- Calculators are allowed.
- Cell-phones are not allowed. Please turn them off and put them away or give them to the staff to hold them for you until the end of the exam.
- If you violate the above rules or if you communicate with a person other than the exam proctors during the exam, you will immediately get zero and you will be referred to the appropriate disciplinary committee.
- Submit your solutions each part in a separate file as indicated in the booklet. Include your name and ID number in each file. Submit the files online in a single zip file called
yourLastName.yourFirstName.zip.

Problem Q1.1: (25 points)

Write a program that asks the user to enter three integers, and checks whether or not one of the three numbers is a divider of the other two. If the answer is YES, your program should print which one in the format below. Otherwise, it should print “None of the integers is a common divider of the other two.”

Examples

```
Please enter three integers: 1 10 9
YES: 1 is a common divider to 10 and 9
```

```
Please enter three integers: 6 -2 20
YES: -2 is a common divider to 6 and 20
```

```
Please enter three integers: 11 -3 8
None of the integers is a common divider of the other two.
```

Submit your solution in a file called Prob1.cpp including your name and ID number.

Problem Q1.2: (50 points)

a) (35 points) Power test.

Write a program which prompts the user to enter a non-negative integer n (i.e., $n \geq 0$), and checks whether or not n is a power of another integer. That is, your program should check whether or not there exist a non-negative integer x and a positive integer $l > 1$, such that $n = x^l$.

For instance, the following numbers are some positive power of some non-negative integer: $0 = 0^2$, $1 = 1^2$, $4 = 2^2$, $8 = 2^3$, $9 = 3^2$, $64 = 2^6$. On the other hand, 2, 3, 10 are not.

If the answer is YES, your program is supposed to print x and l in the format shown below. If more than one solution exists, your program is also supposed to print the combination that has the lowest value of x . For example, since $64 = 2^6 = 4^3$, your program should output the solution $64 = 2^6$.

You are *NOT allowed* to use the power function or any other function in the *cmath* library. You are expected to check if such an x and l exist using a loop by first trying $x = 0$, then $x = 1$, then $x = 2$, and so on ... and for each x , try $l = 2$, then $l = 3$, then $l = 4$, etc ... as long as ...

Note: You may find that “0” and “1” are special cases!

Format:

```
Please enter an integer: 3
3 is not a power of an integer
```

```
Please enter an integer: 27
YES: 27=3^3
```

Submit your solution in a file called Prob2a.cpp including your name and ID number.

b) (15 points) A more exhaustive test.

In this part you are asked to design a similar program to that in (a), but that allows negative integers to be tested. For example, $-64 = (-4)^3$, while -25 is not a power of an integer.

To be more precise, the user may input any integer (possibly a negative one) and your program should check whether or not there exist an integer x and a positive integer $l > 1$, such that $n = x^l$.

As in Part (a), you are *NOT allowed* to use the power function or any other function in the *cmath* library.

Submit your solution in a file called Prob2b.cpp including your name and ID number.

Problem Q1.3: (25 points)

Write a program which prompts the user to enter a list of integers, finds the average of the entered values, and splits this list into a (possibly empty) left sublist of numbers less than the average and a (nonempty) right sublist of numbers greater or equal to the average.

Examples:

- Consider the list: 1, -5, 20, 2, 4, 2, 5, 2, 1. The average of the numbers is 3.5556. The left sublist is hence 1, -5, 2, 2, 2, 1 and the right sublist is 20, 4, 5.
- Consider the list: 5, 2, 1, 3, -7 that has an average of 0.8. The left sublist is -7 and the right sublist is 5, 2, 1, 3.

Assume that the list end is indicated by the sentinel -999.

The output of your program should be as shown in the examples below.

```
Enter a list of integers ending with -999:
```

```
1 -5 20 2 4 2 5 2 1 -999
```

```
The average is 3.5556
```

```
The left sublist is 1, -5, 2, 2, 2, 1
```

```
The right sublist is 20, 4, 5
```

```
Enter a list of integers ending with -999:
```

```
5 2 1 3 -7 -999
```

```
The average is 0.8000
```

```
The left sublist is -7
```

```
The right sublist is 5, 2, 1, 3
```

Note: You need arrays to solve this problem.

Submit your solution in a file called Prob3.cpp including your name and ID number.