

**CS112: Structured Programming**  
**Assignment 2 (7 marks + 2 bonus) – Version 8.0**



**ابدأ الآن و لا تنتظر فلو تأخرت لن تجد وقتا كافيا Start now and do not wait**

**FACULTY OF COMPUTERS AND AI,  
CAIRO UNIVERSITY**

**CS112: Structured Programming  
Year 2022-2024  
Second Semester**

**Assignment 2 – Version 8.0**

**Course Instructors:**  
**Dr. Mohammad El-Ramly**

**Revision History**

<b>Version 1.0</b>	By Dr Mohammed El-Ramly 20 Feb. 2018	Main Doc
<b>Version 2.0</b>	By Dr Mohammed El-Ramly 22 Feb. 2018	Errors Fixed
<b>Version 3.0</b>	By Dr Mohammed El-Ramly 24 Feb. 2018	Elaborations added
<b>Version 4.0</b>	By Dr Mohammed El-Ramly 28 Feb. 2018	Pb 0, 1 fixed
<b>Version 5.0</b>	By Dr Mohammed El-Ramly 28 Feb. 2022	21/22 OpSrc & Pb#s
<b>Version 6.0</b>	By Dr Mohammed El-Ramly 8 Mar. 2022	Replace pb 14 pg 141
<b>Version 7.0</b>	By Dr Mohammed El-Ramly 26 Feb. 2024	2023/24 Version
<b>Version 8.0</b>	By Dr Mohammed El-Ramly 3 Mar. 2024	Changed team condition

# CS112: Structured Programming

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### Introduction

Congratulations! You did your first game and played it with your family and friends. I know it is a simple one, but now you can make more complex ones. You also learnt how to type faster, so keep training and improving. Maybe you did the bonus and also did a real app for managing pdf files or displaying country statistics from xls files. Now, we will do another real thing: Encryption and Decryption algorithms for securing information and communication. We will also learn how to create professional software repositories to store and show our code and collaborate. Moreover, we will do another real application for calculations with fractions.

### Objectives

This assignment trains students on algorithms, C++ Basics, problem solving, team work and professional software development.

### Instructions

1. Review the concepts of **arrays, functions, strings, and loops**.
2. It is very important to collect course work marks in order to pass easily and get a good grade.  
من المهم للغاية حسن أداء أعمال السنة لتتجح بسهولة و تحصل على تقدير مرتفع
3. These instructions must be followed to get the full marks. يجب اتباع هذه التعليمات بكل دقة
4. **Deadline of part 1 (Tasks 1 and 2) is Sunday 10 March 2024 @ 11:59 pm.**
5. **Deadline of part 2 (Tasks 3 and 4) is Saturday 17 March 2024 @ 11:59 pm.**
6. Weight of the assignment is **7 marks** + you can earn up to **2 bonus** marks.
7. Students will form teams of three students **from the same group / lab** whose IDs **do not end with the same digit**. For example, 2021023, 20210433 and 20210124 cannot be in one team because two of them have IDs ending with 3. الفريق من 3 طلاب لا ينتهي رقم بطاقة الكلية لهم بنفس الرقم
8. Please submit **only work that you did yourself**. If you copy work from your friend or book or AI or the net **you will fail the course**. تسليم حلول منقولة من أى مصدر يؤدي إلى الرسوب فى هذا المقرر. لا تغش الحل أو تنقله من أى مصدر و تعالى و اسألنى فى أى شئ لا تفهمه. لا تقدم أى حل لم تكتبه أنت كاملاً.

### Task 1 (1 mark) – Individual Task

Each team member will:

- 1- Create an account on GitHub.
- 2- Learn basics of GitHub and how to use it. Watch the first 10 videos of [https://www.youtube.com/watch?v=ACOiGZqC8w&list=PLDoPjvoNmBAw4eOj58MZPa\\_kHjaO3frVMF](https://www.youtube.com/watch?v=ACOiGZqC8w&list=PLDoPjvoNmBAw4eOj58MZPa_kHjaO3frVMF) (1:20 hrs)
- 3- Upload the best project you did so far to GitHub after you organize the code & add comments and write an introduction to it.

**What to submit?** (Everyone individually)

- 1- Create and upload a pdf report named **CS112\_A2\_T1\_SectionNum\_YourID.pdf**.
- 2- Report should have your name, ID, FCAI name, course name, assignment and task number.

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- 3- Add to the report **screenshots** showing your account and profile on GitHub and showing the home page of the project you uploaded.
- 4- Each member writes in the report a **summary** in one page single-space font size 12 of the **basic operations that can be done on GitHub** and how to do them.
- 5- Add the **algorithm** you developed for your encryption and decryption algorithms.

### Task 2 (3 mark) – Individual Task & Group Submission

Each team member will solve one of these problems **in C++**, by designing (an algorithm or flowchart) and programming encryption and decryption algorithms. *Encryption is changing a message so it cannot be understood.* The program implemented will depend on the student's last digit in his ID. For example if his ID number is 20210080, then he solves problem **0** and if his number is 20210236, he solves problem **6**. If the student solves the **wrong problem**, he gets **ZERO**. In each problem, the student develops a program that takes a message from the user and **encrypts it** using a **cipher algorithm**. **The list of cipher algorithms to implement is in the document CS112-Winter2023-2024-Assignemnt2-CipherAndCalclatorDescription-V8.0.** The program should also allow the user to **decipher** a given message to get the original message. Each student will implement a different cipher. So, it has three options like this and allows choosing one of the three ciphers of the team. It loops until the user exits. **You should test your program very well. All team should understand all code.**

```
Ahlan ya user ya habibi.
What do you like to do today?
1- Cipher a message
2- Decipher a message
3- End
>> 1
Please enter the message to cipher:
.....
Which Cipher do you like to choose?
1- .....
2- .....
3- .....
4- Return
```

You may find this link useful explaining ciphers [https://maryash.github.io/135/labs/lab\\_06.html](https://maryash.github.io/135/labs/lab_06.html)

#### What to submit? (Group Submission)

- 1- One person submits the **integrated program for all the team**.
- 2- Write the algorithms you used in writing this program (Cipher and decipher) in the report of Task 1.
- 3- Submit one code file named **CS112\_A2\_T2\_SectionNum\_YourID1\_ID2\_ID3.cpp**
- 4- Add **comments** and a **header** to your code and **write clean code**.
- 5- Add a comment about **who did which cipher** (very important)
- 6- **Team should submit original work. Solutions similar to any others or external sources will be penalized. ALL TEAM WILL BE PENALIZED**

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### Task 3 (3 marks) – Team Task

- 1- The team will work together and develop the fractions calculator in CS112-Winter2023-2024-Assignemnt2-CipherAndCalculatorDescription-V8.0. **Divide the work equally.**
- 2- Team should ensure all members submitted code that follows the standard below and is organized. Code must have good style and comments in each file.

**What to submit?** (One person submits for all the team)

- 1- Submit **one integrated code file** named **CS112\_A2\_T3\_SectionNum\_ID1\_ID2\_ID3.cpp**
- 2- Add **comments** and **a header** to your code and **write clean code**.
- 3- Write **who did what part**. (very important)
- 4- **Team should submit original work. Solutions similar to any others or external sources will be penalized.**

### Bonus1: Task 4 (2 marks) – Team Task

To get 2 bonus marks, the team should implement a cipher program the implements **all the ten algorithms** in task 2. The program should allow the user to choose from a menu the specific cipher (or decipher) he wants to apply. **Team should divide the work equally.**

**What to submit?** (One person submits for all the team)

- 1- Submit one code file named **CS112\_A2\_T4\_SectionNum\_ID1\_ID2\_ID3.cpp**
- 2- Add **comments** and **a header** to your code and **write clean code**.
- 3- Write **who did what part**.
- 4- **Team should submit original work. Solutions similar to any others or external sources will be penalized.**

### Coding Style

All programs should follow proper coding style for C++ as shown below.

<b>1- Variable names must be in mixed case starting with lower case.</b>
<code>line, savingsAccount</code>
<b>2. The prefix <i>n</i> should be used for variables representing a number of objects.</b>
<code>nPoints, nLines</code>
<b>3. Iterator variables should be called <i>i</i>, <i>j</i>, <i>k</i> etc.</b>
<code>for (int i = 0; i &lt; nTables); i++) { : }</code>
<b>4. The prefix <i>is</i> should be used for Boolean variables and methods.</b>
<code>isSet, isVisible, isFinished, isFound, isOpen</code>
<b>5. The conditional should be put on a separate line.</b>
<code>if (isDone) // NOT: if (isDone) statement1; statement1;</code>

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#### 6. Block layout should be as illustrated in example 1 below (recommended) or example 2

```
while (!done) {
    doSomething();
    done = moreToDo();
}

while (!done)
{
    doSomething();
    done = moreToDo();
}
```

(Taken from <http://geosoft.no/development/cppstyle.html>)

### Program Header

Each program should start with a header explaining what it is and who authored it. It should also have the date.

- لابد أن يحتوى كل برنامج على تعليقات وإيضاحات كافية و أن يبدأ بالتعليق التالي:

```
// FCAI - Structured Programming - 2024 - Assignment 2
// Program Name:          xxxxxx.cpp
// Program Description:    .....
// Last Modification Date: xx/xx/xxxx
// Author1 and ID and Group:  xxxxx xxxxx
// Author2 and ID and Group:  xxxxx xxxxx
// Author3 and ID and Group:  xxxxx xxxxx
// Teaching Assistant:      xxxxx xxxxx
// Who did what:.....
```

### Academic Honesty Declaration

Each group should fill this form and submit with the report to the TA.

- لابد أن يملأ كل فريق هذا القسم و يقدمه للمعيد مطبوعا.

Faculty of Computers and Information	جامعة القاهرة – كلية الحاسبات و المعلومات
Structured Programming – 2024- Assignment 2	الفرقة الأولى – البرمجة الهيكلية - المسألة 2
Group ..... المجموعة	Date ..... التاريخ
Group ..... المجموعة	Date ..... التاريخ
Group ..... المجموعة	Date ..... التاريخ
We give oath that we have fully authored all the programs we submitted for Assignment 2 and we did not copy work from the net, from other colleagues or from any sources.	
نقسم بالله العظيم نحن الموقعون أدناه أننا قد قمنا بتنفيذ هذه المسألة Assignment 2 بأنفسنا و لم نخش مطلقا أو ننقل جهد غيرنا للحصول على درجات بغير حق أو نعطي مجهودنا للآخرين بغير حق و الله على ما نقول شهيد (من يتخرج من صيغة القسم لسبب ديني يكتب ما يناسب معتقده بدون أى حرج)	
Signature .....	التوقيع .....
Signature .....	التوقيع .....

### Marking Criterion (TBA)