Object-Oriented Programming
Assignment 5 – Project

May 23, 2017

Objectives

Practice and get familiar with classes in C++ language. In this assignment you will make use of the subject matters about Practice and get familiar with advanced skills in dealing with classes in C++ language. In this assignment you will make use of the results of previous assignments and the taught subject matters about Separate Compilation and Namespaces (ch. 11).

Problem Description

Team up to design classes that are capable of calculation of complex numbers:

$$c_1 = \frac{1}{3} - \frac{6}{17}\,\mathrm{i}$$
$$c_2 = \frac{81!}{320!} + \frac{128!}{520!}\,\mathrm{i}$$
$$\frac{c_1}{c_2} = ?$$

To this end, your team must develop three classes with appropriate operators:

1. **Complex number** $\mathbb{C} \equiv \{a + b\mathrm{i} \mid a, b \in \mathbb{Q}\}$

    - A complex number is in the form $a + b\mathrm{i}$, where a and b are rational numbers, and i represents $\sqrt{-1}$.
    - Develop class `Complex` by using class `Rational` for a and b.

2. **Rational number** $\mathbb{Q} \equiv \{\frac{a}{b} \mid a, b \in \mathbb{Z}\}$

    - A rational number is a number that can be represented as the quotient of two integers, e.g., $\frac{1}{2}$, $\frac{3}{4}$, and $\frac{64}{2}$.
    - Modify class `Rational` (assignment 3) to represent a rational number as two values of type `BigInt`, one for the numerator and one for the denominator.
    - Must define necessary constructors and overload needed operators ($+$, $-$, $*$, $/$, $==$, $<<$, ...)

3. **Big integer** $\mathbb{Z}$

    - Modify class `BigInt` (assignment 4).
    - Define a member function `factorial` to calculate the factorial of the calling big integer.

Assignment

- Programmer #1:

  - Develop **class Complex** associated with class `Rational`.
  - Write the **application** to solve the above question "$\frac{c_1}{c_2}$ =?". (Note $(a + bi)/(c + di) = \frac{(ac+bd)+(bc-ad)i}{c^2+d^2}$)

- Programmer #2:

  - Develop **class Rational** associated with class `BigInt`.

- Programmer #3:

  - Develop **class BigInt** with function `factorial`.

- Team

  - Each programmer must use **namespace**:
    * Create your own namespace for the class
    * Use unnamed namespace to hide helping functions if necessary.
  - Utilizes **separate compilation**:
    * Three **Interface** files for the three classes
    * Three **Implementation** files for the three classes
    * One **Application** file for solution of the above question using the three classes

Report

Each of you should answer the following questions ($\leq$ **three** A4 pages).

- Regarding the goal "concurrent development" of OOP:

  - Describe the parts of this work that *help* to achieve this goal.
  - Describe the parts of this work that *fail* to achieve it. Could you give some ways to resolve this issue?

- What are the advatanges of OOP principles (encapsulation, inheritance, and polymorphism) used in this work?

- What did you learn from this experience of team programming?

- Please **evaluate** your two teammates respectively:

  - Score: 0 (worst) – 15 (best)
  - Give short comment (**15–140** words for each teammate)

Evaluation

- Correctness: 80%

- Styling: 10%

- Report: 30%

- Cooperation (teammates' evaluation): 30%

Submission

- **2017/06/12 (degrade by 10 points for each day delay)**

- Source code (.h, .cpp)

    - Show your information (Team No., Name, Student ID, Dept, Year) as comments in the beginning of your code.

    - Zip (.h, .cpp, report) to a file named "Hw5_(#Student ID).zip".

    - Upload your work to eCourse website.

Team	Role	學　號	姓　名	Email
1	#1	404410023	朱軒緯	ady2343231@gmail.com
	#2	402410056	連劭謙	simon11778@yahoo.com
	#3	404410036	林奕奇	mike9846@gmail.com
2	#1	404410022	余煥淵	fichufish@csie.io
	#2	404410068	鄭諺輿	journey5320@gmail.com
	#3	404410034	黃筱茜	sherry860713@gmail.com
3	#1	404410002	張詠婷	andreachange99@yahoo.com.tw
	#2	404410038	陳坤鈿	billy85122011@gmail.com
	#3	403410102	劉怡廷	acuid01@gmail.com
4	#1	404410044	陳國威	erfd8525@gmail.com
	#2	404410032	謝鴻偉	hsieh9031786@gmail.com
	#3	404410088	佘承澔	steven294@yahoo.com.tw
5	#1	402520022	黃伯靜	z8630076@yahoo.com.tw
	#2	404410053	張碩恩	u04410053@ccu.edu.tw
	#3	404220029	陳麥克	o860116@gmail.com
6	#1	404420020	張庭瑋	a1504popeye@gmail.com
	#2	404410025	張維恩	f19735642@gmail.com
	#3	404410039	李維哲	lwj851226@gmail.com
7	#1	403210019	游濬璘	affordshark_jim946840@yahoo.com.tw
	#2	404410015	陳思翰	ms0204251@yahoo.com.tw
	#3	404410101	林政賢	z970485888@gmail.com
8	#1	404210015	張璞剛	chang.860605@gmail.com
	#2	404410073	趙　辰	hekz38960@gmail.com
	#3	404410042	王采莉	tsaili0509@gmail.com
9	#1	404410057	張芫紳	wolf103057@gmail.com
	#2	402520085	方羿茗	nibvay06@gmail.com
	#3	404410048	胡鐘堡	fsesb9801@gmail.com
10	#1	404410017	江明軒	andy4042023@yahoo.com.tw
	#2	404410013	林義翔	sean110456@gmail.com
	#3	404410029	蔡欣健	ylae234@gmail.com
11	#1	403410033	曾俊宏	henrybear327@gmail.com
	#2	404410098	黃子俞	thehandsomeboyno.1@gmail.com
	#3	404410043	童彥淇	moon78700@gmail.com
12	#1	404410018	陳韋呈	asdfvcxz50@gmail.com
	#2	404410045	林佳宜	ilikehitmanreborn@gmail.com
	#3	404410028	陳　曦	stevenchen0326@gmail.com
13	#1	404410060	林松佑	j92415@yahoo.com.tw
	#2	404410051	張世亞	otischang.true@gmail.com
	#3	404410067	呂宗樺	spigbbbbb@gmail.com
14	#1	404410055	蘇辰堯	rockx870@gmail.com
	#2	404410047	張育碩	ljk25679@gmail.com
	#3	404410082	李宗樺	qaz10130166@gmail.com
15	#1	404410033	黃郁儒	lu981300@gmail.com
	#2	402125039	葉家瑋	jrvsye@gmail.com
	#3	402410071	莊亞晉	g123dg123d@gmail.com

Team	Role	學 號	姓 名	Email
16	#1	404410050	林妤潔	au13941@gmail.com
	#2	404410008	關正為	kwanzw1996@gmail.com
	#3	404410026	李岳庭	ck1000356@gmail.com
17	#1	404410081	陳柏諺	simon860521@yahoo.com.tw
	#2	403530004	楊楚玄	eddy540511@yahoo.com.tw
	#3	404410095	藍笙祐	langeniustw@gmail.com
18	#1	404410052	賴在興	hyacinth97223@gmail.com
	#2	404410014	蔡帛洋	ianpaul32@gmail.com
	#3	402520019	張乃方	c8404242000@yahoo.com.tw
19	#1	404410021	賴炘民	along80202@gmail.com.tw
	#2	404410096	龍柏安	lpa860112@gmail.com
	#3	404410097	鄭昆庭	a6163508@gmail.com
20	#1	403210045	吳思嬋	qempsil0914@gmail.com
	#2	404410006	徐尉庭	l7365714@gmail.com
	#3	404410046	王偉丞	wmike851223@gmail.com
21	#1	404410064	王瀚翊	dennis7096@gmail.com
	#2	404410074	朱易薪	andychu0325@gmail.com
	#3	404410016	宋慶澔	hower.song@gmail.com
22	#1	403530009	彭欣瑩	smile25896@yahoo.com.tw
	#2	404410003	游陳叡	omarchen1231@gmail.com
	#3	404410058	曹維廷	a0903511820@gmail.com
23	#1	404410079	許凱荃	ekids12345@gmail.com
	#2	404410110	洪翊訓	coolsuper91367@gmail.com
	#3	404410004	郝品才	peterggwp@gmail.com
24	#1	404410091	劉濟實	calvin84614@gmail.com
	#2	404410009	林佑荃	popk456789159357@gmail.com
	#3	404410089	廖蕙萍	yipingliaoalice@gmail.com
25	#1	404410054	蔡明憲	a8524456a@gmail.com
	#2	404410062	林佳萱	kl8534ghj4633@gmail.com
	#3	404410024	廖紹凱	louislouis859111996@gmail.com