CSC3002 23Fall Assignment 2

Due 23:59, Oct. 22, 2023

About this assignment

- You don't need to modify or submit any other files other than *calendar.cpp*, *reversequeue.cpp*, *MorseCode.cpp*.

Problem 1 (Exercise 5.13, Points:25)

Problem Description

And the first one now
Will later be last
For the times they are a-Changin'.
-Bob Dylan, "The Times They Are a-Changin'," 1963

Following the inspiration from Bob Dylan's song (which is itself inspired by Matthew 19:30), complete the functions in *reversequeue.cpp* :

```
void reverseQueue (queue < string > & queue);
void listQueue(queue < string > & queue);
```

that reverses the elements in the queue. Remember that you have no access to the internal representation of the queue and must therefore come up with an algorithm - presumably involving other structures - that accomplishes the task.

In & Out In this problem, you are recommended to use a `.txt` file to input. Files *in/p1_in*.txt* are provided for your tests. You may create new input files by your own, however, we DO NOT recommend inputting the queue from the terminal directly. You don't need to re-split or combine any elements in the input queue.

Both the original queue and the reversed queue need to be output. Please refer to the file *out/p1_out*.txt* for the standard output format.

当你传递一个对象（比如 queue<string>）给函数时，通常会创建该对象的一个副本，函数在副本上操作，不会影响到原始对象。但是，当你使用引用（使用 & 符号）时，函数可以直接操作原始对象，而不是复制它。这在处理大型数据结构时特别有用，因为避免了不必要的内存开销。

所以，queue<string> &queue 允许你在 reverseQueue 函数中直接修改传入的队列对象，而不需要返回新的队列。

Problem 2 (Exercise 5.19, Points: 25)

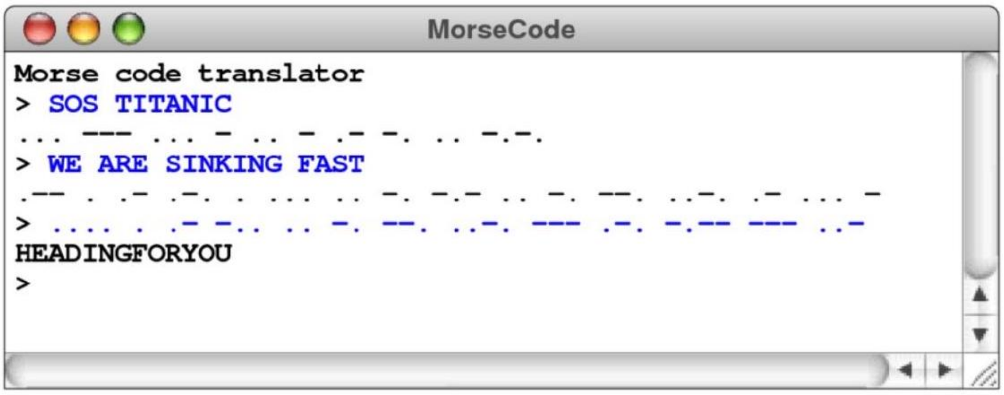
In May of 1844 , Samuel F. B. Morse sent the message "What hath God wrought!" by telegraph from Washington to Baltimore, heralding the beginning of the age of electronic communication. To make it possible to communicate information using only the presence or absence of a single tone, Morse designed a coding system in which letters and other symbols are represented as coded sequences of short and long tones, traditionally called dots and dashes. In Morse code, the 26 letters of the alphabet are represented by the codes shown in Figure .

A	•▬	H	••••	O	▬▬▬	V	•••▬
B	▬•••	I	••	P	•▬▬•	W	•▬▬
C	▬•▬•	J	•▬▬▬	Q	▬▬•▬	X	▬••▬
D	▬••	K	▬•▬	R	•▬•	Y	▬•▬▬
E	•	L	•▬••	S	•••	Z	▬▬••
F	••▬•	M	▬▬	T	▬		
G	▬▬•	N	▬•	U	••▬		

Write a program that reads in lines from the user and translates each line either to or from Morse code depending on the first character of the line:

- If the line starts with a letter, you need to translate it to Morse code. Any characters other than the 26 letters should simply be ignored. Lower case letters will be translated after they are transferred into upper cases.
- If the line starts with a period (dot) or a hyphen (dash), it should be read as a series of Morse code characters that you need to translate back to letters. Each sequence of dots and dashes is separated by **spaces**, but any other characters should be ignored. Because there is no encoding for the space between words, the characters of the translated message will be run together when your program translates in this direction.

The program should end when the user enters a blank line. A sample run of an existing program (not the demonstration of this assignment, taken from the messages between the Titanic and the Carpathia in 1912) might look like this:



```
Morse code translator
> SOS TITANIC
... --- ... - .. - .- -. .. -.-.
> WE ARE SINKING FAST
.-- . .- .-. . ... .. -. -.- .. -. --. ..-. .- ... -
> .... . .- -.. .. -. --. ..-. --- .-. -.-- --- ..-
HEADINGFORYOU
>
```

Requirements A sample of creating Morse code map is given in *MorseCode.cpp*. You do not need to implement the letter-to-Morse translation by yourself. For inverted map, generating inverted map manually (typed inverted map directly) is not allowed. You need to create the inverted map using the created map before. Please fill in the **TODO** part of *morsecode.cpp*.

In & Out Input should be a string of letters or Morse code. Files *in/p2_ in*.txt* are provided for your tests. The translated sequence needs to be output. Please refer to the file *out/p2_ out*.txt* for the standard output format.

About this Problem

- Input will only include pure letters or pure Morse codes, and no mixed input will be tested.
- Letters input contains upper and lower case letters only.
- Morse code input contains dot, dash and spaces (to split the codes) only.

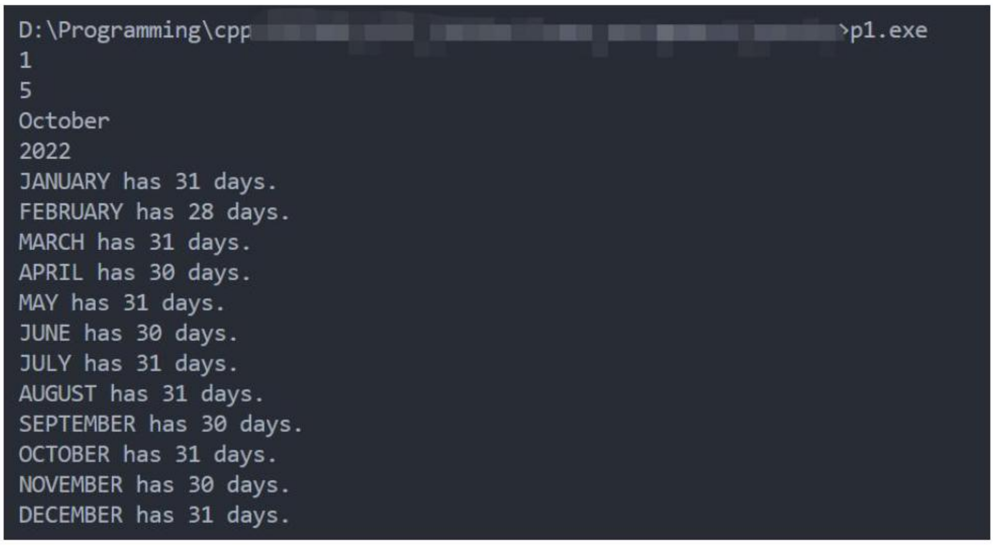
Problem 3 (Points: 50)

P3Part1: (Exercise 2.11, Points: 20)

Problem Description Taking the `direction.h` interface [Figure 2-7 in textbook] as an example, using `calendar.h` design and implement functions in *calendar.cpp* that exports the Month type from Chapter 1. **TODO**: You need to complete functions `daysInMonth` and `isLeapYear`. Your should also implement the `monthTostring` function that returns the constant name for a value of type Month.

In & Out Input of this program has 4 positions, see file *in/p1_in1.txt*. The types and meanings are all in the following table. Note that values of variables in positions 2 and 3 will not affect your output contents. To test your implementation in this part, index of the task will always =**1**.

Position	type	meaning
0	`int`	index of the task
1	`int`	day
2	`string`	month
3	`int`	year



```
D:\Programming\cpp[redacted]>p1.exe
1
5
October
2022
JANUARY has 31 days.
FEBRUARY has 28 days.
MARCH has 31 days.
APRIL has 30 days.
MAY has 31 days.
JUNE has 30 days.
JULY has 31 days.
AUGUST has 31 days.
SEPTEMBER has 30 days.
OCTOBER has 31 days.
NOVEMBER has 30 days.
DECEMBER has 31 days.
```

Figure 1: Capture of an in & out example.

Your implementation in `monthToString()`, `daysInMonth()` and `isLeapYear()` will be test automatically in the `main()` function. Please refer to the file *out/p3_out1.txt* for the standard output format.

P3Part2: (Exercise 6.5, Points: 20)

Problem Description Based on the *calendar.h* interface above, complete the declaration of `Date` class so that it also exports the following methods:

- A default constructor that sets the date to January 1, 1900.
- A constructor that takes a month, day, and year and initializes the Date to contain those values. For example, the declaration

  `Date moonLanding (JULY, 20,1969);`

  should initialize `moonLanding` to represent July 20,1969.

- An overloaded version of the constructor that takes the first two parameters in the opposite order, for the benefit of clients in other parts of the world. This change allows the declaration of `moonLanding` to be written as `Date moonLanding (20, JULY, 1969);`
- The getter methods:: `getDay`, `getMonth`, and `getYear`.
- A tostring method that returns the date in the form $dd - mmm - yyyy$, where dd is a one- or two-digit date, mmm is the three-letter English abbreviation for the month, and yyyy is the four-digit year. Thus, calling `tostring(moonLanding)` should return the string "20-Jul-1969".

In & Out The input format of this part follows the same as that in part 1. To test your implementation in this part, the index of the task will always =**2**.

Your implementation of `Date` initialization, getter methods, and `toString()` method will be tested automatically in the `main()` function. Please refer to the file *out/p3_ out2.txt* for standard output format.

P3Part3: (Exercise 6.6, Points: 10)

Problem Description Extend the `Date` by adding overloaded versions of the following operators:

- The insertion operator <<, implemented in `ostream &operator<<`.
- The relational operators $==, !=, <, <=, >$, and $>=$, implemented in `bool operator==, operator!=, operator<, operator<=, operator>, operator>=`. We define later date >= earlier date = true, and vice versa.
- The expression date $+n$, which returns the date n days after date, implemented in `Date operator+`.
- The expression date $-n$, which returns the date n days before date, implemented in `Date operator-`.
- The expression $d_1 - d_2$, which returns how many days separate d_1 and d_2, implemented in `int operator-`.
- The shorthand assignment operators $+=$ and $-=$ with an integer on the right, implemented in `Date &operator+=, Date &operator-=`.
- The ++ and −− operators in both their prefix and suffix form, implemented in `Date operator++(Date &date), Date operator++(Date &date, int), Date operator(Date &date), Date operator(Date &date, int)`.

Suppose, for example, that you have made the following definitions: `Date electionDay(6, NOVEMBER, 2012);`
`Date inaugurationDay(21, JANUARY, 2013);`

Given these values of the variables,

- `electionDay < inaugurationDay` is **true** because `electionday` comes before `inaugurationDay`.
- Evaluating `inaugurationDay - electionday` returns **76** , which is the number of days between the two events.
- The definitions of these operators, moreover, allow vou to write a for loop like `for (Date d<=electionDay; d = inaugurationDay; d++ )` that cycles through each of these days, including both endpoints.

In & Out The input format of this part is similar to that in the previous parts. To test your implementation in this part, the index of the task will always =**3**. Five dates will be input at the same time.

Position	Type	meaning
0	`int`	index of the task
1,2,3	`int, string, int`	Date 1 in form of dd-mm-yyyy
4,5,6	`string, int, int`	Date 2 in form of mm-dd-yyyy
7,8,9	`string, int, int`	Date 3 in form of mm-dd-yyyy
10,11,12	`int, string, int`	Date 4 in form of dd-mm-yyyy
13,14,15	`int, string, int`	Date 5 in form of dd-mm-yyyy

Your implementation of the above operators will be tested automatically in the `main()` function. Please refer to the file *out/p3_ out3.txt* for the standard output format.

About this Problem

- In all the test cases, all month name inputs will only includes upper cases.
- In part3 test cases, date 5 will always be assigned as a earlier date than date 4.
- Pre-test cases on the OJ platform are test case of part1, part2, and part3, respectively.
- The three parts of this problem are combined together. The source file is in *calendar.cpp*. You need to finish all `TODO` parts in this file.