CIS 15 Fall 2007, Assignment VII

Instructions

- This is the assignment for Unit VII.
- It is worth 5 points.
- **It is due on Wednesday December 19** and must be submitted by email (as below).
- **Follow these emailing instructions:**
  1. Create a mail message addressed to **parsons@sci.brooklyn.cuny.edu** with the subject line **cis15 hw7**.
  2. Attach ONLY **hw7a.cpp**, **hw7b.cpp** and **hw7c.cpp**,
  3. Write your name, that is the name under which you registered for the course, in the email. When I get an email from `deathmetal@aol.com` or `pinkprincess@yahoo.com`, I can usually guess whose program it is, but that is not as good as *knowing* whose program it is.
  4. Failure to follow these instructions will result in points being taken away from your grade. The number of points will be in proportion to the extent to which you did not follow instructions . . . (which can make it a lot harder for me to grade your work)

Description

For this assignment, you will write three small programs that help you explore **templates** and the **STL**.

a. Writing your own template

1. Create a file called **hw7a.cpp**.
2. In it, put the following header definition:

```
template<class TYPE>
class Elements {
public:
  Elements( int size=1 );
  ~Elements();
  void set( int index, TYPE value );
  TYPE get( int index );
  int getSize();
private:
  TYPE *data;
  int size;
}; // end of class Elements
```

3. Add the following main function definition:

```
int main() {
  char *tmp = "hello";
  Elements<char> A(5);
  for ( int i=0; i<strlen(tmp); i++ )
    A.set( i,tmp[i] );
  for ( int i=0; i<A.getSize(); i++ )
```

```
    cout << A.get( i ) << " ";
  cout << endl;
} // end of main()
```

4. Complete the template class by writing definitions for the 5 functions:
   - `Elements( int size=1 );`
   - `~Elements();`
   - `void set( int index, TYPE value );`
   - `TYPE get( int index );`
   - `int getSize();`
5. Compile, link and run your code.
6. Test it to make sure it works robustly. The output should look like this:

```
unix-prompt$ ./hw7a.exe
h e l l o
```

b. Using the STL `list` class

1. Create a file called **hw7b.cpp**.
2. Copy the `main()` function from **hw7a.cpp** into your new file (hw7b.cpp).
3. Modify it so that instead of using the `Elements` class that you created yourself, it is using the STL `list` class.
4. Inside the `for` loop for inserting elements onto the list, you will need to use either the `list` function named `push_front()` or `push_back()`.
5. Inside the `for` loop for the printing elements that are on the list, you will need to call either `back()` (to access the last element on the list) and `pop_back()` (to remove the last element from the list) or `front()` and `pop_front()` (to access and then remove the first element on the list).
6. Refer to the documentation handed out in class on the `list` template. This can also be found online at: `http://www.cppreference.com/cpplist/index.html`
7. Compile, link and run your code.
8. Test it to make sure it works robustly. The output should look the same as it does with the first program (hw7a).

c. Using the STL `list` class with an `iterator`

1. Create a file called **hw7c.cpp**.
2. Copy your code from **hw7b.cpp** into your new file (hw7c.cpp).
3. In the second `for` loop, where you print the elements that are on the list, replace the use of `i` with an **iterator**.
   Refer to the class notes (lecture VII) and the textbook (chapter 7) for help with iterators.
   You can also find help online at:
   `http://www.cppreference.com/iterators.html`
4. Compile, link and run your code.
5. Test it to make sure it works robustly. The output should look the same as it does with the first program (hw7a).

Marking rubric

- Part a: *2.5 points*
  0.5 points for each of the 5 functions
- Part b: *1.5 points*
  0.5 points for correctly defining a list object
  0.5 points for correctly adding items to the list
  0.5 points for correctly printing the list
- Part c: *1 point*
  0.25 points for correctly defining a list iterator
  0.75 points for correctly using the list iterator to print out the list contents