Level 3 Develop software using C++ (7266/7267-302)

e-Quals
Assignment guide for Candidates
Assignment D

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Assignment D

Introduction – Information for Candidates

About this document

This assignment comprises the part of the assessment for Level 3 Develop software using C++ (7266/7267-302).

Health and safety

You are asked to consider the importance of safe working practices at all times.

You are responsible for maintaining the safety of others as well as your own. Anyone behaving in an unsafe fashion will be stopped and a suitable warning given. You will **not** be allowed to continue with an assignment if you compromise any of the Health and Safety requirements. This may seem rather strict but, apart from the potentially unpleasant consequences, you must acquire the habits required for the workplace.

Time allowance

The recommended time allowance for this assignment is **6 hours**.

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Candidate instructions

Candidates are advised to read **all instructions** carefully before starting work and to check with your assessor, if necessary, to ensure that you have fully understood what is required.

Time allowance: 6 hours

Assignment set up: A scenario is provided below for this assignment.

This assignment is made up of **five** tasks

- **Task A** - requires the candidate to design the program on paper and collect information prior to coding.
- **Task B** - requires the candidate to implement the design and to annotate the code
- **Task C** - requires the candidate, if possible, to produce screen prints of the program.
- **Task D** - requires the candidate to produce end user instructions.
- **Task E** - requires the candidate to print the program listing and save the code to removable media.

Scenario

Terrific Software Ltd has been approached by a local company Guilds Ponds who specialise in building and maintaining garden ponds. Some time ago they had a simple program written for them, which kept on file, chemical readings from the ponds they service.

The old program simply took in a list of chemical values, displayed them on screen, then using a separate file handling program saved them to file. This has worked well for some time, but due to the retirement of some older members of staff, the newer staff are finding it difficult to work out the treatments that some ponds require.

Guilds Ponds still use the old program and do not want that touched in any way at this time. They ask that the class structure of the existing program be modified to become a base class for a new class which will hopefully answer their employees' needs.

In addition they require a new program or sub-program to be written which will calculate the surface and volume area of any pond, then inform the user of the correct dose of chemicals that has to be used to remove any chlorine in a new or refilled pond.

You are employed as a programmer for Terrific Software and have been tasked with designing and writing a demonstration program.

The current class which is to be re-used is:

```
class pondClass
{
   private:
         float ph;
         float kh;
         float gh;
         float NO2;
         float NO3;
         public:
         void out(void);
};

void pondClass::out(void)
{
        cout<<"\n\n\n\tValue of ph  = "<<ph;
        cout<<"\n\tValue of kh  = "<<kh;
        cout<<"\n\tValue of NO2 = "<<NO2;
        cout<<"\n\tValue of NO3 = "<<NO3;
        cout<<"\n\n\n\tTreatment required : \n";
}
```

Note: Only minor changes may be made to this class so as not to affect the file handling program.

Guilds Ponds asks that the program be menu driven, as a successful trial will lead to the existing file handling program being incorporated into the menu.

The following lists the values which apply to each of the tests and the information that is shown should be used as a basis for the program output.

PH - Measures the acidity and alkaline levels of the pond.
The range can vary from 0 to 20.
Readings of 6.5 to 8.5 are considered to be normal.
Readings below 6.5 mean that the water has excessive acidity. The user should use 'PH ADJUSTER – ACID' and as a quick cure change 50% of the water, especially in the Autumn.
Readings above 8.5 mean that the water is excessively alkaline and the user should use 'PH ADJUSTER – ALKALINE', and as a quick cure change 50% of the water, especially in the Autumn.

KH - Measures the carbonate hardness levels of the pond.
The range can vary from 0 to 20.
Readings of 6 to 12 are considered to be normal.
Readings below 6 mean that the water is too soft and the user should add hard water.
Readings above 12 mean that the water is too hard and the user should add soft water.

GH - Measures the general hardness levels of the pond.
The range can vary from 0 to 20.
Readings of 7 to 14 are considered to be normal.
Readings below 7 mean that the water is too soft and the user should add hard water.

Readings above 14 mean that the water is too hard and the user should add soft water.

NO2 - Measures the nitrite levels of the pond.
The range can vary from 0.0 to 1.0 ml/l.
Readings below 0.3 ml/l are considered to be normal.
Readings above 0.3 mean that the nitrite levels are too high. Probable causes and cures for this are:

too much waste in the pond
too much over feeding
there may be dead fish in the pond
there may be too little nitrifying bacteria
check the PH and KH levels
quick cure - change the pond water as soon as possible.

NO3 - Measures the nitrate levels of the pond.
The range can vary from 0 to 200.
Readings of 25 to 100 are considered to be normal.
Readings between 50 and 100 require that a regular check be kept.
Readings below 25 mean that the water is low in nitrate and no action need be taken.
Readings above 100 mean that the water is too high in nitrate as a quick cure 50% of the water should be changed immediately.

The amount of water conditioner required for new or refilled ponds is based on the volume of water in gallons. For each 50 gallons of water, 25 millilitres of 'Clear Water Conditioner' must be used.

Conversions for assistance:

Volume in cubic feet * 6.23 = pond capacity in gallons
Volume in cubic metres * 1000 = pond capacity in litres
1 litre = 0.2642 gallons
1 metre = 3.2808 feet

*To assist you in your design, the following design criteria, which **must** be followed, has been defined by Terrific Software:*

1. The program **must** be written using classes and functions

2. Global variables may be declared, but as far as possible, local variables should be used

3. When the program is run, the screen must clear and a menu displayed, similar to that below but giving the following options:

" Welcome to GUILDS PONDS

Do you want to:...
1.....Check the chemical levels
2.....Change the water
3.....Exit the program";
Selection : "

4. User entry must be validated in the range of 1 to 3 only.

5. Entry of 3 shall cause a suitable message to be displayed and after a short delay the screen clear and the program terminate.

6. A user entry of option 1 shall cause the screen to clear and the following messages and range information to be displayed on the screen:

   " Test the pond water and note the readings below

   What is the PH (Acidity) reading?
   What is the KH (Carbonate Hardness) reading?
   What is the GH (General Hardness) reading?
   What is the NO2(Nitrite) reading?
   What is the NO3(Nitrate) reading? "

7. The user should be given some indication of the ranges that are required to be entered.

8. On entering values for each of the questions, the user must be given the opportunity to check them and confirm that they are correct. A suitable message similar to that below should be used:

   " Are these values correct? "

9. User entry must be converted to uppercase for validation. An entry other than 'Y' shall cause the program to be repeated for 6 above

10. Entry of 'Y' shall cause the values input to be passed to the new Class. The new class is to be called **outClass** and derived from the base class **pondClass**

11. The base class member function **out( )** must be called to display the readings taken from the pond.

12. This is to be followed by the output of member function(s) of **outClass** which must display on screen the results of the tests as set out in the scenario above.

13. The screen must be held at the bottom of the display to enable the user to read the messages. A suitable prompt should be used similar to:

    " Press any key to continue : "

14. Depression of any key must cause the screen to clear and the main program menu displayed.

15. Selection of menu option 2 must cause the screen to clear and suitable screen messages displayed requesting the approximate length, width and depth of the pond.

    There **must** be clear a indication to input dimensions in metres only.

16. After entry of the dimensions, a new class **sizeClass** shall be called to display the following information (see scenario):

" Surface area of the pond in square feet
Volume of the pond in cubic feet
Surface area of the pond in square metres
Volume of the pond in cubic metres
Volume of water in gallons
Volume of water in litres
Amount of chemical required to treat a new/refilled pond "

17. The user must be allowed to read the screen and press any key to continue with the program. On pressing a key, the screen shall clear and the menu **must** be displayed.

Task A

Use a word processor or paper to design your program and class structures. In designing the program, the criteria set out by Terrific Software must be followed.

Task B

Having designed the program on paper, implement that design into a C++ program, again ensuring that it conforms to the above design criteria. Your source code **must** be fully commented so as to aid understanding.

Task C

In order to provide supportive evidence that the program runs to the design criteria, screen prints should be produced.

Note: If for any reason your system will not allow screen prints to be produced, screen output must be demonstrated to your test supervisor and your documentation noted accordingly.

Task D

Produce end user instructions for the operation of the software.

Task E

Print a fully annotated listing of the program.

Note

- At the conclusion of this assignment, hand all paperwork and removable media to the test supervisor.
- Ensure that your name is on the removable media and all documentation.

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