**Name:**

**Advanced Programming in C++**

**Lab Exercise 2/3/2025**

In this exercise, you will write several programs that will demonstrate some of the basic features of the C++ programming language. When you have completed your programs, you are to submit your documented source code as well as a sample output.

1. The speed of sound varies depending on the medium through which it travels. In general, sound travels fastest in a rigid media such as steel and slower in liquid media such as water and slowest in gases such as air. The following table shows the approximate speed of sound, measured in feet per second, in air, water, and steel.

|  |  |
| --- | --- |
| **Medium** | **Speed (feet/second)** |
| Air | 1100 |
| Water | 4900 |
| Steel | 16400 |

Write a program that displays a menu allowing the user to select air, water, or steel. After the user has made the selection, the number of feet the sound wave will travel in the selected medium will be entered. The program will then display the amount of time it will take to four decimal places.

1. The date June 10, 1960, is special because when we write it in the following format, the month times the day equals the year.

Example: 6/10/60

Write a program that asks the user to enter a month (in numeric form), a day, and a two digit year. The program should then determine whether the month times the day is equal to the year. If so, it should display a message saying the date is magic. Otherwise, it should display a message saying the date is not magic.

1. The following table lists the freezing and boiling points of several substances. Write a program that asks the user to enter a temperature, and then shows all the substances that will freeze at that temperature and all that will boil at that temperature. For example, if the user enters –20 the program should report that water will freeze and oxygen will boil at that temperature.

|  |  |  |
| --- | --- | --- |
| **Substance** | **Freezing Point (°F)** | **Boiling Point (°F)** |
| Ethyl alcohol | -173 | 172 |
| Mercury | –38 | 676 |
| Oxygen | –362 | –306 |
| Water | 32 | 212 |

1. Modify the freezing and boiling points program described in the previous problem so it reads its input from a file instead of from the keyboard. Perform the necessary test to determine if an error occurs when the file is opened. If an error occurs, display a message informing the user. The following data to test your program can be found in the FrzBoil.dat file found on the server.

-173 -38 -362 32

172 676 -306 212

It is important that your program read the data from the file in the same order it is written

in the file. Notice that the four freezing point values come first, followed by the four boiling point values.