CPSC 120
ABET Data Preparation and Collection

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CPSC 120– Performance Indicators (PIs)

- Code
- IDE—Debugging with Visual Studio

Related Teaching Activities
- Problem solving, pseudocode, coding examples in lectures
- Programming assignments and projects
- Debugging instruction, demo and practice in lab assignment
Lab 3.4 Writing C++ program with debugging, documentation and formatting

This lab exercise will introduce you to writing a C++ program that includes documentation and is correctly formatted.

You will write a short C++ program that compiles, links (builds), and runs and does the following. It should ask the user to input the temperature in degrees Celsius, and when the user does type in a temperature in Celsius, converts and prints it in degrees Fahrenheit.

The math formula given for the conversion is given below.

Formula for conversion:

\[
\text{degrees in Fahrenheit} = \frac{9}{5} \times \text{(degrees in Celsius)} + 32
\]

Sample output to screen:

Please enter the temperature in degrees Celsius.

22

The equivalent to 22.0 degrees Celsius is 71.6 degrees Fahrenheit.
Please do this exercise in the following way.

3.4.1 Write you pseudocode;

3.4.2 Write the program out on paper, pretending it is a question on a quiz. Include everything that will make it compile, build, and run properly.

After you have written it out, review it carefully to make sure you did not make careless mistakes. Fix any that you find.

3.4.3 After you have done the first two steps, start the Visual Studio, create an empty WIN 32 console project and copy the program exactly as you wrote it. Try compiling it. List everything you had to change, and give the reason why.

Example:

Misspelled the variable temperature, did not match the spelling used in declaring it.

3.4.4 Once it compiled, go to the source code and put a breakpoint (click on the bar just left of the code window) on the line right after int main(). Then under “Debug” menu, click “Start debugging..”. Click F10 to step through your code. Note that all consecutive variable declarations are done in one step; look at “Auto” window to see what values are stored in the variables when they are first declared, and write them down.

3.4.5 Step through your program and look at the values of the variables change as each line of code is done. Can you see how this can help you see how the program runs? Have the instructor or lab assistant check how you go through debugging.
Evaluation Method

- **Ideal:**
  - Programming test in lab that count at least 50% of final exam
  - I gave students programming test for midterm exam

- **However, Practically:**
  - It was too hard to arrange an at least 2 hours’ programming test in final exam
  - I use one question in final exam to evaluate the two “PIs”
    - Code
    - IDE
Project 2 (15 points)

Sound travels through air as a result of collisions between the molecules in the air. The temperature of the air affects the speed of the molecules, which in turn affects the speed of sound. The velocity of sound in dry air can be approximated by the formula:

\[ \text{velocity} = 331.3 + 0.61 \times T \]

where T is the temperature of the air in degrees Celsius and the velocity is in meters/second.

Write a program that prompts the user for a starting and an ending temperature. Within this temperature range, the program should output the temperature and the corresponding velocity in one degree increments. In the example below, the user entered 0 as the start temperature and 2 as the end temperature:

- Enter the starting temperature, in degrees Celsius: 0
- Enter the ending temperature, in degrees Celsius: 2
- At 0 degrees Celsius the velocity of sound is 331.30 m/s
- At 1 degrees Celsius the velocity of sound is 331.9 m/s
- At 2 degrees Celsius the velocity of sound is 332.5 m/s

Input Details: The input will consist of two integers, both responses to program prompts.

Output Details: The program uses the prompts shown in the example above. The output percentage must have two digit past the decimal point.
The Question Used for Evaluation in Final Exam(2)

1. (10 points) Write your C++ solution;

2. (5 points) Describe the main steps of “Step -By -Step ”debugging if you need to do debugging of your code with Visual Studio IDE;
## Data Collection Example (Code & IDE)

### Code:

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<tr>
<th>PI Rubric Level</th>
<th>Score [0-10]</th>
<th># Observed Samples</th>
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<tbody>
<tr>
<td>0: Unsatisfactory</td>
<td>[0-6)</td>
<td>13</td>
</tr>
<tr>
<td>1: Developing</td>
<td>[6-8)</td>
<td>12</td>
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<tr>
<td>2: Satisfactory</td>
<td>[8-10]</td>
<td>5</td>
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### IDE:

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