24-780 B—Engineering Computation

Assigned: Mon. Aug. 28, 2023
Due: Tues. Sept. 5, 2023, 11:59pm

Problem Set 1: Bike Speed Calculator

Before we can do any programming, you must install the computer resources necessary. Follow the instructions given in Lecture 1 (see Piazza or Canvas) to get the integrated developing environment (IDE) that best suits you. Although I *highly, highly, highly* recommend Visual Studio, you are free to select anything that makes you comfortable. This course is about programming, not about compiling. That said, don't be a hero by picking the most basic/raw application. If you select an IDE based solely on familiarity, you are likely to miss out on a ton of features available in something new.

Also, note that even if you use a Mac, installing a Windows simulator (Bootcamp, Parallels, etc.) to run Visual Studio and other Windows programs (e.g., SolidWorks, Ansys, etc.) is probably a good idea. Visual Studio is also available on Virtual Andrew so that you don't have to install it at all, although Virtual Andrew sometimes feels a bit slow.

Now for the real task:

I was riding my bike the other day when I thought about how I may be using my multiple speeds inefficiently. Normally, I shift among the 3 front gears when I need a quick change of power/speed and use the 9 rear gears for fine adjustments. However, since the gear ratios for each of the three scales overlap, I may actually be missing some fine adjustments. For example, speed 2-4 (2^{nd} gear in front, 4^{th} in back), may be a higher speed (i.e., less power) than speed 3-7.

Your program must do the following:

1. Print a title message "24-780-B Engineering Computation Prob Set 1 – Bike Speed Calculator"
2. Print "Gear Ratios:" on the console.
3. Generate and print the gear number (as described above) and the gear ratio (driving front gear to driven rear gear) for each gear on a separate line.
4. Prompts the user "Press the ENTER key to close the program >"
5. Waits until the user presses the ENTER key.

I counted the teeth on each of the gears to serve as input. The input to the program will be hard-coded (we're keeping it simple for now) using the following lines:

```
int frontGears[] = { 0, 22, 32, 44 }; // sorted lowest to highest
int rearGears[] = { 0, 34, 30, 26, 23, 20, 18, 16, 14, 12 };
```

Note that the zero position on each of the arrays is not used and that the lowest, most powerful speed, 1-1 uses the smallest gear in front and the largest gear in back.

Expected Sample Output

The console window should look like the following:

```
24-780B Engineering Computation Prob Set 1 – Bike Speed Calculator
Gear Ratios:
1-1: 0.647059
1-2: 0.733333
1-3: 0.846154
    .  .  .
3-9: 3.66667

Press the ENTER key to close the program >
```

Hint: copy/paste directly from the assignment write-up to ensure spacing and spelling,

Deliverables

1 file, very appropriately named:

ps01_bikegears_yourAndrewID.cpp

Upload the file to the class Canvas page before the deadline (Tuesday, Sept. 5, 11:59pm).

Hint: Even if you name your file appropriately, be sure to include your full name within the code itself (in a comment block at the top of the file). It is also appropriate to include date and course info, plus a short description of what the program does. (Think about what part of the text in the assignment write-up can be copy/pasted or adapted for this purpose.)

Learning Objectives

Installing and using an integrated developing environment (IDE) and/or editor and compiler (nearly insane choice) for programming in C/C++.

Familiarizing yourself with C++ syntax and how to write a simple program.

Begin to understand how programming style can enhance any program.

Searching references (online and/or textbook) for C++ library functions.