

CS 410: Homework 1

Due: Tuesday, Sept. 18, 2018 at noon

100 pts

Instructions: Create a subdirectory named “hw1” in your cs410 directory. Use that subdirectory for your files submission on this assignment. You will create the following two files in your hw1 directory:

1. a single C++ compilable file containing a program written in C++ named “hw1.cpp”
2. a “typescript” file demonstrating program compilation, execution and testing. Use the commands below at the UNIX prompt to generate the typescript file:
 - **script** command to start a typescript.
 - **ls -l** to list files in your directory and write date/time
 - **cat hw1.cpp** to print out solution file
 - **g++ -o hw1 hw1.cpp** to compile program
 - **./hw1** to execute program with test input (provided on last page)
 - **exit** command to end typescript file

Background: Hans Moleman needs a new pair of glasses. He’s going to try out a new optometrist in town, a Dr. Riviera. He has been involved in “cutting edge” (see pic) research (see other pic) which is why he has changed residences and started a new practice in optometry. But I digress. Dr. Nick has developed a new formula for determining the grinding thickness for lenses. Your program is going to do that computation. Roughly speaking, the thickness of the lenses (both the same for right and left, since Dr. Nick believes in simplicity) is dependent on both left and right visual acuity, some cliometric¹ constants, and the patient’s social security number. The formula is given below



$$thickness = \frac{L_{VA}}{R_{VA} + K_1} + 5 \times K_2 + IAF$$

where:

- thickness is an *integer* value in cm (centimeters),
- L_{VA} is left visual acuity, a positive *integer*,
- R_{VA} is right visual acuity, a positive *integer*,
- K_1 is the index of refraction constant that Dr. Nick has discovered empirically. Its value is the *constant integer* value 2,
- K_2 is the Nick Needs Money constant which ensures Dr. Nick a minimum income from each customer; currently it is 4.2, and
- IAF is the insurance adjustment factor



IAF is the sum of the last two digits of the patient's soc sec number. This factor is added into the thickness computation ONLY IF the patient has insurance. Why? Well, it screws up the prescription and then they have to come back to Dr. Nick for another diagnosis and more new lenses. Hence, Nick can bill the insurance companies for more money.

¹ We have no idea what this word means. It sounds cool and impressive, and it boosts our esteem to use it; we come off as really smart now. Don't look it up.

Specifications: Your program is to prompt the user for:

- Left visual acuity (L_{VA}) and right visual acuity (R_{VA}), both entered as *integers*,
- The last 4 digits of the patient's social security number (this is entered as a single 4-digit *integer*), and
- Whether the patient has insurance (1 for yes) or not (0 for no). The value be read into a *boolean* type variable.



Note: The thickness value computed should always be rounded down to the nearest integer value. You are **not** allowed to use conditional statements (if or if-else) in the program. Think carefully how to use the information you have input from the user, how it is stored, how boolean variables are represented. It is up to you how you want to name your variables and constants. Your program should be “user friendly” in that it should have an opening statement or greeting, user friendly and understandable prompts, and clear and concise outputs and sign-off. Here’s a good example of bad output:

```
Hello
34
12
3456
0
22
```

Notice that there are NO prompts to speak of, and the output is completely unexplained. This is horrible output. Something like the following is much much better:

```
You are using the LENS-O-MATIC program
enter:
```

```
left visual acuity:    34
right visual acuity:   12
ssn:    3456
ins?    0
thickness of lens:     23 cm
```

```
Good luck with those glasses! And come back to see Dr. Nick !
```

When you submit: When you submit, you will have to enter inputs as a user of the program. Now, in order to make the output uniform for the grader and to keep them sane, ALL OF YOU will enter the same information. For this assignment, it is:

```
left visual acuity:    20
right visual acuity:   30
last 4 of soc sec:     4567
yes for ins coverage
```

If you have any questions about this assignment, be sure to ask your TAs or instructor.