

Assignment 3: Control of Flow

[1] **Objectives:** This assignment aims to practice controlling program flow using several forms of IF statements. We will also practice using a status variable (Boolean and integer) to remember the states.

[2] **Description:** A thermostat is a device we use to control the room temperature for our comfort in hot and cold weather. It monitors the current temperature and turns on **A/C** or **heater** to control the indoor temperature. We simulate this control mechanism in only one instance (partially because we have not learned the loops yet). Just assume the thermostat takes the temperature once a minute and decides what to turn ON or OFF. However, we do want to remember the state (whether the A/C and heater are ON or OFF) so that the thermostat can make the right decision the next time unit comes.



The device operates in the following way. The thermostat has three exclusive settings: 1-**A/C**, 2-**Heater**, and 0-**None** (or standby). Since A/C and Heater work in symmetric patterns, we shall describe the A/C, and you can figure out the heater operation.

- If the thermostat is on the “**A/C mode**,”
 - If the current temperature is higher than or equal to the “high” value threshold (too hot)
 - If the A/C is OFF, then turn ON the A/C
 - If the A/C is ON, then don’t change anything
 - If the current temperature is lower than the “high” value threshold (cool enough)
 - If the A/C is OFF, then don’t change anything
 - If the A/C is ON, turn OFF the A/C

There are many possible cases (3x3x2), but many do not have to be implemented because we don’t need to change anything. There may be 8 (2x2x2) cases that you must use an if-statement to separate them. Four of the eight cases are shown above.

Here is what you need to do:

1. Set up the thermostat setting by choosing the (one of three) mode, setting the low- and high-temperature thresholds, and setting A/C and heater’s status to ON or OFF (only one can be ON at a given time).
2. Enter the current temperature.
3. Print all these values out. Make sure you get this part right before going on to the next step. (About ten lines of mostly input calls)
4. Develop the first nested-if statement for the A/C using the logic above. This part will take about 15 lines of code
5. Test the **A/C** setting before going on to the next step.
6. Develop the second case for the **heater** in a similar way. Another 15 lines of code about you can easily edit the first part for this case. (Symmetry)
7. Develop the third setting (**None**), which involves printing a message only. Overall, you should be able to do the assignment with about 50-60 lines of code.

[3] **Output:** Four sample outputs are given below. Remember, it should work for all possible cases. The TA will run your program to see if it works properly. The following are four outputs from four execution of the program, not one.

```
Enter the Thermostat to (1-AC, 2-Heating, 0-Standby): 1
Enter the low temperature to turn on the heating (F): 70
Enter the high temperature to turn on the A/C (F): 80
Is the AC on (1-Yes, 0-No)? 0
Is the Heater on (1-Yes, 0-No)? 0
Current temperature (F): 75
[Setting=1 AC=OFF Heater=OFF Low=70 High=80 Temp=75]
--- Temperature below the high setting
[Setting=1 AC=OFF Heater=OFF Low=70 High=80 Temp=75]
```

```
Enter the Thermostat to (1-AC, 2-Heating, 0-Standby): 1
Enter the low temperature to turn on the heating (F): 70
Enter the high temperature to turn on the A/C (F): 80
Is the AC on (1-Yes, 0-No)? 0
Is the Heater on (1-Yes, 0-No)? 0
Current temperature (F): 81
[Setting=1 AC=OFF Heater=OFF Low=70 High=80 Temp=81]
*** Turn on the AC
[Setting=1 AC=ON Heater=OFF Low=70 High=80 Temp=81]
```

```
Enter the Thermostat to (1-AC, 2-Heating, 0-Standby): 1
Enter the low temperature to turn on the heating (F): 70
Enter the high temperature to turn on the A/C (F): 80
Is the AC on (1-Yes, 0-No)? 1
Is the Heater on (1-Yes, 0-No)? 0
Current temperature (F): 80
[Setting=1 AC=ON Heater=OFF Low=70 High=80 Temp=80]
--- A/C is already ON
[Setting=1 AC=ON Heater=OFF Low=70 High=80 Temp=80]
```

```
Enter the Thermostat to (1-AC, 2-Heating, 0-Standby): 1
Enter the low temperature to turn on the heating (F): 70
Enter the high temperature to turn on the A/C (F): 80
Is the AC on (1-Yes, 0-No)? 1
Is the Heater on (1-Yes, 0-No)? 0
Current temperature (F): 75
[Setting=1 AC=ON Heater=OFF Low=70 High=80 Temp=75]
*** Turn off the AC
[Setting=1 AC=OFF Heater=OFF Low=70 High=80 Temp=75]
```

[4] **Deadline:** 11:59 pm, Wednesday, February 22, 2023