Dimensional Analysis HW 1: Hot Tub T-table

In this homework, we'll learn (or, for some of you, re-learn!) one of the most efficient ways to collecting numerical information: t-tables.

Here's an example. After filling up his hot tub, Sean looked at the thermometer on the side every hour and recorded the results.

Hours after Filling	Temperature (degrees Celsius)
0	9.2
1	12.2
2	15.0
3	18.2
4	21.1
5	24.1
6	26.9
7	29.7
8	32.4
9	35.2
10	40.4
11	39.9
12	40.3
13	39.9
14	40.1
15	40.2
16	40.3
17	40.1
18	40.2
19	40.4
20	40.0
21	40.2
22	40.0

1. **(1 point)** What temperature was the water when he first turned on the hot tub's heater? Make sure you include the correct unit!

2. **(2 points) (w)** Subtract the temperature that he recorded at hour 4 from the temperature he recorded at hour 7 (you should have a positive number – if not, subtract them the other way). Then divide that number by 3—since the hot tub heated up that many degrees over *three* hours. Write that **final** result below, with its correct unit. (Think carefully about the unit, and check this video out if you need help!)

The number you just calculated is the Average Rate of Change (AROC) of the water temperature in the hot tub between hours 4 and 7 (some of you may have called this "slope" in the past – they're two different names for the same idea!).

The number you calculated "smooths out" the increase in temperature: you might notice that from hour 4 to 5, the tub increased by 3 degrees Celsius, but from hours 5 to 6, it only increased by 2.8 degrees Celsius (same as from hours 6 to 7). So the AROC aims to "smooth out" the change in the dependent variable (temperature) over a constant change in the independent variable (time).

3. **(1 point) (w)** What's the AROC between hours 0 and 3? Include the correct unit.

4. **(1 point)** How does that AROC compare to the one from #2?

5. **(1 point) (w)** What's the AROC between hours 2 and 10? Include the correct unit.

6. **(1 point)** How does that AROC compare to the one from #2 and #3?

7. **(1 point) (w)** What's the AROC between hours 0 and 22? Include the correct unit.

8. **(2 points)** Why is that AROC so different than the others you calculated?