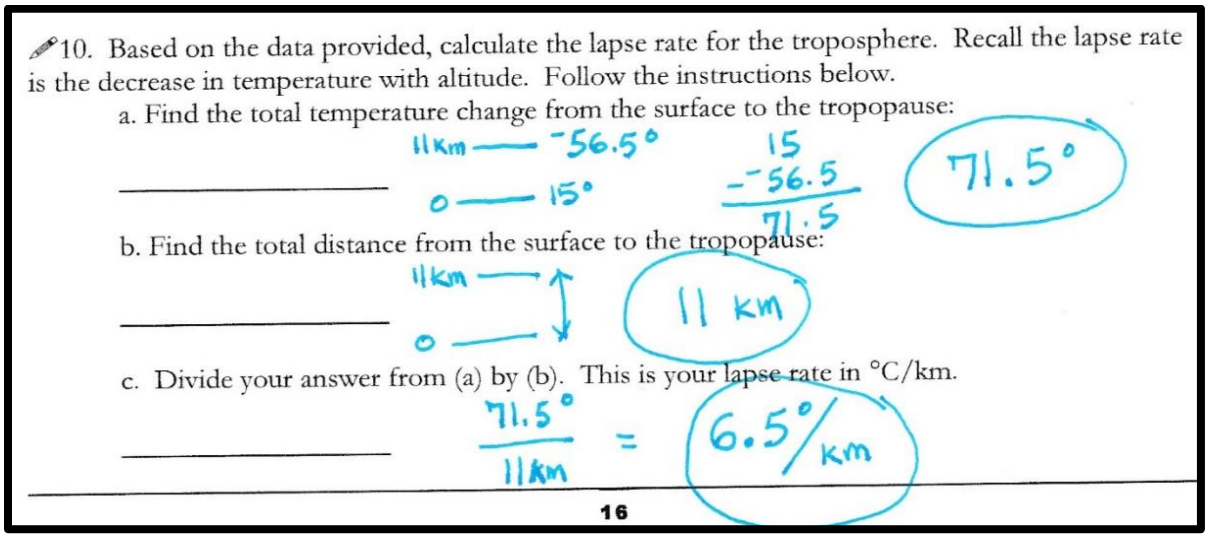
How to solve the Lapse Rate problem in Lab 2:

NOTE: We will use the findings from question 10 to solve a **similar problem to question 11**

After you plot the points from the dataset onto the graph, you can locate the tropopause and understand where the troposphere ends. Then use the change in temperature (from sea level (0 km) to the top of the troposphere (11 km)) and divide this by the change in altitude to determine the lapse rate.



10. Based on the data provided, calculate the lapse rate for the troposphere. Recall the lapse rate is the decrease in temperature with altitude. Follow the instructions below.

a. Find the total temperature change from the surface to the tropopause:

11km — -56.5°

0 — 15°

15 − -56.5 = 71.5°

b. Find the total distance from the surface to the tropopause:

11km

0

11 km

c. Divide your answer from (a) by (b). This is your lapse rate in °C/km.

71.5° / 11km = 6.5°/km

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Now that we have found the lapse rate for this area/date, you can proceed to the next step.

In problem 11 we are asked to determine the temperature for the peak of Mt. Washington based on the current temperature in Salem MA by using the lapse rate from question 10.

We will use a different, but very similar example.

11-x) The lapse rate can be used to estimate temperatures above the surface in the troposphere. Suppose today you decide to take a trip from Salem to the top of Mt. Greylock in Adams, MA (highest peak in MA). Based on your knowing the elevation of Salem and the peak of Mt. Greylock, as well as the current temperature in Salem and the lapse rate (from Q10)…

Predict what the temperature would be at the peak of Mt. Greylock.

Givens:

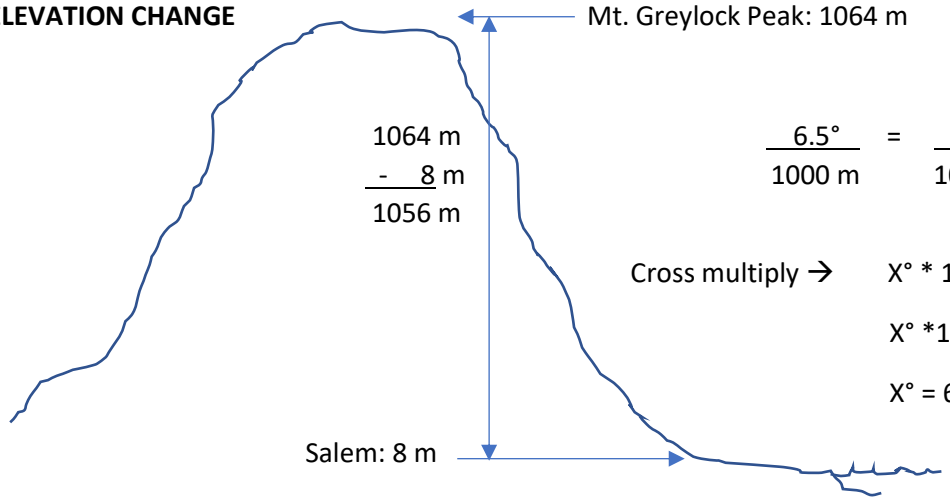
Salem Elevation	8 Meters (26 feet)	Difference in Elevation Mt. Greylock	1064 m
Mt. Greylock Elevation	1064 meters (3,491 feet)	Salem	- 8 m
			1056 m
Salem Temperature	16° F… ***But we need C***	(16°F − 32) × 5/9 = -8.889°C (or -8. 9°C	
Lapse Rate (from Q10)	6.5°/1000m or 6.5°/1km		

Here you must calculate the elevation change between Salem (8 m) and Mt. Greylock (1064 m). This will be the elevation you will calculate your temperature change from.

Remember, there are 1000 m per 1 km, so… 6.5°C / 1 km → 6.5°C / 1000 m

Now you'll use this rate to determine the change in temperature from Salem to Mt. Washington.

ELEVATION CHANGE



$$\frac{6.5^\circ}{1000\ m} = \frac{X^\circ}{1056\ m}$$

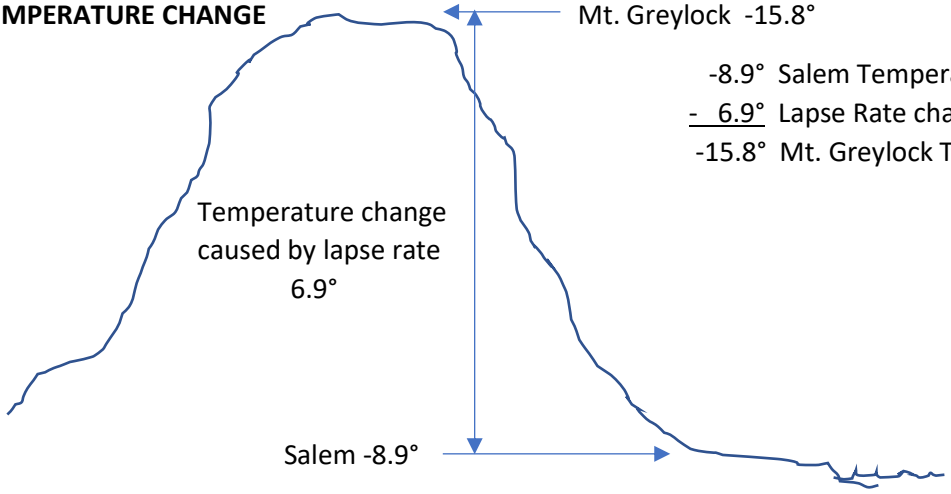
Cross multiply → $X^\circ * 1000m = 6.5^\circ * 1056$

$X^\circ * 1000\ m = 6864\ ^\circ m$

$X^\circ = 6.864$ = A change of 6.9°

Remember… If we are going UP in the troposphere, the temperature will DECLINE. Thus as we go from the current temperature in Salem (-8.9° C) UP TO Mt. Greylock, we will need to **DROP IN TEMPERATURE** by 6.9° C.

TEMPERATURE CHANGE



-8.9° Salem Temperature (given)
- 6.9° Lapse Rate change for 1056 m
-15.8° Mt. Greylock Temperature (calculated)