Pietro Longhi's painting, The Alchemists, *depicts a laboratory setting from the middle of the 18th century.*

T (°C)	V (l)
0	9.5
50	11.2
100	12.9
150	14.7
200	16.4
250	18.1
300	19.9

a. On graph paper, plot V as a function of T. Choose scales that go at least from $T = -300$ to $T = 400$.

b. You should find, as Charles did, that the points lie in a straight line! Extend the line backward until it crosses the T-axis. The temperature you get is called *absolute zero*, the temperature at which, supposedly, all molecular motion stops. Based on your graph, what temperature in degrees Celsius is absolute zero? Is this the number you recall from science courses?

c. Extending a graph beyond all given data, as you did in 2b, is called **extrapolation.** "*Extra-*" means "beyond," and "*-pol-*" comes from "pole," or end. Extrapolate the graph to $T = 400$ and predict what the volume would be at 400°C.

d. Predict the volume at $T = 30$°C. Why do you suppose this prediction is an example of **interpolation?**

e. At what temperature would the volume be 5 liters? Which do you use, interpolation or extrapolation, to find this temperature?

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f. Why can you say that the volume is a *function* of temperature? Is it also true that the temperature is a function of volume? Explain.

g. Considering volume to be a function of temperature, write the domain and the range for this function.

h. See if you can write an algebraic equation for V as a function of T.

i. In this problem, the temperature is the independent variable and the volume is the dependent variable. This implies that you can change the volume by changing the temperature. Is it possible to change the *temperature* by changing the *volume,* such as you would do by pressing down on the handle of a tire pump?

3. *Mortgage Payment Problem:* People who buy houses usually get a loan to pay for most of the house and pay on the resulting *mortgage* each month. Suppose you get a $50,000 loan and pay it back at $550.34 per month with an interest rate of 12% per year (1% per month). Your balance, B dollars, after n monthly payments is given by the algebraic equation

$$B = 50{,}000(1.01^n) + \frac{550.34}{0.01}(1 - 1.01^n)$$

a. Make a table of your balances at the end of each 12 months for the first 10 years of the mortgage. To save time, use the table feature of your grapher to do this.

b. How many months will it take you to pay off the entire mortgage? Show how you get your answer.