Voltage Divider Project

For this homework assignment, you'll work with a voltage divider in many different ways. You'll use the resistors from your electronics kit for your calculations.

Read:

1. Vol 1, Chapter 7 in All About Circuits
2. Sparkfun's tutorial on voltage dividers https://learn.sparkfun.com/tutorials/voltage-dividers

Select Resistors:

Select 5 pairs of resistors from your electronics kit to build 5 different voltage dividers. Use each resistor no more than twice. Your voltage dividers must have output voltages varying over the range from 20% to 80% of the input voltage with a current less than 20 mA.

Build the Voltage Divider Circuits:

Using the resistors, mini breadboard, wires and battery, build the voltage divider circuits and measure the output voltage of each at a point between the resistors. Record your results. Note the voltage of the battery.

Calculations:

1. Calculate the voltage at a point between the two resistors for the 5 different voltage dividers from your set of parts.

Computation in MATLAB:

1. Following instructions from the video, create a MATLAB *function* to calculate the voltage at the point between two resistors in a two-resistor voltage divider.
2. Fill in the template of the MATLAB Live Script to use the function to calculate the voltage between resistors for the different resistor combinations in your electronics kit. Your results should range from 20% to 80% of your total voltage with a total current less than 20mA.
3. Verify that the computed results match the calculations.
4. Create a table that lists the output voltage for all of the resistor combinations. In the title of your table, include the measured voltage of your 9V battery.
5. Continue to fill in the MATLAB Live Script to create a graph to plot the measured voltage values between the resistors to the ratio of the resistance of the second resistor to the total resistance (i.e. V_{out} vs $R_2/(R_1 + R_2)$).
6. Continue to fill in the MATLAB Live Script to fit a line to your data using the polyfit function, create the line of best fit using the polyval function, and plot the line of best fit on the graph.
7. Continue to fill in the MATLAB Live Script to plot the calculated output voltage values on a new graph. Compare the measured and computed output voltages to ensure that the resistors are arranged as expected and match the calculations.

8. Calculate the percent error between the slope of the line of best fit, p(1), and the measured 9 V battery voltage.

Simulink Modeling:

1. Create a SimElectronics model of a voltage divider and display the voltage on the scope or the display.
2. Verify that the Simulink results match the calculated results.