

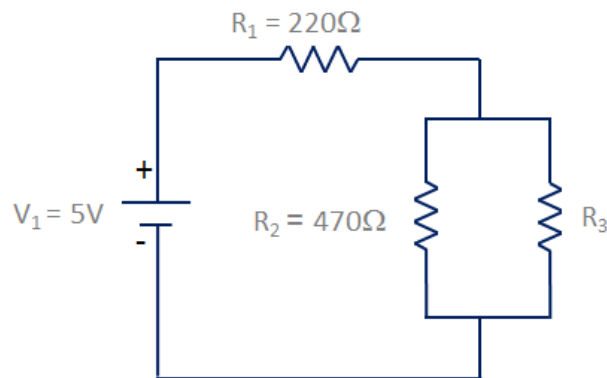
NOTE: Use non-engineering format for problem 1 and engineering format for problems 2 through 4. This is an individual assignment.

1. A voltage divider circuit was implemented in the last class to sense changes in light level measured by a photoresistor. A short sketch was provided in the notes that displayed the output of the voltage divider circuit on the serial monitor. Add an "if" statement to the sketch to cause the on-board LED (which lights up when digital pin 13 is HIGH) to blink on for 300 ms and off for 300 ms when you reduce the amount of light striking the photoresistor. Please include your program listing in your homework (as usual when sketches are written).

Suggestion: Copy the sketch from the class notes to get it working the first time, and then spend a little while trying to get it working without looking; even if you can't do it completely without looking at another program, this practice will improve your programming skills.

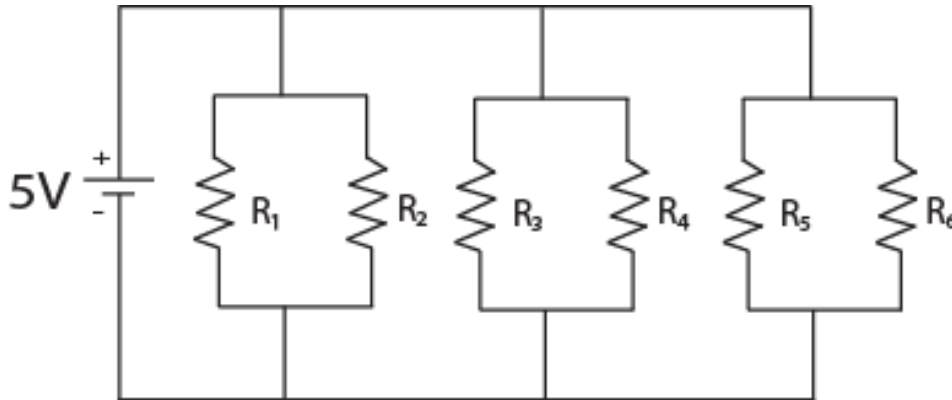
2. The circuit below has the resistances shown as well as a resistor R_3 that has a variable resistance. Use Mathcad to complete the following:

- Determine the current output of the power source as a function of R_3 for values of 50Ω , 100Ω , 220Ω , and $1k\Omega$. For 50Ω , $I=0.019A$
- Plot the current output of the power source as a function of R_3 for values ranging from 50Ω to $1k\Omega$ in steps of 10Ω .
- Plot the power consumed by resistor R_3 as a function of R_3 for values ranging from 50Ω to $1k\Omega$ in steps of 10Ω . For checking purposes, $P(50\Omega)=0.015W$



3. Assume the following circuit is powered by your robot, where $R_1=100\Omega$, $R_2=470\Omega$, $R_3=470\Omega$, $R_4=1000\Omega$, $R_5=4700\Omega$ and $R_6=10000\Omega$.

- Determine the voltage drop across each resistor. [Answer Not Provided](#)
- Compute the current across each resistor using Mathcad. [Answer Not Provided](#)
- Compute the total current leaving the power source using Mathcad. [Answer = 0.078 A or 78 mA](#)
- Discuss the results. Where does most of the current go?



NOTE: If you don't have Mathcad running on your computer, you can try the computer lab in Bogard Hall. If you are unable to find access to Mathcad, please solve the problems above by hand, and please visit the HelpDesk until you get Mathcad running.

4. The `analogRead()` function returns a value of 683.

- What voltage is sensed at the analog pin?
- What would the voltage at the pin be if `analogRead()` returned a value of 684.
- What is the difference between the answer for parts (a) and (b)?
- Can you compute the value determined in part (c) if you know that the Arduino uses a 10-bit analog to digital converter and that the reference voltage for the analog to digital converter is 5 volts?
- What is the significance of this number?

5. Look ahead to the "learning to solder" presentation and the "soldering safety quiz" in the class 6 downloads. Please turn your completed quiz in next time. However, turn it in separately from this homework; put it in a separate stack (not with problems 1 through 4 above).