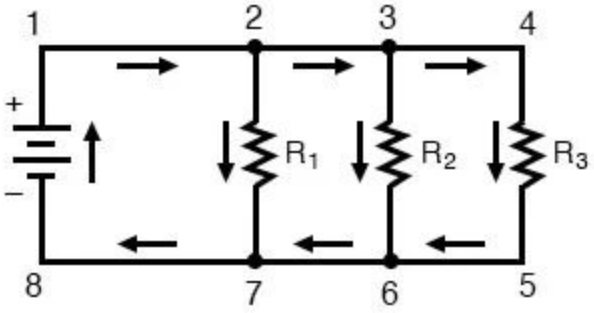
Lab: Circuit Design Notes

- Lab objective: “How do voltage, current, and resistance affect one another?”
- Using Ohm’s Law:
  - Equation: V = IR
    - V = voltage
      - Unit: V
    - I = current
      - Unit: A
    - R = resistance
      - Unit: Ω
  - Step 1: Rearrange Ohm’s Law (V = IR) to what you are trying to solve for
    - V = IR
    - I = $\frac{V}{R}$
    - R = $\frac{V}{I}$
  - Step 2: Plug in your known variables
  - Step 3: Solve
  - Question: V = 20 V and R = 4 Ω, find I.
    - Use: I = $\frac{V}{R}$
    - Plug in V and R: I = $\frac{20\ V}{4\ \Omega}$
    - Solve: I = 5 A
- Calculating Resistance in a Circuit:
  - Step 1: Decide if the circuit is a series circuit or a parallel circuit
    - Remember: Series circuits only have one path
    - Remember: Parallel circuits have multiple paths
  - Step 2: Choose the right formula
    - For Series: $R_{eq} = R_1 + R_2 + ... + R_n$
    - For Parallel: $\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + ... + \frac{1}{R_n}$
  - Step 3: Plug in your known resistances
  - Step 4: Solve
  - Question: The circuit below has three resistors: R_1, R_2, and R_3. R_1 = 5 Ω, R_2 = 3 Ω, and R_3 = 10 Ω. Find the equivalent resistance of the circuit.



        - Step 1: It is a parallel circuit because there are multiple paths the current can go.
        - Step 2: Use the formula for parallel circuits.
            - $\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + ... + \frac{1}{R_n}$
        - Step 3: Plug in our known resistances.
            - $\frac{1}{R_{eq}} = \frac{1}{5\Omega} + \frac{1}{3\Omega} + \frac{1}{10\Omega}$
        - Step 4: Solve
            - $\frac{1}{R_{eq}} = \frac{1}{5\ \Omega} + \frac{1}{3\ \Omega} + \frac{1}{10\ \Omega} = \frac{6}{30\ \Omega} + \frac{10}{30\ \Omega} + \frac{3}{30\ \Omega}$
            - $\frac{1}{R_{eq}} = \frac{19}{30\ \Omega}$
            - $R_{eq} = \frac{30\ \Omega}{19} = 1.6\ \Omega$
    - Question: If there is a 10 V battery in the circuit from the last example, what would the approximate current be?
        - Given: V = 10 V
          $R_{eq} = 1.6\ \Omega$
        - Unknown: I = ?
        - Equation: I = $\frac{V}{R}$
        - Substitue: I = $\frac{10\ V}{1.6\ \Omega}$
        - Solve: I = 6.25 A
- Calculating Power in a Circuit
    - Equation: P = IV
        - P = power
            - Unit: W
        - I = current
            - Unit: A
        - V = voltage
            - Unit: V
    - Question: A circuit has 5 A of current and 20 V of voltage running through it. How much power can a lightbulb that is attached to the circuit put out?
        - Given: I = 5 A
          V = 20 V
        - Unknown: P = ?
        - Equation: P = IV
        - Substitute: P = (5 A)(20 V)
        - Solve: P = 100 W
- Link: https://www.explorelearning.com/index.cfm?method=cExtAccessSecure.dspResource&ResourceID=398&certificate=authorizer%3dE2020%26userid%3dGizmos4Test%26expires%3d2020%2f03%2f24+13%3a47%3a57%26hash%3dmNKhINA5WvLBmQ49rcGAOA%253d%253d