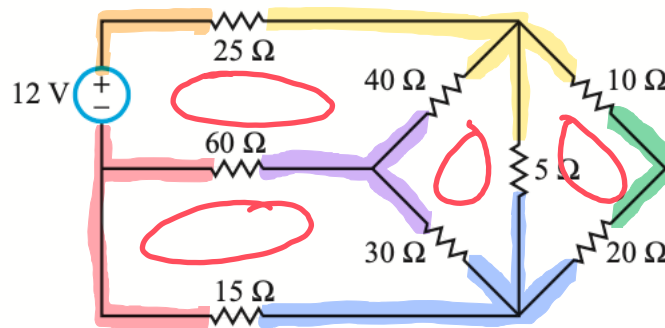


Homework 1
Due: Friday, January 27th, 2023 by 7PM.

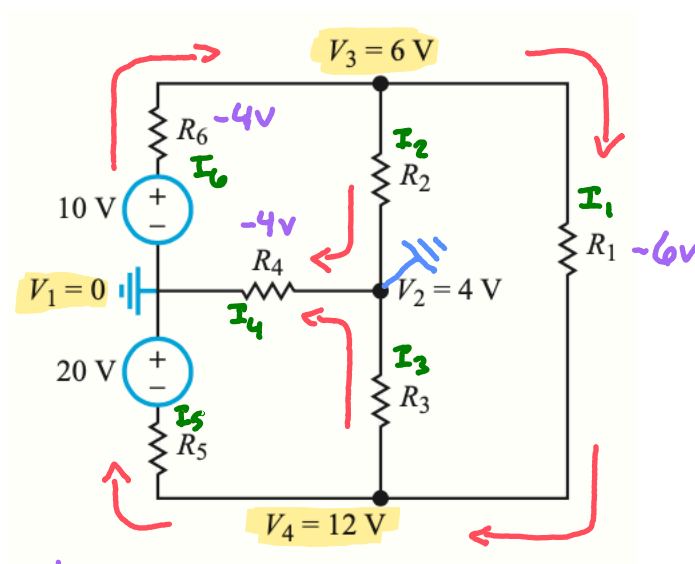
Note: In order to receive full credit, you must show your work and carefully justify your answers. The correct answer without any work will receive little or no credit.

1. For the circuit below, answer the following questions and clearly justify your answer.
 - A. How many nodes are there?
 - B. How many meshes are there?
 - C. Can you identify any components in series?
 - D. Can you identify any components in parallel?



- A. 6 nodes
- B. 4 meshes
- C. Voltage source & 25Ω resistor in series
 - no other components share a branch without splits or side paths in them
- D. Nothing in parallel - no two components have the same nodes on both sides

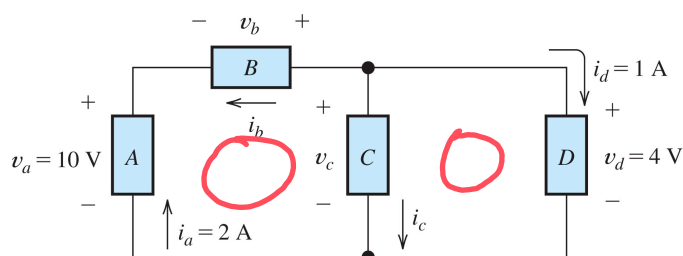
2. In the circuit below, node V1 was selected as the ground node.
- What is the voltage difference across R_6 ?
 - What are the voltages at nodes 1, 3, and 4 if node 2 is selected as the ground node instead of node 1?



A. -4 V $6\text{ V} - 10\text{ V} = -4\text{ V}$

B. $V_1 =$
 V_3
 V_4

3. For the circuit below,
- Use KVL and KCL to solve for the labeled currents and voltages.
 - Compute the power for each element.
 - Is conservation of power satisfied? Explain your answer.



A. $-i_b = -i_c - i_d \rightarrow i_b = i_c + i_d \rightarrow 1 + 1 = i_b = 2 \text{ A}$

$i_c = i_a - i_d \rightarrow 2 - 1 = i_c = 1 \text{ A}$

$V_c - V_b - V_a = 0 \rightarrow 4 - V_b - 10 = 0 \quad V_b = -6 \text{ V}$

$V_d - V_c = 0 \rightarrow 4 - V_c = 0 \quad V_c = 4 \text{ V}$

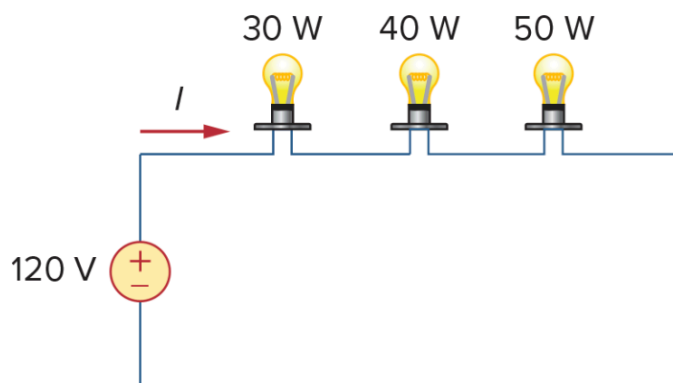
B. $A = 10 \cdot 2 \quad A = 20 \text{ W} \quad C = 4 \cdot 1 \quad C = 4 \text{ W}$

$B = -6 \cdot 2 \quad B = -12 \text{ W} \quad D = 4 \cdot 1 \quad D = 4 \text{ W}$

C Conservation of Power is not satisfied
because the sum of powers doesn't equal 0

$\sum V_k i_k = 16 \text{ W}$

4. Three Light bulbs are connected in series to a 120 V source as shown below. Find the current I through each of the bulbs.



$$P_T = 30 + 40 + 50 = 120 \text{ W}$$

$$I = \frac{P}{V} = \frac{120}{120} \quad I = 1 \text{ A}$$

$$P = IV \rightarrow$$