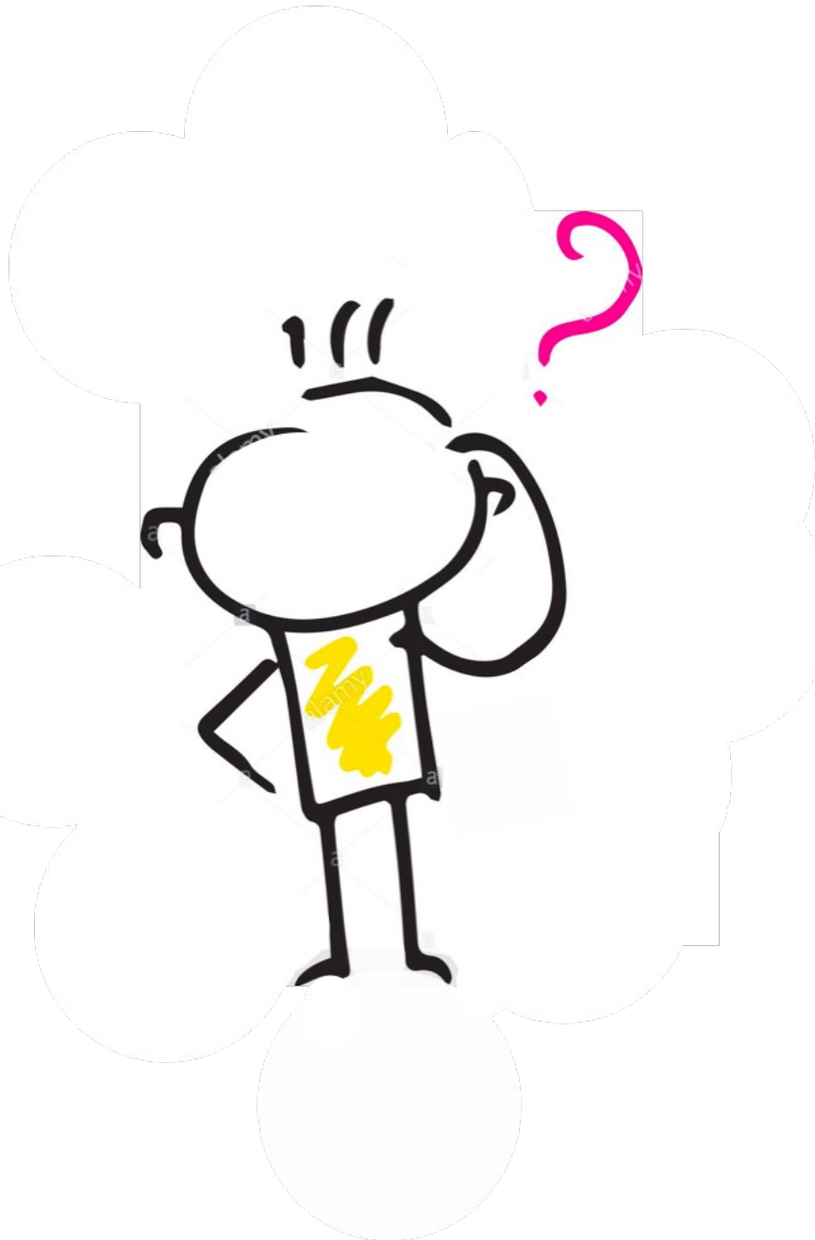
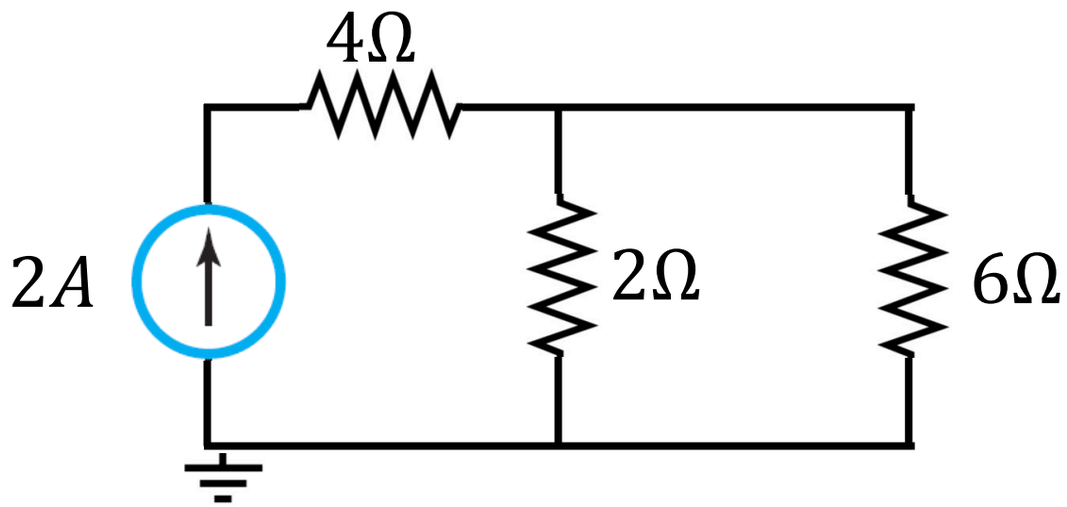
Last Class…

1. What is a voltage divider and what is a current divider?



2. What is the current across the 2Ω resistor?



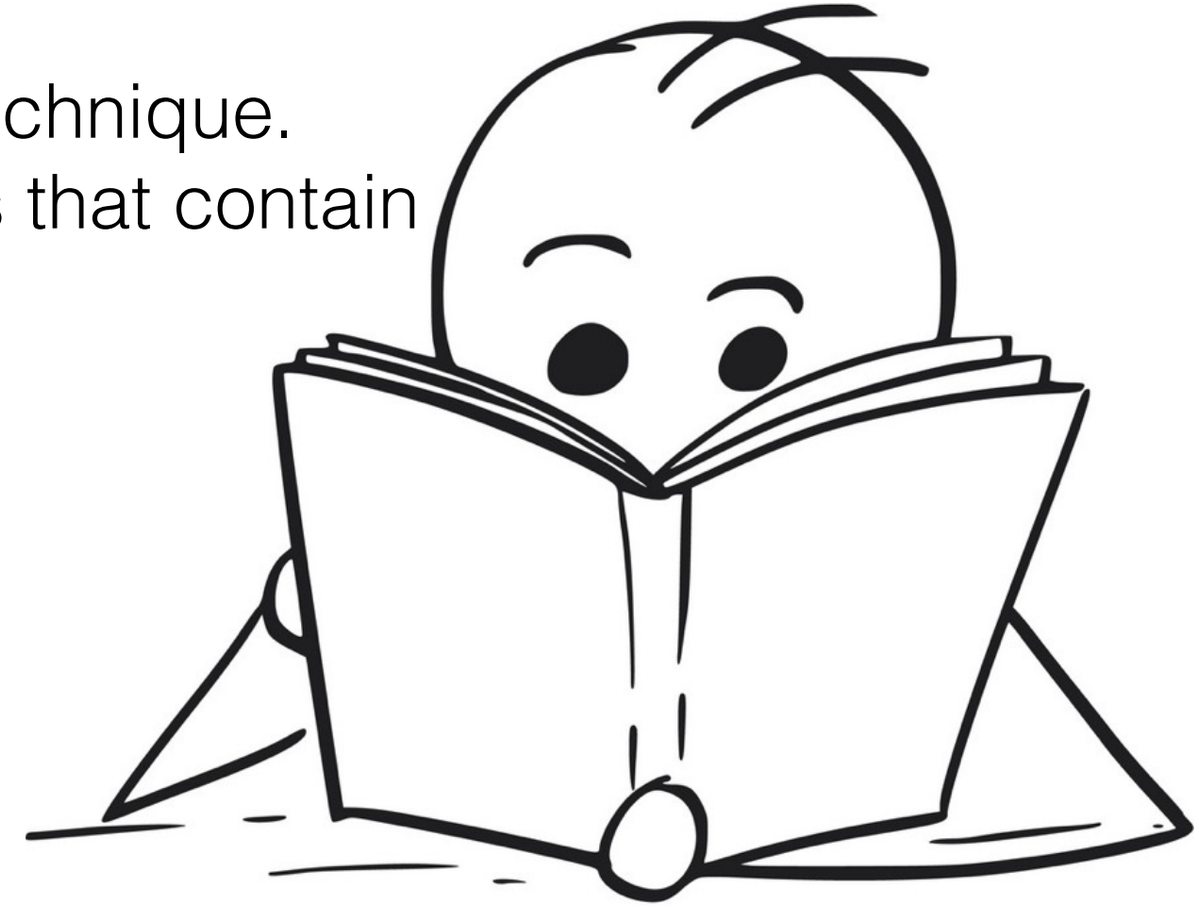
THE OHIO STATE UNIVERSITY

COLLEGE OF ENGINEERING

Node Voltage Analysis

This Lecture…

- Learning Objectives:
  - Apply the node-voltage analysis technique to linear electric circuits.
  - Identify a super-node.
  - Apply the node-voltage technique. to analyze electric circuits that contain super-nodes.



Node Voltage Method

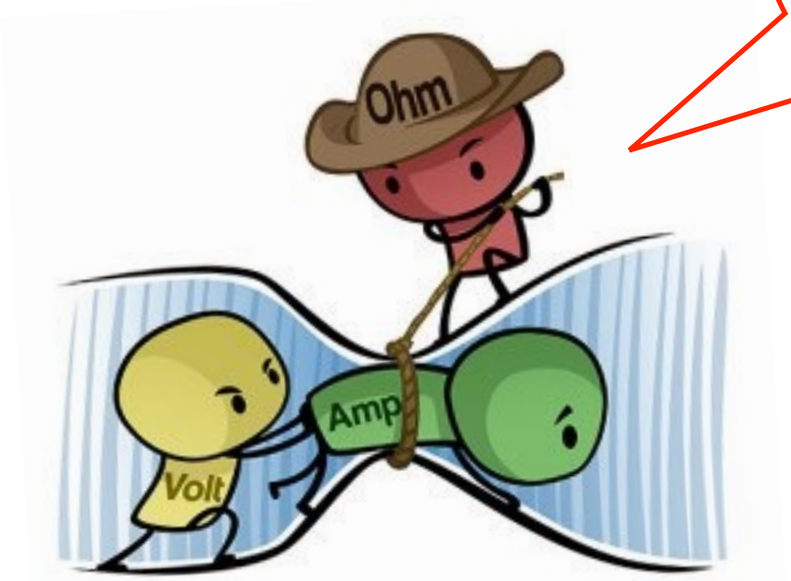
1. Identify how many nodes there are and assign variables to each of them.

Mainly used to solve for node voltages.

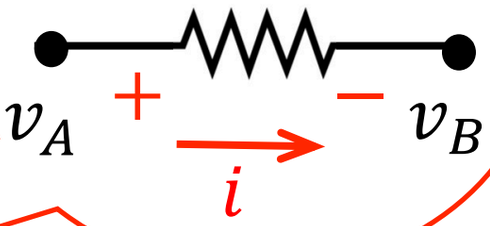
2. Select a reference node.

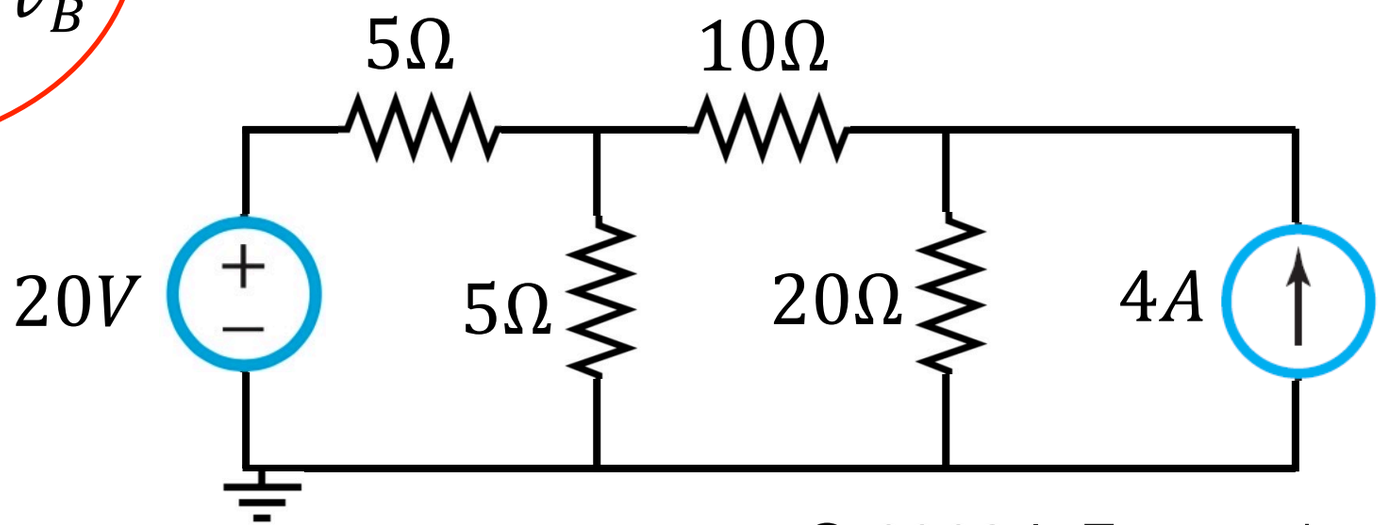
3. Identify if the voltage on any of the nodes is known.

4. Assume a direction for the current on each of the elements.



Recall that:





Node Voltage Method

1. Identify how many nodes there are
   and assign variables to each of them.

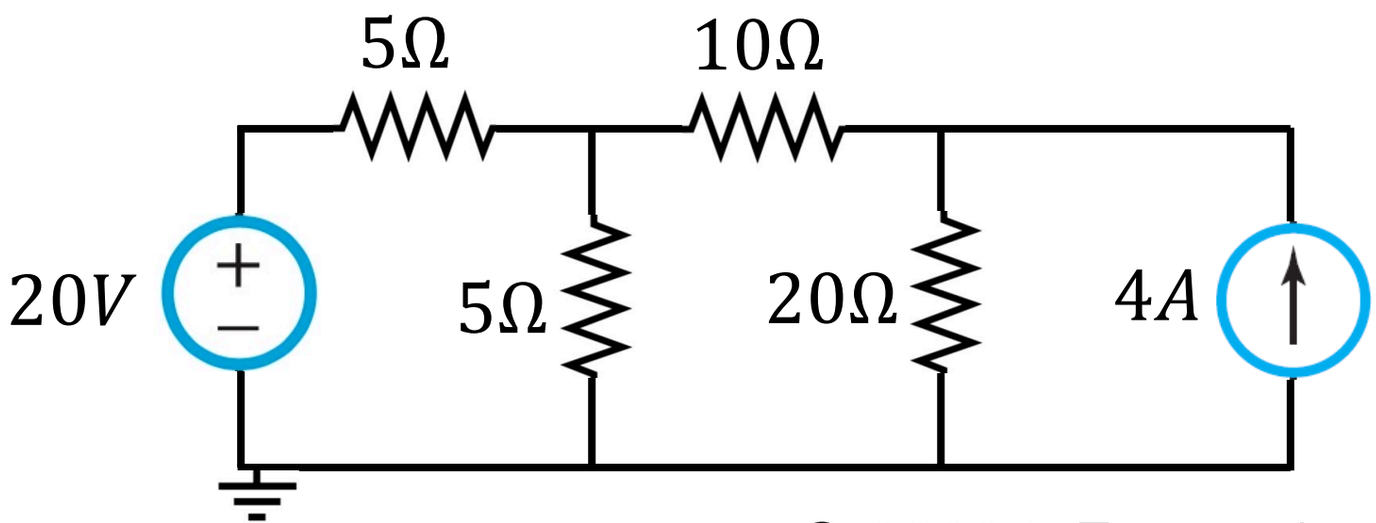
2. Select a reference node.

3. Identify if the voltage on any of the nodes is known.

4. Assume a direction for the current on each of the elements.

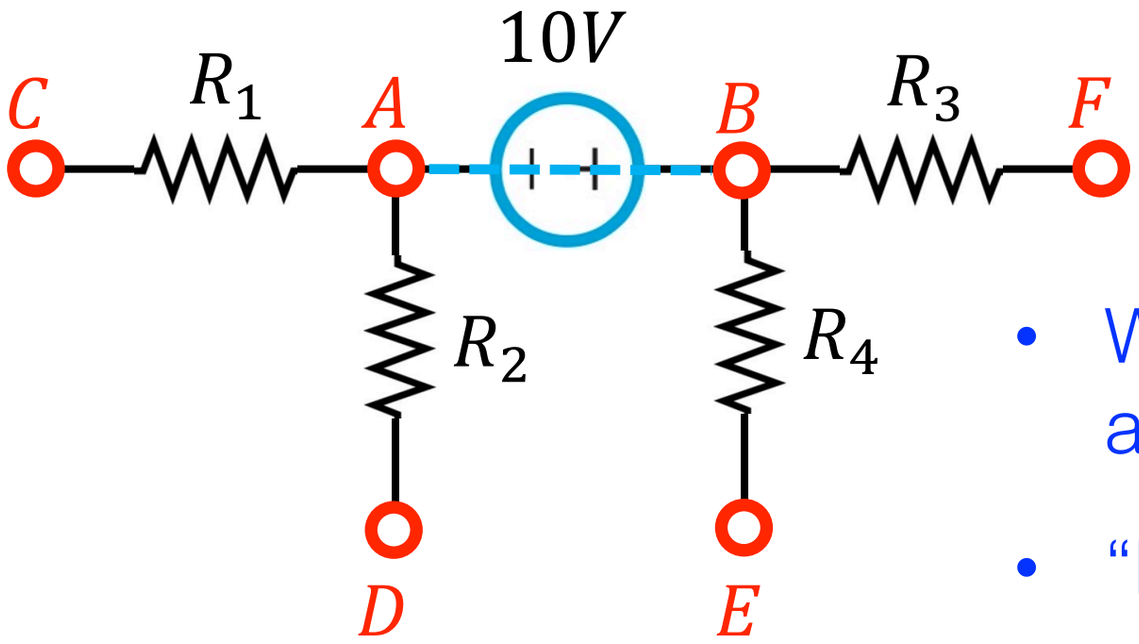
5. Apply KCL to all remaining nodes.

6. Solve.



Super-node

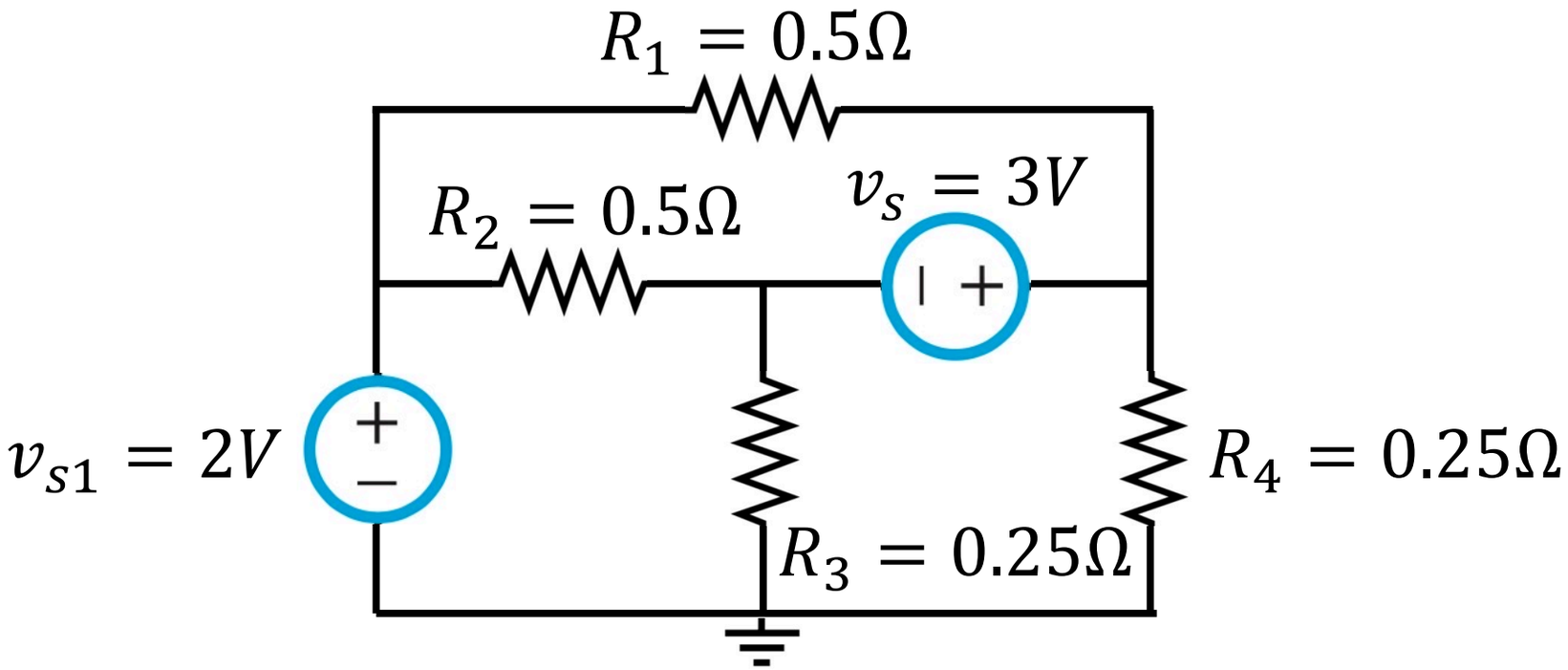
- Non-grounded voltage source.



- We do not know the current flowing across the voltage source.
- “Remove the voltage source.”

Example

Using node voltage analysis, find the voltage across R_4.



$V_D = 0V$

$2 = V_A - V_D$

$V_A = 2V$

Auxiliar Equation

$3 = V_C - V_B$

KCL @ SuperNode

$i_2 = i_3 + i_4 + i_1$

KCL @ supernode

$$2 - V_B = 2V_B + 2V_C + V_C - 2$$

$$4 = 3V_B + 3V_C$$

V_1

V_2

V_3

$$V_4 = V_C - V_D = V_C$$

$$4 = 3(V_C - 3) + 3V_C$$

$$\downarrow$$

$$13 = 6V_C$$

$$V_C = \frac{13}{6} V$$

Aux Eq.

$$3 = V_C - V_B$$

$$V_B = V_C - 3$$