Complex circuit analysis

- When faced with a complex circuit (one that can't be easily simplified into a single equivalent resistor), up until now, we've used the "seat of the pants" approach -- working piecemeal to figure out parts and eventually getting to an answer.
- There is a more formal way to do this…which we've actually already sort of been doing! Before going on, though, we need to make sure we're all on the same page with some vocabulary. So…

What's a node?

Junction where branches meet.

What's a branch?

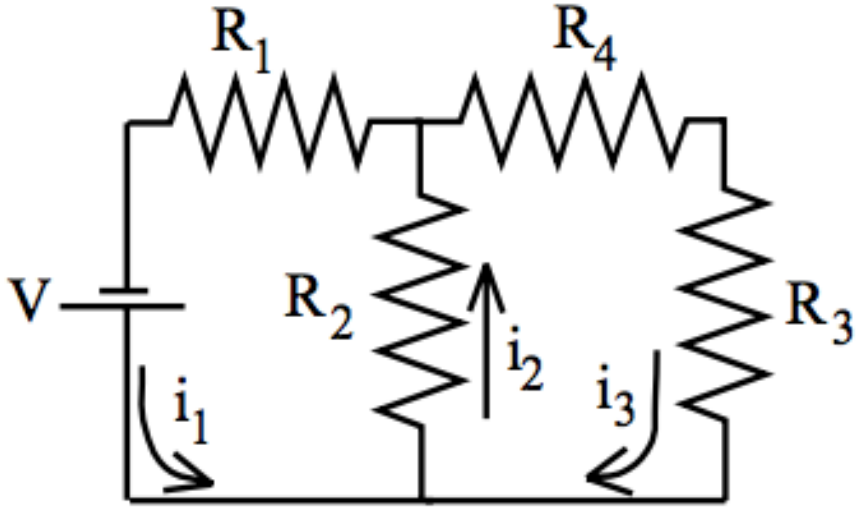
A connection between nodes

What do you know about current(s) at a node?

I in = I out

What do you know about current in a branch?

I is constant in a branch - one path!

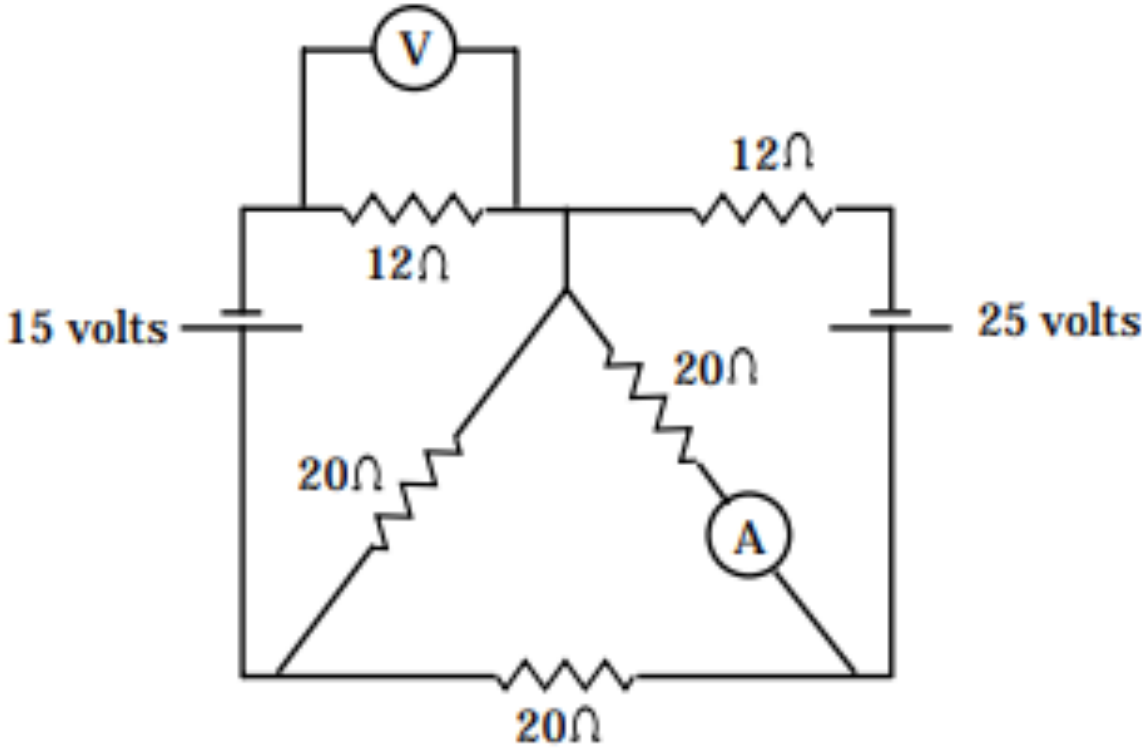


General guide to using Kirchhoff's Laws

- Don't get thrown by the circuit! Ignore meters, crazy connections and shapes, whatever. Take a deep breath.
- 1. Define and label the current in every branch of the circuit.
  - Remember, a branch starts and ends at a junction. Also remember that if you choose the wrong direction, it will work out. Just choose.
- 2. Identify the nodes, and use the Junction Rule to write out the node equation for each node.
  - Do this for as many nodes as you can find, unless you're just repeating a previous equation.
- 3. Identify a closed loop and use the Loop Rule to write out the loop equation. Do this for as many loops as needed to accommodate the number of unknowns you have.
- 4. Solve simultaneously for the unknowns!

Fletch's 13.30

- Use Kirchhoff's laws to determine the meter readings. (hint: be clever! If you define all 5 currents, you will have 5 unknowns, and therefore a nasty matrix to solve. Can you figure out how to only have two or so unknown currents…?)



Fletch's 13.29

- Examine the following circuit:
  - a.) How many nodes are there in the circuit?
  - b.) How many loops?
  - c.) Write out any three node equations using the information provided in the circuit.
  - d.) Write out any three loop equations.

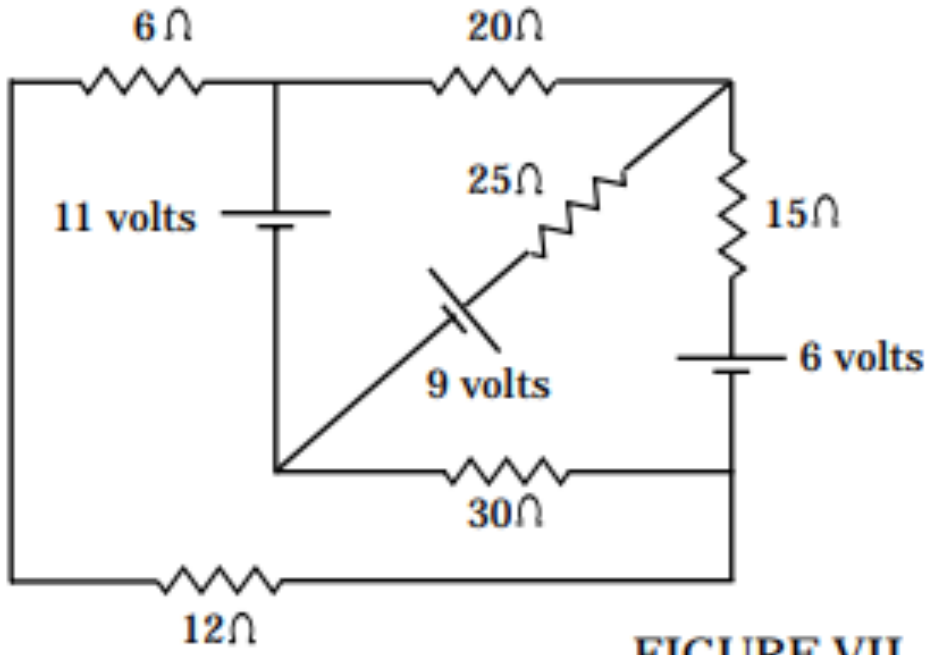


FIGURE VII