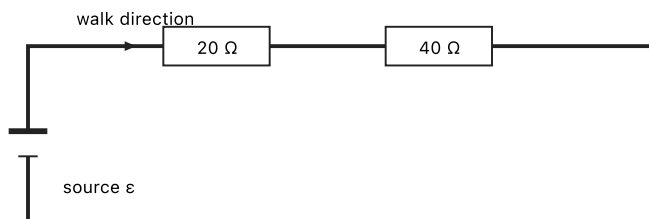


CIRCUITS DAY 11: KIRCHHOFF'S LOOP RULE

CED 11.6 · Skill 1.A · FRQ: TBR

PREDICT

An ideal 18 V source and two resistors form one loop. Circle one: **each resistor has 18 V / their voltage drops sum to 18 V / the drops are unrelated.**

CHOOSE A DIRECTION BEFORE ASSIGNING SIGNS**LOOP CLOSURE**

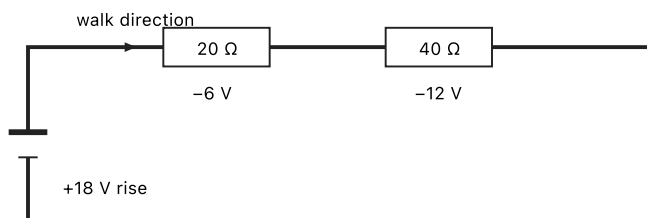
$$\sum_{loop} \Delta V = 0$$

Around a closed path, energy per charge returns to its starting value.

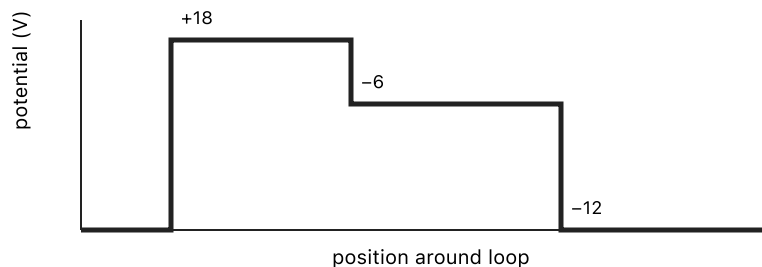
NOTES / REASONING

SIGNS FOLLOW THE TRAVERSAL

- Across the source from – to +: positive rise.
- Across a resistor in the current direction: negative drop.
- Reverse the traversal and every sign reverses.

18 V SOURCE, 20 Ω AND 40 Ω IN SERIES

WE DO Find the current and both resistor drops.

POTENTIAL VERSUS POSITION**CUMULATIVE POTENTIAL AROUND THE LOOP**

TRANSLATE Starting at 0 V, state the potential immediately after the battery, after the $20\ \Omega$ resistor, and after the $40\ \Omega$ resistor.

REASON Explain why the flat wire segments do not mean current is zero.

PRACTICE

1. A 15 V source has resistor drops of 4 V and 7 V. Find the third drop.

2. A 12 V source drives $20\ \Omega$ and $40\ \Omega$ in one loop. Find current.

3. Traverse a resistor opposite the current. State the sign of ΔV .

4. Explain why “voltage is used up” confuses potential difference with energy transfer.