

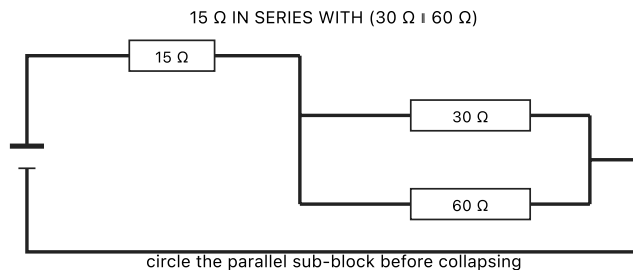
CIRCUITS DAY 8: MIXED RESISTOR NETWORKS

CED 11.5 · Skill 2.B · FRQ: MR

RETRIEVE AND PREDICT

A resistor is added as a new parallel branch while the source maintains a fixed terminal voltage. Circle the change: **total R rises / total R falls / total R is unchanged**. Then predict the source current: **rises / falls / unchanged**.

FIND THE SUB-BLOCK BEFORE CALCULATING



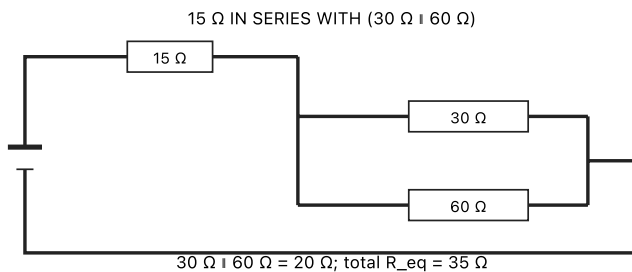
COLLAPSE INWARD

1. Mark nodes and identify a true series or parallel sub-block.
2. Replace that sub-block with its equivalent resistance.
3. Repeat until one R_{eq} remains.

NOTES / REASONING

EXAMPLE: FIND THE TOTAL

$$15\ \Omega + (30\ \Omega \parallel 60\ \Omega)$$



WE DO For the network shown, calculate the parallel equivalent, total equivalent resistance, and total current from an 18 V source.

Do not add 15 Ω , 30 Ω , and 60 Ω directly: the same current does not pass through both parallel branches.

WALK BACK OUTWARD**STEP 1** Use the total current to find the voltage across the $15\ \Omega$ series resistor.**STEP 2** Subtract from 18 V to find the voltage across the parallel block.**STEP 3** Use that shared block voltage to find the $30\ \Omega$ and $60\ \Omega$ branch currents.**Check:** branch currents must add to the current entering the junction.

PRACTICE

1. Find R_{eq} for $10\ \Omega$ in series with two $40\ \Omega$ parallel resistors.

2. Connect the network in Problem 1 to 12 V. Find total current.

3. Find the voltage across the parallel block in Problem 1.

4. Find the current through either $40\ \Omega$ branch.

5. A third $40\ \Omega$ branch is added in parallel. State and justify the changes in total resistance and source current.