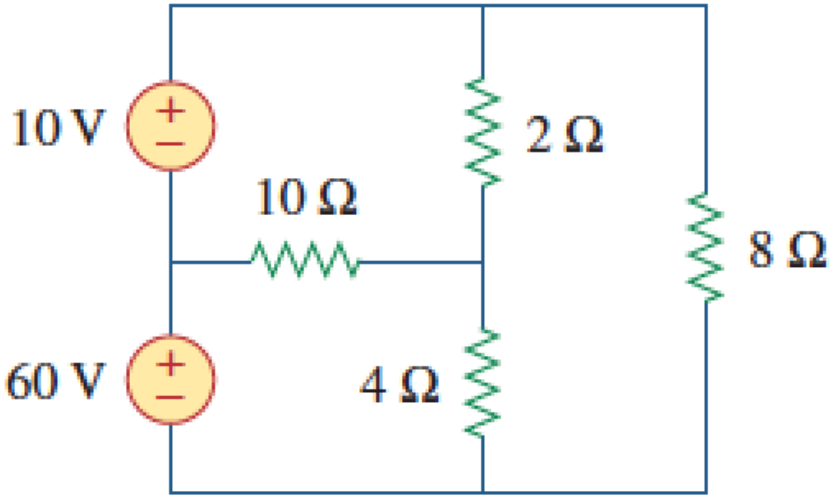
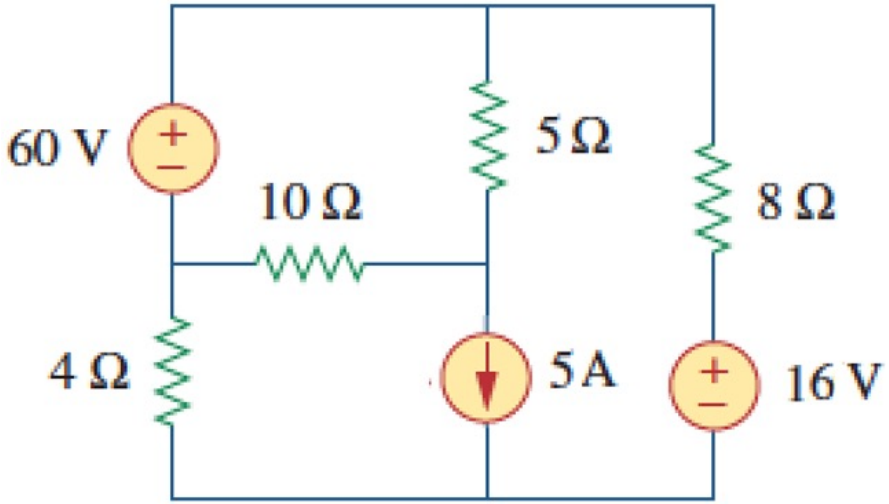
Node – 5

supernodes

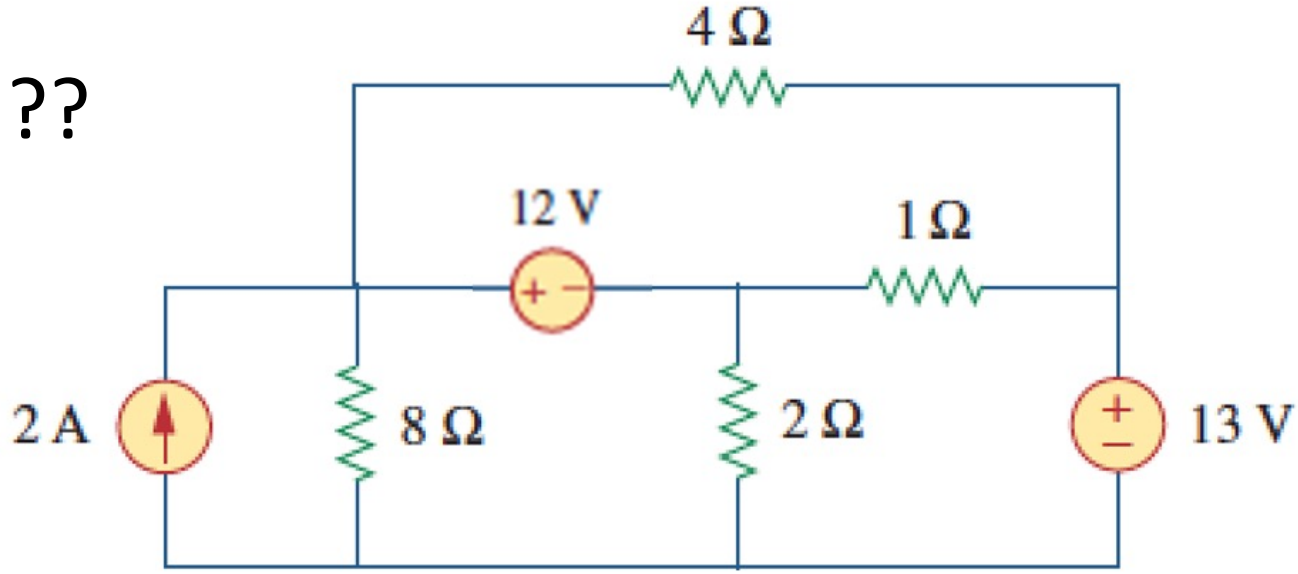
Extension #4 – multiple V-only branches

- There might be an obvious solution

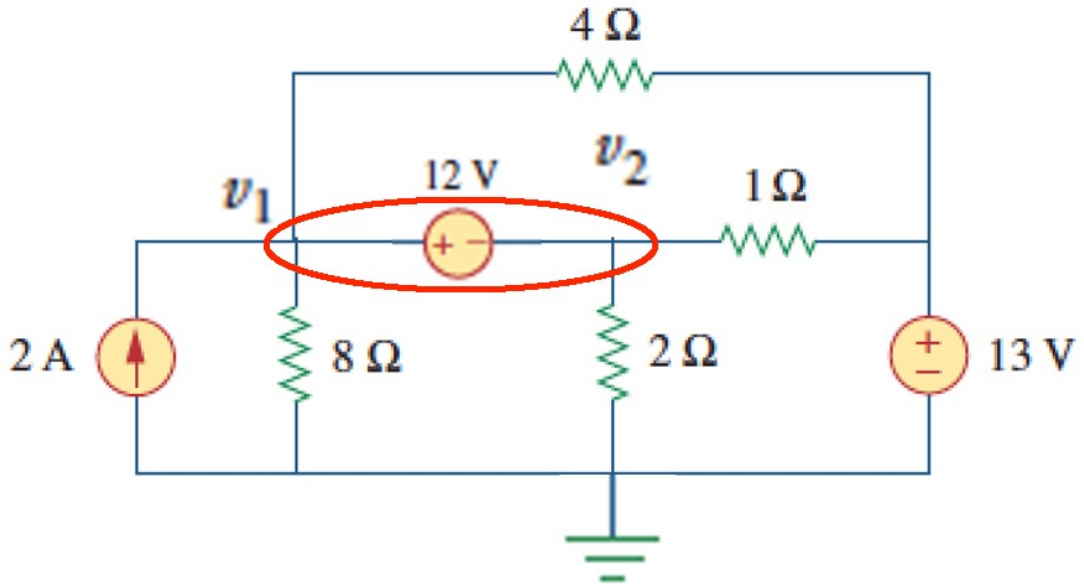




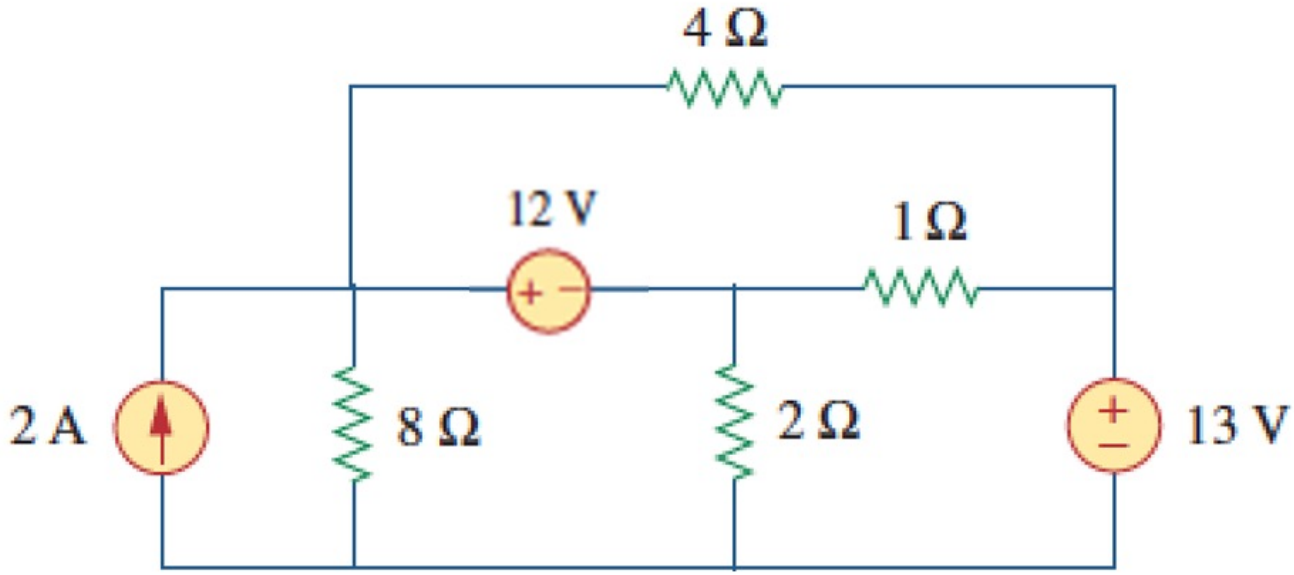
But sometimes ??

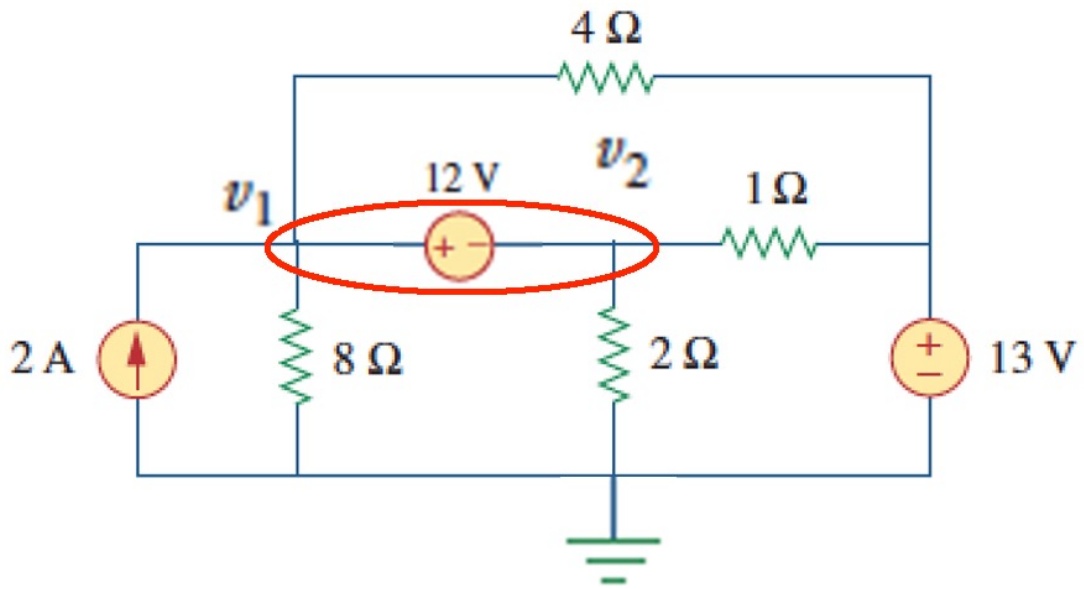


- Define a "supernode" (a cutset)
- Apply KCL on it
- Relate the voltages across it



Example (details on next slide)





Relate nodes:

$$v_2 = v_1 - 12$$

Node equation:

$$\frac{v_1}{8} - 2 + \frac{v_1 - 13}{4} + \frac{v_2 - 13}{1} + \frac{v_2}{2} = 0$$

$$3v_1 + 12v_2 = 146$$

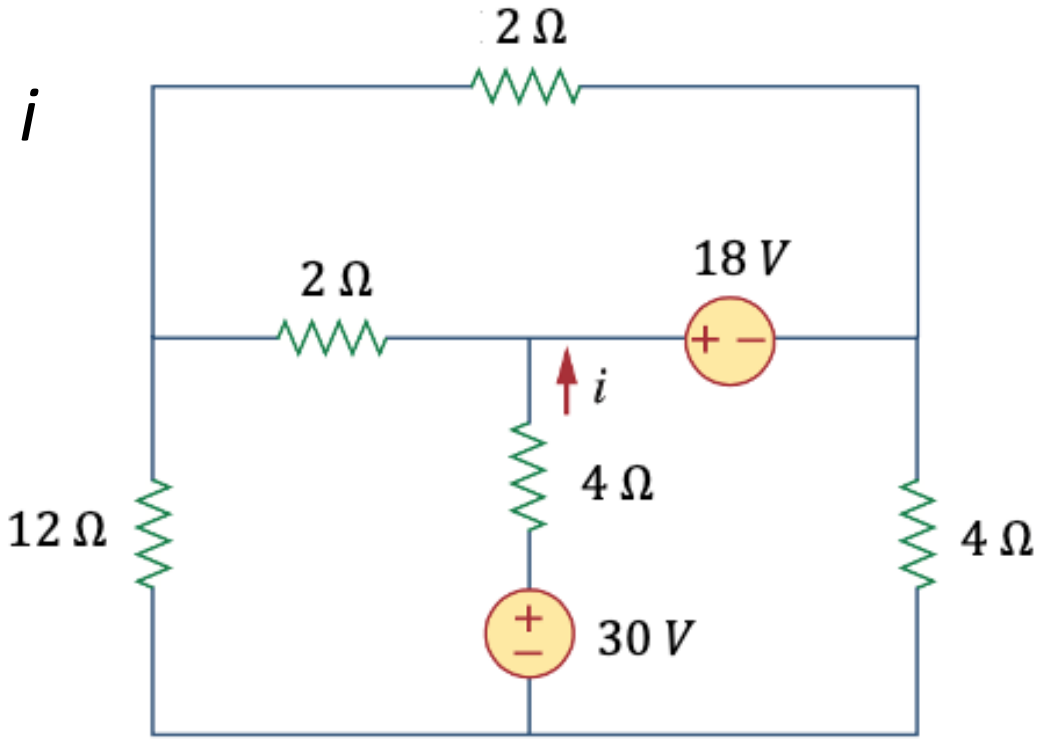
$$3v_1 + 12(v_1 - 12) = 146$$

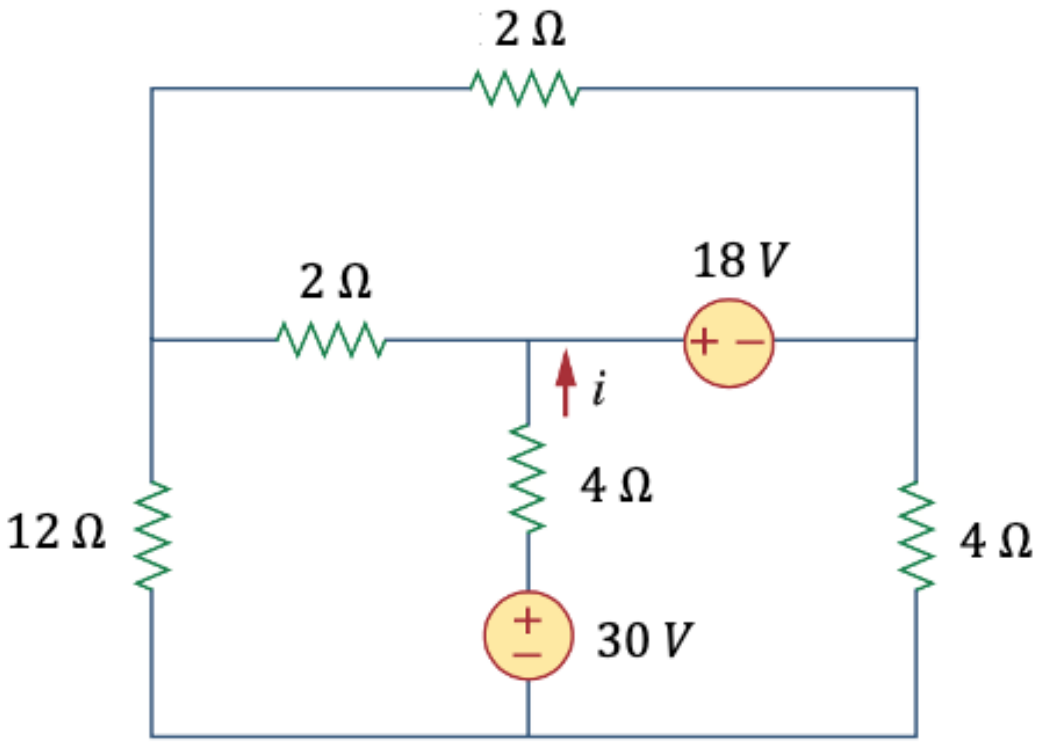
$$15v_1 = 290$$

$$v_1 = 19\frac{1}{3}$$

$$v_2 = 7\frac{1}{3}$$

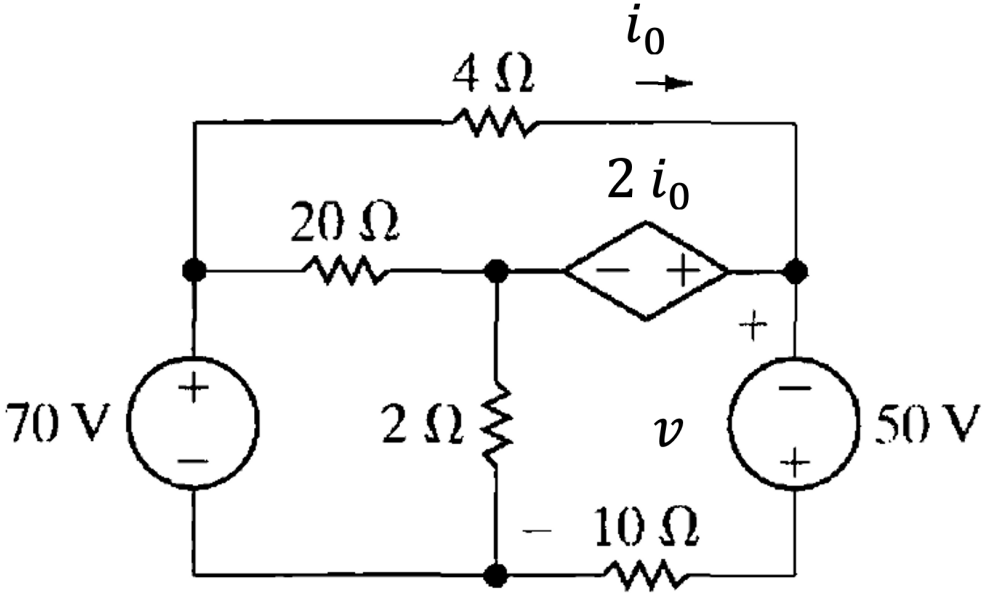
Example: find *i*

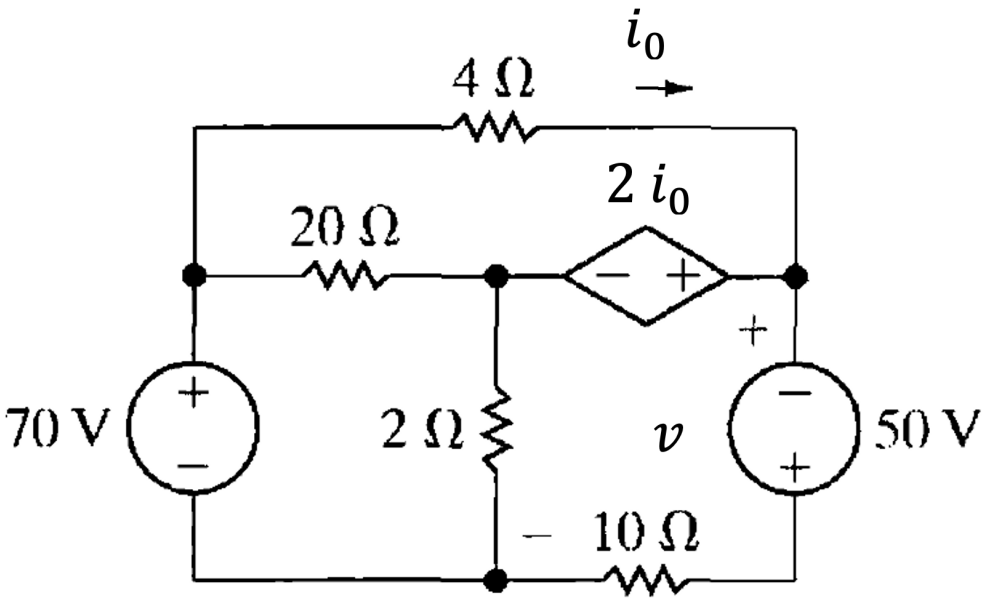




$i = 2\ A$

Example: find v

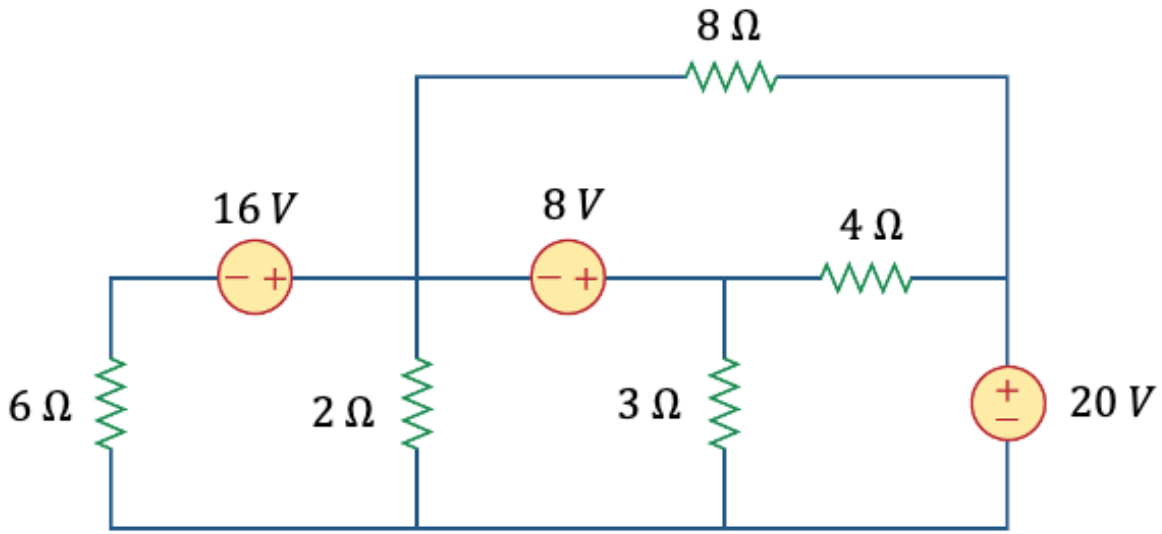




$v = 30\ V$

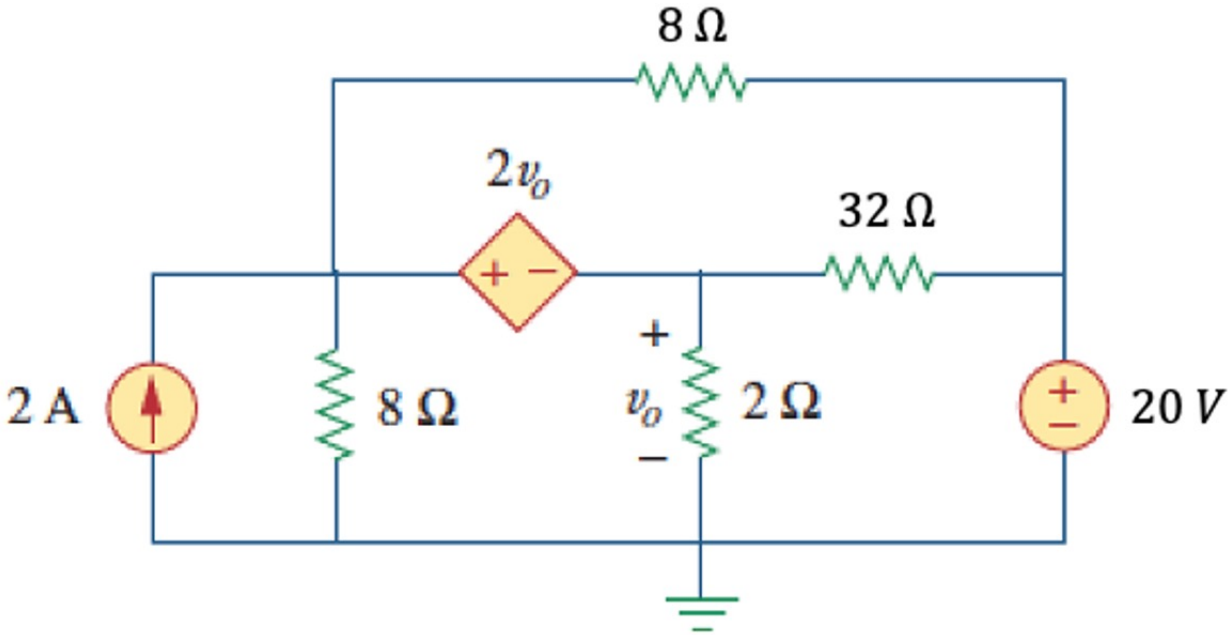
48 W

Practice problem: find the power of the 3 Ω resistor



$v_0 =$

Practice problem: find v_o



$v_0 =$

Practice problem : find v_o