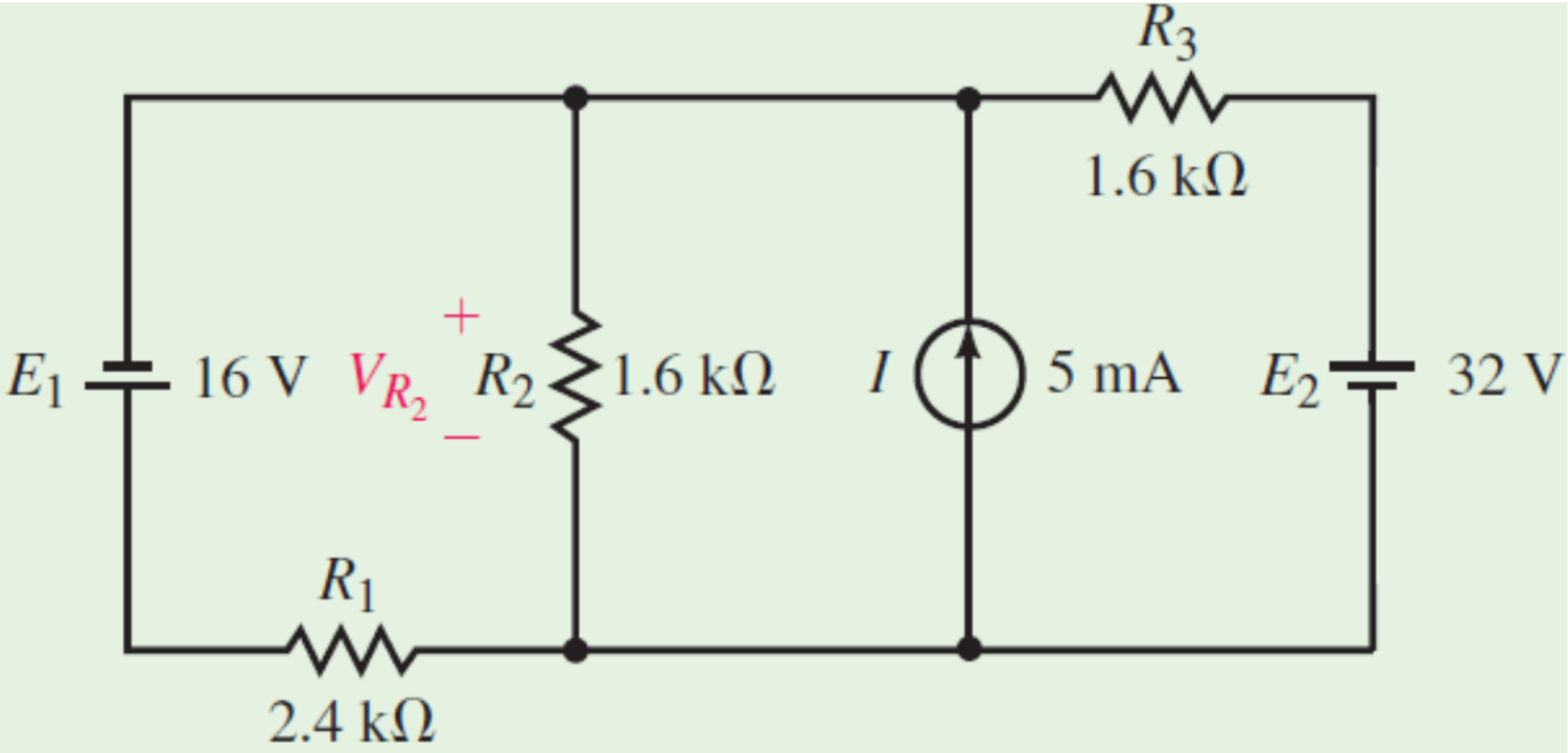
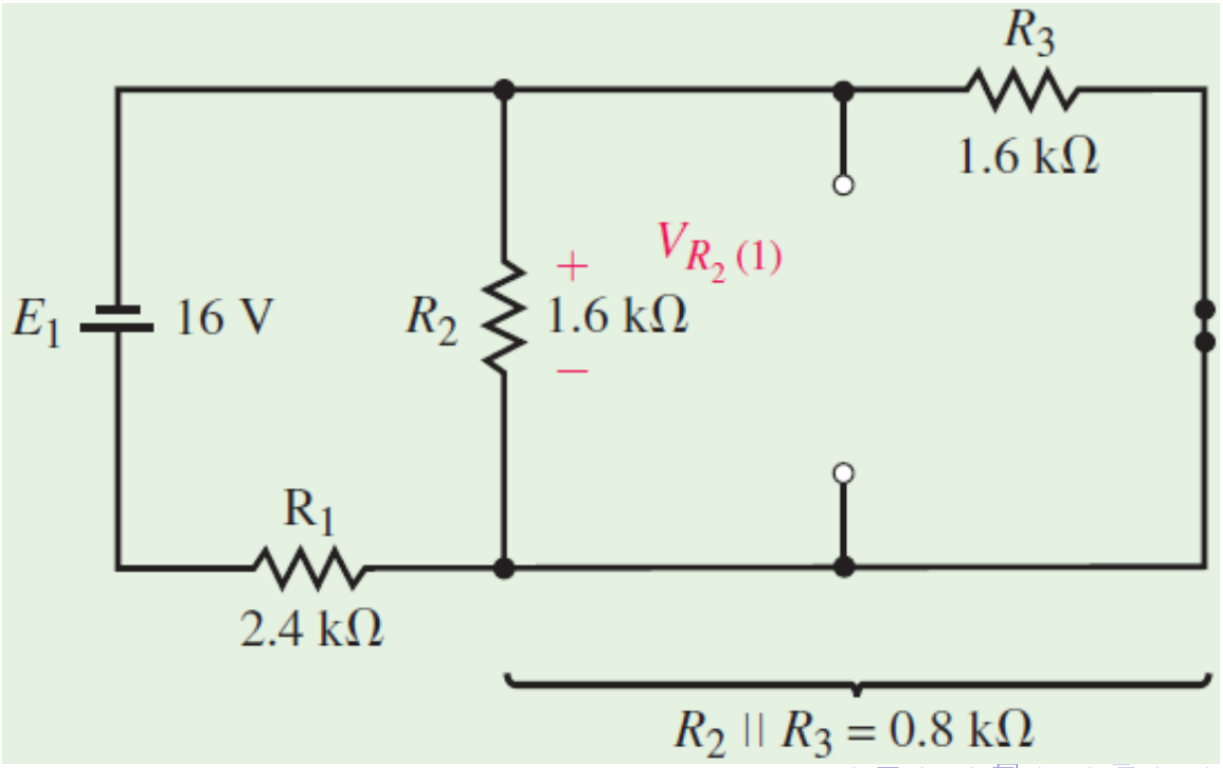
Example

Determine the voltage across R_2



Solution

- The circuit has 3 separate sources and it is necessary to determine the voltage across R_2 due to individual source.
- Let's consider as a result of the 16 V source. Voltage across R_2 is the same as that across R_3 because they are parallel



Solution

- Since R_2 and R_3 are in parallel, the resultant resistance will be

$$= \frac{R_3 R_2}{R_3 + R_2} = \frac{(1.6)(1.6)}{1.6 + 1.6} = 0.8\ \Omega$$

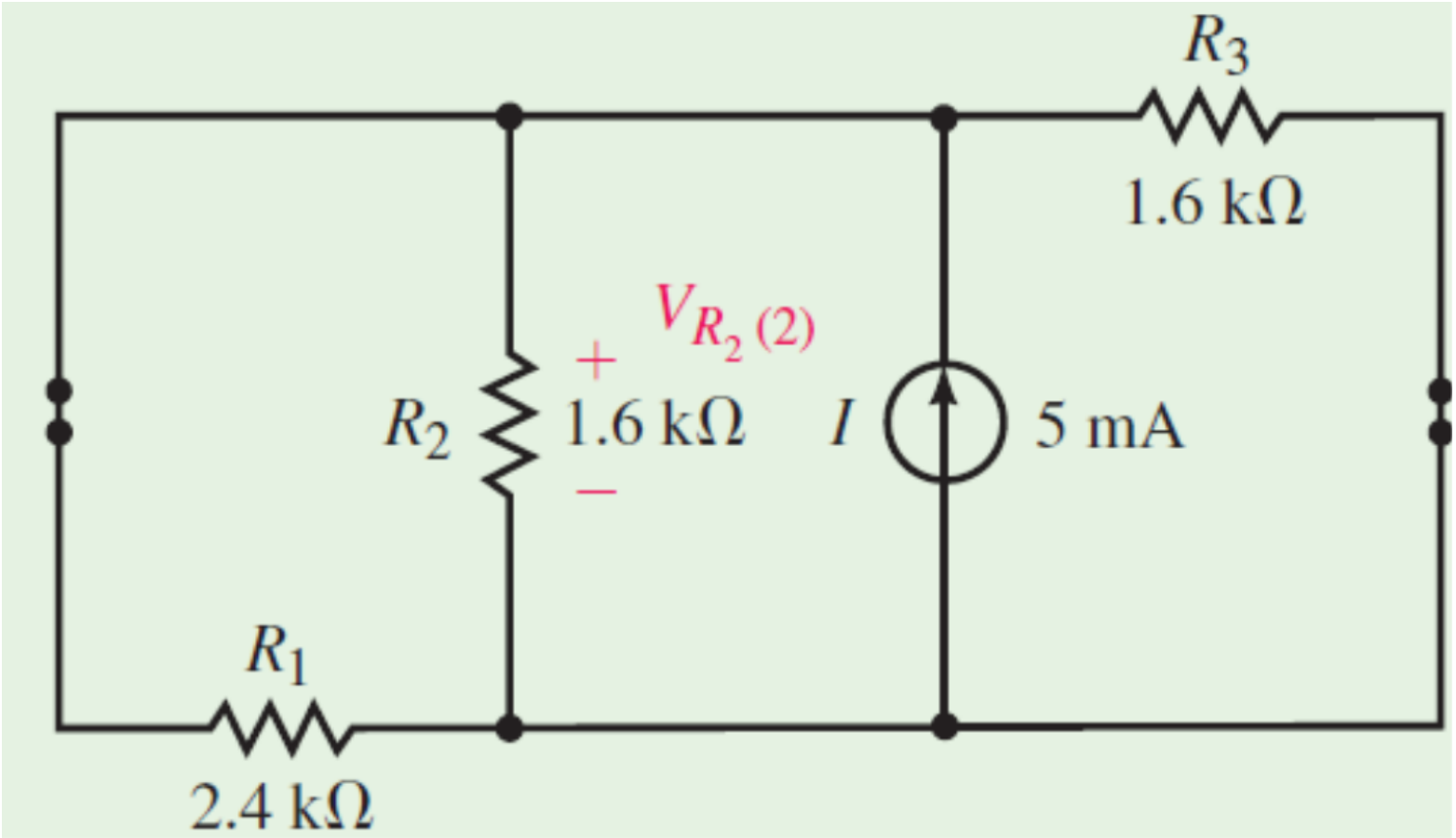
- The voltage across the resistor R_2 will be

$$V_{R_2(1)} = -\frac{0.8}{0.8 + 2.4}(16) = -4.0\ V$$

- The negative sign indicates that the voltage across the resistor due to the 16V is opposite the assumed reference polarity

Solution

- Next we consider the current source and with this the effective resistance is that all the resistances are parallel



Solution

- The effective resistance of the three resistors will be

$$\frac{1}{R_T} = \frac{1}{1.6} + \frac{1}{1.6} + \frac{1}{2.4}$$

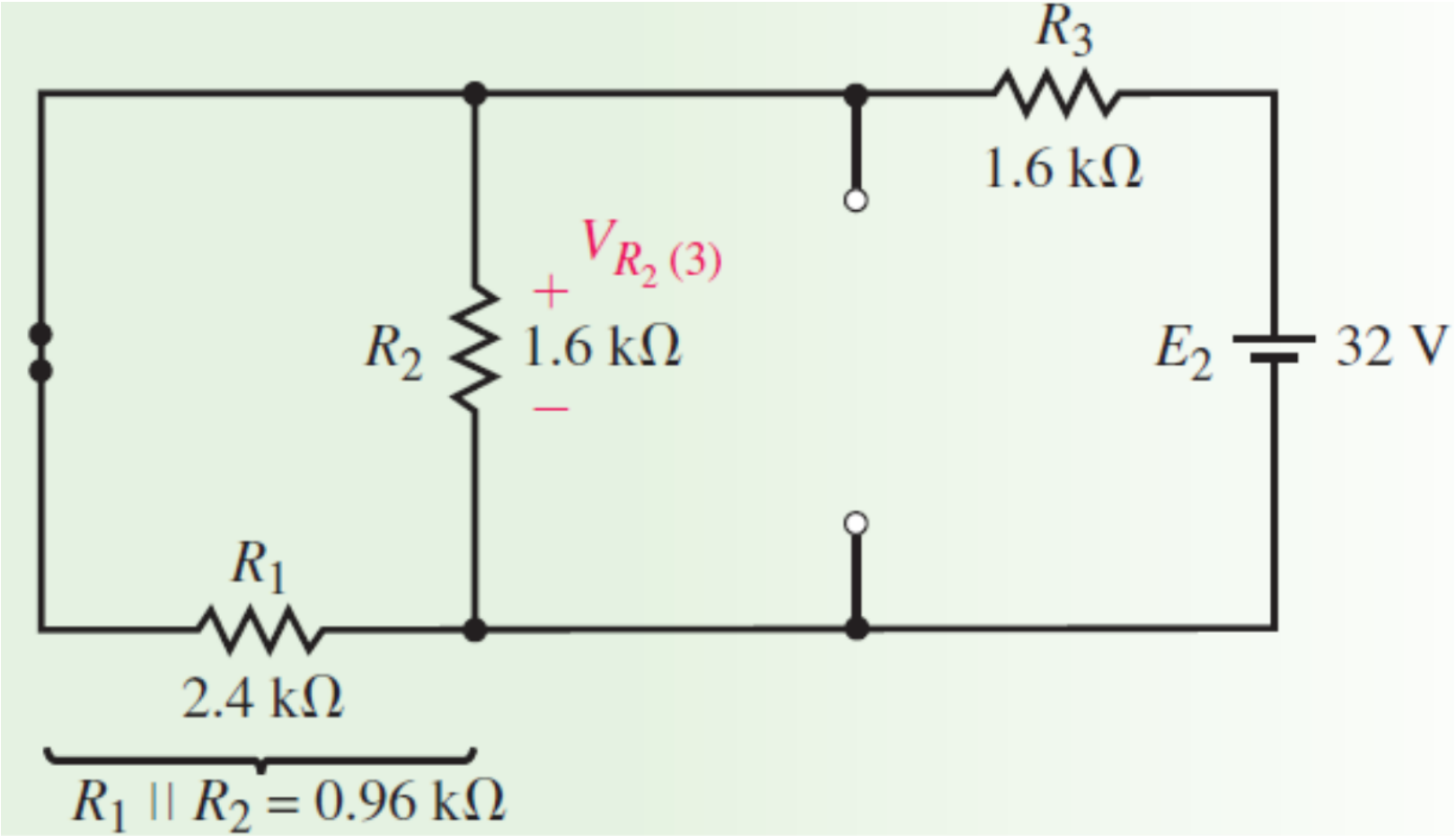
$$R_T = 0.6\ \Omega$$

- The resulting voltage across R_2 will be the effective resistance times the total current

$$V_{R_2(2)} = (0.6\ k\Omega)(5\ mA) = 3.0\ V$$

Solution

- Next we consider the 32 V source and R_1 and R_2 are parallel



Solution

- The effective resistance of R_1 and R_2 will be

$$= \frac{R_1 R_2}{R_1 + R_2} = \frac{(2.4)(1.6)}{2.4 + 1.6} = 0.96$$

- The resulting voltage across R_2 will be

$$V_{R_2(3)} = \frac{0.96}{0.96 + 1.6}(32) = 12.0 \ V$$

Solution

By superposition, the resulting voltage V_{R_2} will be

$$V_{R_2} = V_{R_2(1)} + V_{R_2(2)} + V_{R_2(3)}$$

$$V_{R_2} = -4.0 + 3.0 + 12.0 = 11.0 \ V$$