Ex:

\[ R_1 = 10 \, \Omega \]
\[ R_2 = 20 \, \Omega \]
\[ R_3 = 30 \, \Omega \]
\[ R_4 = 150 \, \Omega \]

- **a)** Find the value of the equivalent resistance, \( R_{eq} \).
- **b)** If a current source is connected to the above network and current \( I_1 = 100 \text{mA} \) flows into terminal \( a \), find \( I_4 \).

**soln a)** Resistors in series sum and resistors in parallel sum as conductances: \( A || B = \frac{AB}{A+B} \)

\[ R_2 + R_3 = \frac{20 \, \Omega + 30 \, \Omega}{10 \, \Omega} = 50 \, \Omega \]

\[ R_{eq} = \frac{50 \, \Omega}{2} \]

\[ 50 \, \Omega \parallel R_4 = \frac{50 \, \Omega \parallel 150 \, \Omega}{50 \, \Omega + 150 \, \Omega} = \frac{50 \, \Omega \times 3}{4} = \frac{150 \, \Omega}{4} = 37.5 \, \Omega \]

We add the 10 \( \Omega \) in series to get \( R_{eq} = 47.5 \, \Omega \).
We have a current-divider as shown in the upper right diagram. Note that $I_1$ flows thru $R_1$ and then splits between the 50.Ω in the center branch and the 150.Ω in the right branch, (i.e., $I_4$). So we use the current-divider formula.

$$I_4 = I_1 \cdot \frac{50.Ω}{50.Ω + 150.Ω} = I_4 \left(\frac{1}{4}\right) = \frac{100mA}{4} = 25mA$$