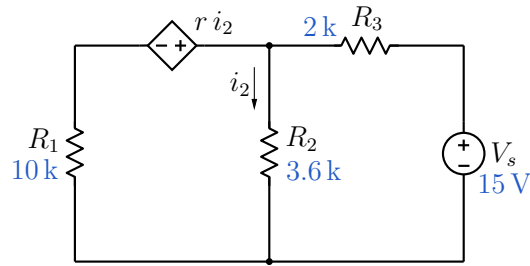**Mesh Analysis-1** (`EC_mesh_1.sqproj`)



Figure 1: Mesh analysis example.

**Question:** In the circuit shown in Fig. 1, find the current $i_2$ using mesh analysis with $r = 1.6\,\mathrm{k}$.

**Solution:**

To begin with, we define mesh currents, as shown in Fig. 2. In terms of the mesh currents, we can write the following KVL equations.
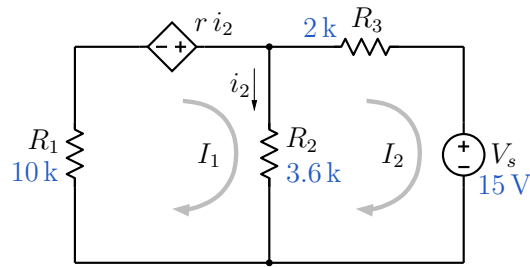


Figure 2: Circuit of Fig. 1 with mesh currents.

$$R_1 I_1 - r(I_1 - I_2) + (I_1 - I_2)R_2 = 0, \tag{1}$$

$$(I_2 - I_1)R_2 + I_2 R_3 + 15 = 0. \tag{2}$$

Collecting terms in $I_1$ and $I_2$, we get

$$I_1(R_1 - r + R_2) + I_2(r - R_2) = 0, \tag{3}$$

$$I_1(-R_2) + I_2(R_2 + R_3) = -15. \tag{4}$$

With currents expresses in mA and resistances in k$\Omega$, we get

$$I_1(10 - 1.6 + 3.6) + I_2(1.6 - 3.6) = 0, \tag{5}$$

$$I_1(-3.6) + I_2(3.6 + 2) = -15. \tag{6}$$

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After simplifying the above equations, we get

$$I_1(12) + I_2(-2) = 0, \tag{7}$$

$$I_1(-3.6) + I_2(5.6) = -15. \tag{8}$$

Solving Eqs. 7 and 8, we obtain $I_1 = -0.5\,\text{mA}$, $I_2 = -3\,\text{mA}$. The current $i_2$ in Fig. 1 is therefore

$$i_2 = I_1 - I_2 = 2.5\,\text{mA}. \tag{9}$$

**SequelApp Exercises:** Find $i_2$ in the circuit of Fig. 1 for the following component values: $R_1 = 1\,\text{k}$, $R_2 = 10\,\text{k}$, $R_3 = 2\,\text{k}$, $r = 6\,\text{k}$, $V_s = 10\,\text{V}$.

Verify your answers using SequelApp.