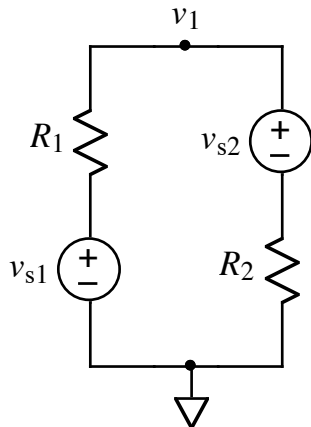**Ex:**

Use the node-voltage method to find a formula for v_1. Write your answer as a sum of a voltage divider for v_{s1} and a voltage divider for v_{s2}.

SOL'N: We sum currents out of the v_1 node:

$$\frac{v_1 - v_{s1}}{R_1} + \frac{v_1 - v_{s2}}{R_2} = 0 \text{ V}$$

or

$$v_1\left(\frac{1}{R_1} + \frac{1}{R_2}\right) = \frac{v_{s1}}{R_1} + \frac{v_{s2}}{R_2}$$

or

$$R_1 R_2 v_1\left(\frac{1}{R_1} + \frac{1}{R_2}\right) = R_1 R_2\left(\frac{v_{s1}}{R_1} + \frac{v_{s2}}{R_2}\right)$$

or

$$v_1(R_1 + R_2) = v_{s1}R_2 + v_{s2}R_1$$

or

$$v_1 = \frac{v_{s1}R_2 + v_{s2}R_1}{R_1 + R_2}$$

or, when written as a sum of voltage dividers:

$$v_1 = v_{s1}\frac{R_2}{R_1 + R_2} + v_{s2}\frac{R_1}{R_1 + R_2}$$