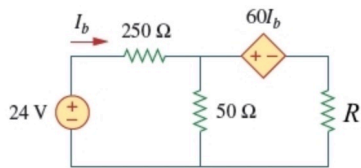
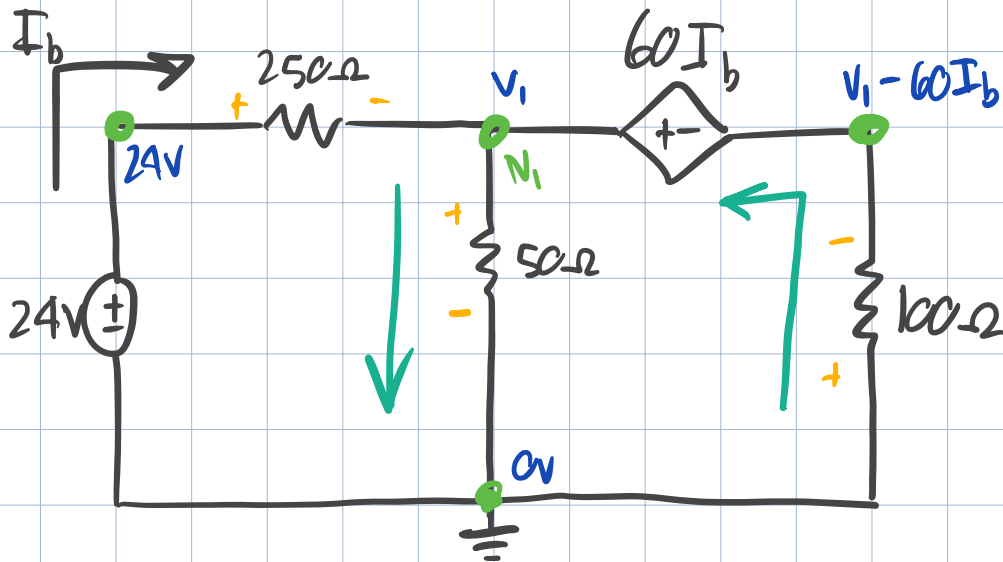


In the circuit given below, $R = 100\ \Omega$. Find the value of I_b using nodal analysis.



The value of I_b in the circuit is mA.



4 nodes - 1 ref - 2 voltage sources

Kcl at N_1

$$\frac{24 - V_1}{250} + \frac{V_1 - (V_1 - 60I_b)}{100} = \frac{V_1 - 0}{50}$$

$$48 - 2V_1 + 5(60I_b) = 100V_1$$

$$48 + 300I_b = 102V_1$$

$$V_1 = \frac{48 + 300I_b}{102}$$

$$I_b = \frac{24 - V_1}{250}$$

$$I_b = \frac{24}{250} - \frac{\frac{48+300I_b}{102}}{250}$$

$$I_b = \frac{24}{250} - \frac{48+300I_b}{102} \cdot \frac{1}{250}$$

$$250I_b = 24 - \frac{48+300I_b}{102}$$

$$25500I_b = 2448 - 48 + 300I_b$$

$$25200I_b = 2400$$

$$I_b = \frac{2400}{25200}$$

$$= \frac{24}{252}$$