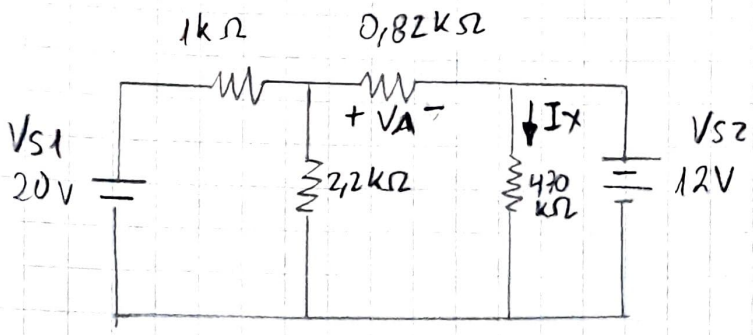
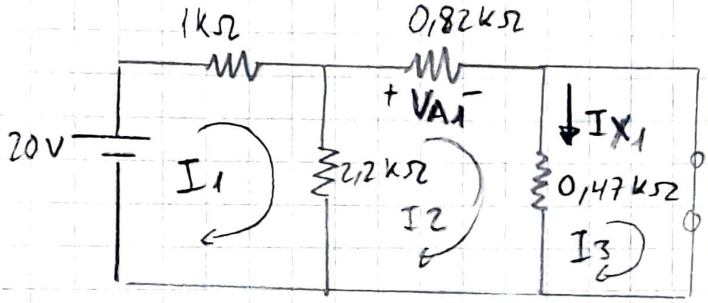


Por superposición:

Haciendo cero la fuente de 12V ($V_{S2} = 0$):



Analizando por mallas:

Malla 1:

$$20 - 1(I_1) - 2,2(I_1 - I_2) = 0$$

$$3,2 I_1 - 2,2 I_2 = 20 \quad (1)$$

Malla 2:

$$2,2(I_2 - I_1) + 0,82 I_2 + 0,47(I_2 - I_3) = 0$$

$$2,2 I_1 - 3,49 I_2 = 0,47 I_3 = 0 \quad (2)$$

Malla 3:

$$0,47(I_3 - I_2) = 0$$

$$I_3 = I_2 \quad (3)$$

Resolviendo el sistema:

$I_1 = 12,521 mA //$

$I_3 = I_2 = 9,121 mA //$

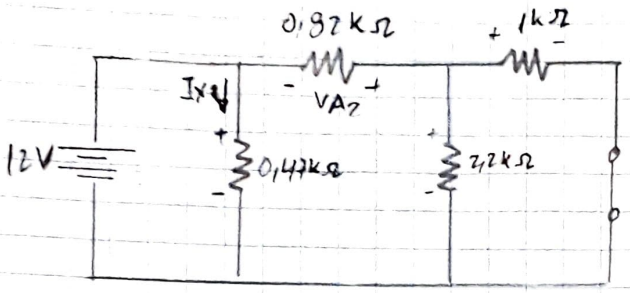
I_{x1} es la corriente total que pasa por esa rama:

$I_{x1} = I_2 - I_3 \Rightarrow$ $\boxed{I_{x1} = 0 mA //}$

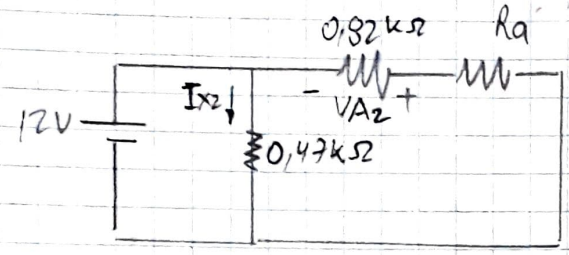
La corriente que pasa por R_A es I_2, entonces V_A es:

$$V_{A1} = R_A \cdot I_2 = 0,82 k\Omega \cdot 9,121 mA$$

$$\boxed{V_{A1} = 7,479 V //}$$

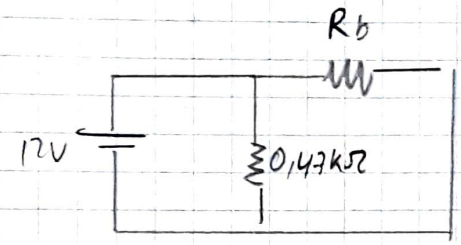


Reduciendo el circuito:



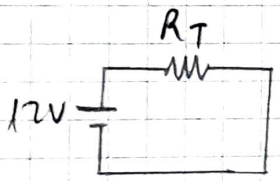
$R_a = 1k\Omega \,//\, 2,2k\Omega$

$R_a = \frac{1 \cdot 2,2}{1+2,2} = 0,6875\,k\Omega$ //



$R_b = 0,82k\Omega + R_a$

$R_b = 1,507\,k\Omega$ //



$R_T = R_b \,//\, 0,47$

$R_T = \frac{1,507 \cdot 0,47}{1,507+0,47} = 0,358\,k\Omega$ //

$I_T = \frac{V_T}{R_T} = \frac{12}{0,358} = 33,483\,mA$ //

Al estar en paralelo: $V_T = V_{0,47} = V_b$

Entonces: $I_{x2} = I_{0,47} = \frac{V_T}{R_{0,47}} = \frac{12}{0,47}$

$$\boxed{I_{x2} = 25,532\,mA\,//}$$

$I_B = I_T - I_{x2} = 7,951\,mA$ //

RA y Ra están en serie: $I_b = I_a$

$V_T = V_{A2} + V_a \Rightarrow V_{A2} = 12 - I_b \cdot R_a = 12 - 7,951 \cdot 0,687$

$V_{A2} = 6,537V$; pero su polaridad es:

$$\boxed{V_{A2} = -6,537\,V\,//}$$

Aplicando superposición:

$$I_X = I_{X1} + I_{X2} = 0 + 25,532$$

$$\boxed{I_X = 25,532 \text{ mA} //}$$

$$V_A = V_{A1} + V_{A2} = 7,479\ V - 6,537\ V$$

$$\boxed{V_A = 0,941\ V //}$$