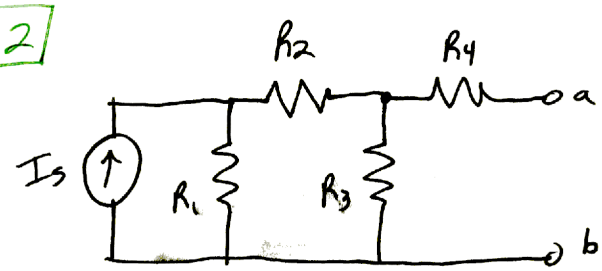
#2



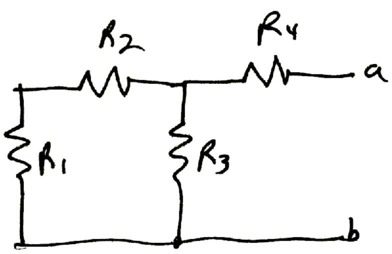
$R_1 = 120$
$R_2 = 470$
$R_3 = 100$
$R_4 = 330$
$I_s = 84\,mA$

Find the Thevenin/Norton equivalent at a-b

Find R_{Th} by setting indep. sources to zero

(doesn't work when there are *dependent* sources)

$I_s \to \emptyset A$ (open-circuit)
redraw

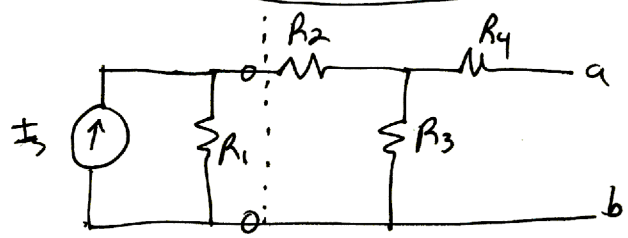


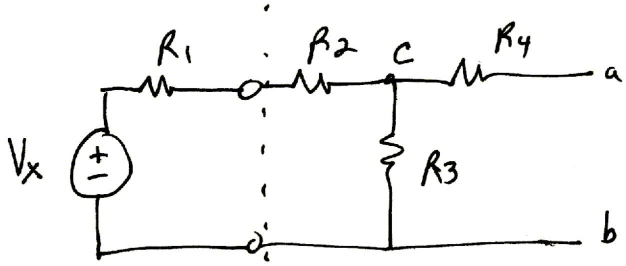
$$R_{ab} = R_4 + R_3 \,||\, (R_2 + R_1)$$
$$= 330 + 100 \,||\, (470 + 120)$$
$$100 \,||\, 590$$
$$= 330 + \frac{(100)(590)}{100 + 590}$$

$$R_{ab} = R_{Th} = R_{Nor} = 415.507\,\Omega$$
$$\downarrow$$
$$\boxed{416\,\Omega}$$ ✓ matches

There are lots of options for finding either $V_{open\text{-}circuit}$ or $I_{short\text{-}circuit}$. All methods will give the same result.

a. source transformation → Voltage divider

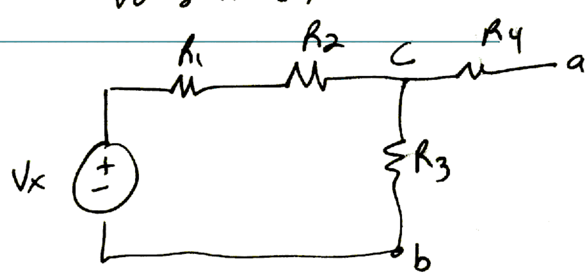




$$V_x = I_s \cdot R_1$$

If we find $V_{open\text{-}circuit}$ now, then there is no current through R_4, and so $V_{ab} = V_{cb}$

voltage divider!



$$V_{cb} = V_x \cdot \frac{R_3}{R_1 + R_2 + R_3}$$

$$= (I_s \cdot R_1) \frac{R_3}{R_1 + R_2 + R_3}$$

$$= \frac{(84\,mA)(120)(100)}{120 + 470 + 100} = \boxed{1.461\,V = V_{Th}}$$

$$I_{Nor} = \frac{V_{Th}}{R_{Th}} = \frac{1.461\,V}{415.507\,\Omega} = 3.516\,mA \rightarrow \boxed{3.52\,mA}$$ ✓ match

(intermediate numbers stored in calculator)