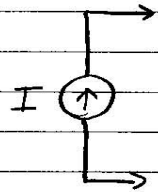


## Today's Material

- Current Sources and Source Conversions
  - Intro and examples
- Breakout #1
  - Voltage divider and series/parallel

## 8.2 CURRENT SOURCES

"IDEAL"

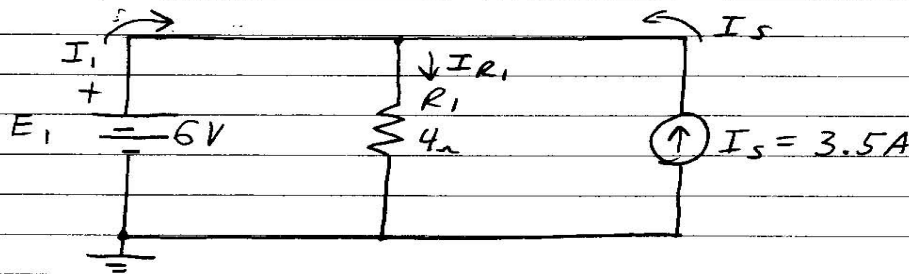


CURRENT "I" WILL FLOW IN THE DIRECTION INDICATED.

THE VOLTAGE ACROSS THE CURRENT SOURCE IS DETERMINED BY THE NETWORK IT IS ATTACHED TO.

(EXAMPLE)

FIND  $I_{R_1}$  &  $I_1$



$$I_{R_1} = \frac{E_1}{R_1} = \frac{6V}{4\Omega} = \boxed{1.5A}$$

$$\text{KCL: } I_1 + I_s = I_{R_1}$$

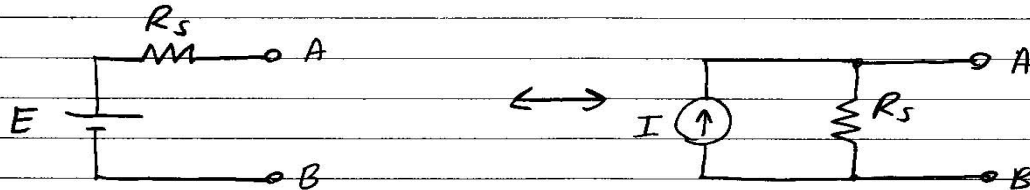
$$\therefore I_1 = I_{R_1} - I_s$$

$$I_1 = 1.5A - 3.5A = \boxed{-2A} \quad \therefore I_1 \text{ IS ACTUALLY ENTERING THE VOLTAGE SUPPLY}$$

# Electrical Engineering Technology

## 8.3 SOURCE CONVERSIONS

PRACTICAL VOLTAGE SOURCE  $\longleftrightarrow$  PRACTICAL CURRENT SOURCE

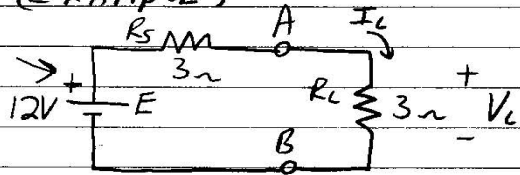


$$E = I \cdot R_s$$

$$I = E / R_s$$

EQUIVALENT AT TERMINALS A-B ONLY

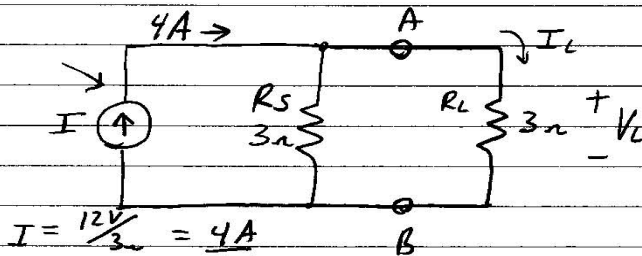
(EXAMPLE)



$$V_L = 12V \left( \frac{3\Omega}{3\Omega + 3\Omega} \right) = 6V$$

$$I_L = \frac{6V}{3\Omega} = 2A$$

CONVERT  
USING  $I = E / R_s$



$$I_L = 4A \left( \frac{R_s}{R_s + R_L} \right)$$

$$I_L = 4A \left( \frac{3}{3+3} \right) = 2A$$

$$V_L = I_L R_L = (2A)(3\Omega) = 6V$$

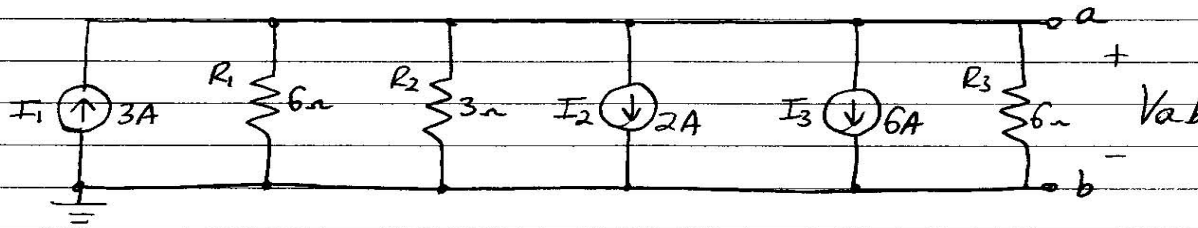
S  
A  
M  
E

## Electrical Engineering Technology

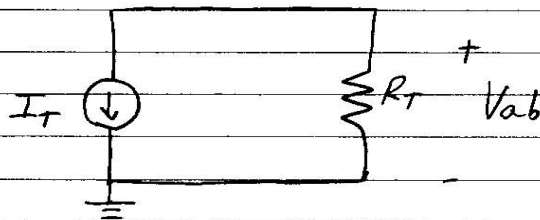
### 8.4 CURRENT SOURCES IN PARALLEL

- CAN COMBINE TO SIMPLIFY CIRCUITS

(EXAMPLE) FIND  $V_{ab}$



- COMBINE  $I_1, I_2, I_3$
- COMBINE  $R_1, R_2, R_3$



$$I_T = -3A + 2A + 6A = 5A$$

$$R_T = R_1 // R_2 // R_3 = 6\Omega // 3\Omega // 6\Omega = (6\Omega // 6\Omega) // 3\Omega$$
$$3\Omega // 3\Omega$$
$$R_T = 1.5\Omega$$

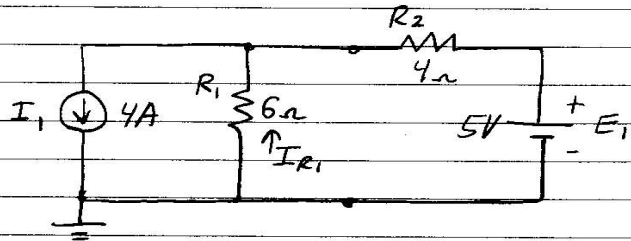
$$\therefore V_{ab} = -I_T R_T$$
$$= (-5A)(1.5\Omega)$$

$$\boxed{V_{ab} = -7.5V}$$

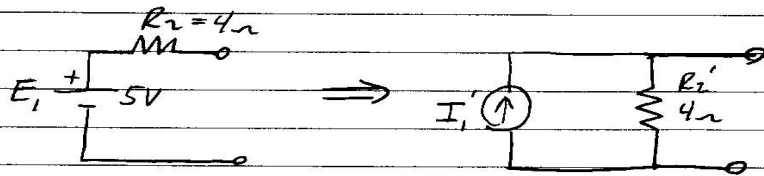
# Electrical Engineering Technology

(EXAMPLE)

FIND  $I_{R1}$

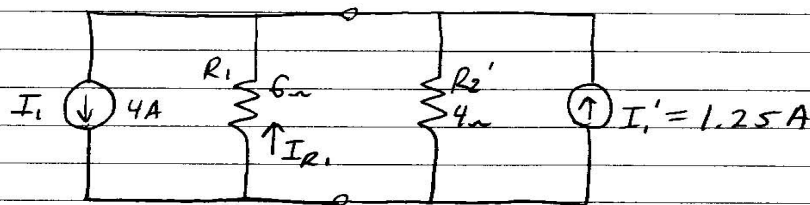


SOURCE CONVERSION ON  $E_1, R_2$  TO CREATE A PARALLEL CIRCUIT:

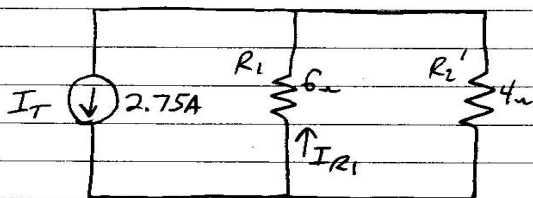


$$I_1' = \frac{E_1}{R_2} = \frac{5V}{4\Omega} = \underline{1.25A}$$

REDRAW:



✓ REDRAW



$$I_{R1} = 2.75A \left( \frac{R_2'}{R_2' + R_1} \right) = 2.75A \left( \frac{4}{10} \right)$$

$$\boxed{I_{R1} = 1.1A}$$

## Breakout #1 (review)

- Find  $R_1$  through  $R_5$

