$i = \frac{\Delta q}{\Delta t}$ in the limit

$i(t) = \frac{dq}{dt} \rightarrow \frac{\text{coulomb}}{\text{sec}}$

$v(t) = \frac{dw}{dq}$

$p = \frac{dw}{dt} = \frac{dw}{dq} \times \frac{dq}{dt} = v \times i$

$p = v \times i$

PASSIVE Sign Convention

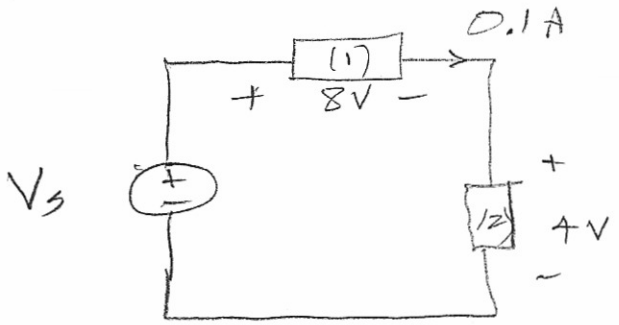
If the assumed direction of the current enters the assumed positive polarity of a device, we say that the power absorbed is

$$p_{abs} = +vi$$

If the assumed direction of the current leaves the assumed positive polarity of a device we say that the power supplied is

$$p_{sup} = +vi$$

Example 2.8



Find the pwr absorbed by (1) & (2)
Find the power supplied by Vs.

We note

$$-V_s + 8 + 4 = 0$$

$$V_s = 12\ V$$

$$P_{Abs\ (1)} = 0.1 \times 8 = 0.8\ W$$

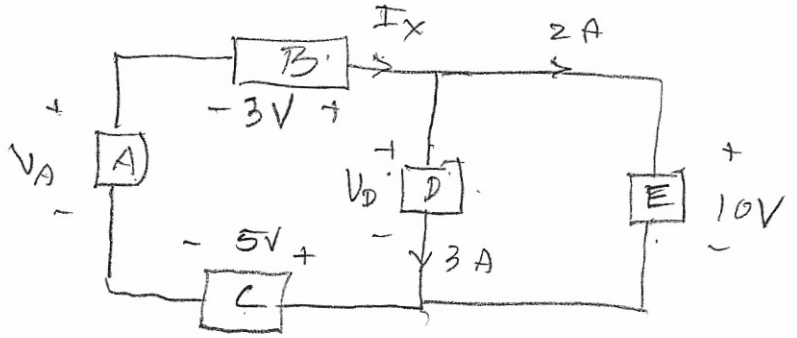
$$P_{Abs\ (2)} = 0.1 \times 4 = 0.4\ W$$

$$\Sigma P_{Abs} = 1.2\ W$$

$$P_{Sup} = 0.1 \times 12 = 1.2\ W$$

Example 2.9

Given



$I_x = 5\,A$

$V_D = 10\,V$

$5 - V_A - 3 + 10 = 0$

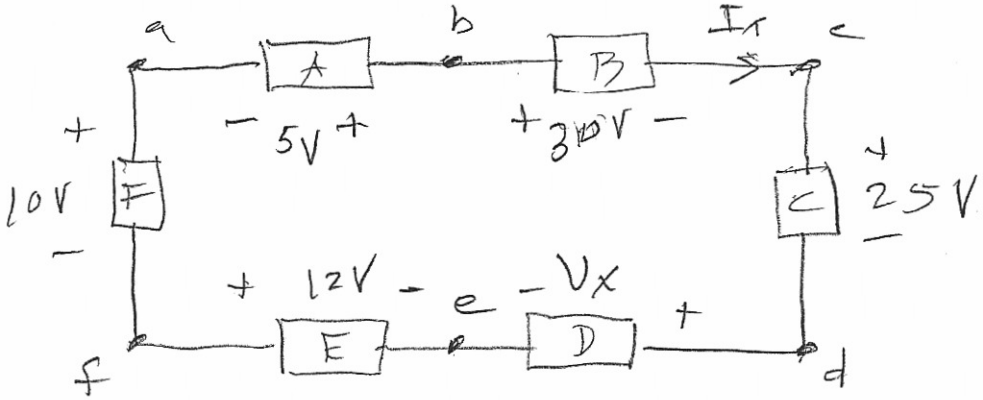
$V_A = 12\,V$

P_{ABS} (Assume all are absorbing)
(A negative # means supplying)

$P_A = -(5)\times(12) = -60\,W$
$P_B = (-3)(5) = -15\,W$
} Supplied 75W

$P_C = 5\times5 = 25\,W$
$P_D = -3\times10 = 30\,W$
$P_E = 2\times10 = 20\,W$
} Absorbed 75W

Example



Given: power absorbed by C is 20 W.

(a) Find V_x

(b) Find I_x

(c) Find V_{ce}

55
27
28

$$V_x - 12 - 10 - 5 + 30 + 25 = 0$$

$$V_x + 28 = 0$$

$$\boxed{V_x = -28\ V}$$

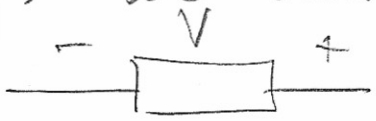
Since C absorbs,

$$P_c = 20 = I_x \cdot 25$$

$$\boxed{I_x = 0.8\ A}$$

We call V_{eb} double subscript notation. There are 3 common

ways we denote voltage



Now find V_{ce}.

We are assume c is positive with respect to e.

We can write

$$+V_{ce} - V_{de} - V_{cd} = 0$$

$$V_{ce} = V_{de} + V_{cd} = -28V + 25 = -3V$$

$$\boxed{V_{ce} = -3V}$$

OR

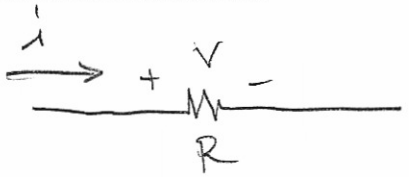
$$V_{fe} + V_{af} + V_{ba} + V_{cb} - V_{ce} = 0$$

$$V_{ce} = V_{fe} + V_{af} + V_{ba} + V_{cb}$$

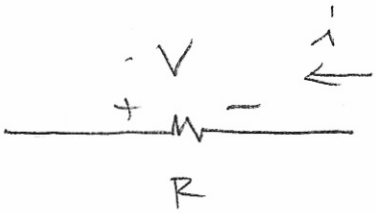
$$= 12 + 10. + 5 - 30$$

$$\boxed{V_{ce} = -3V}$$ check

Ohm's Law

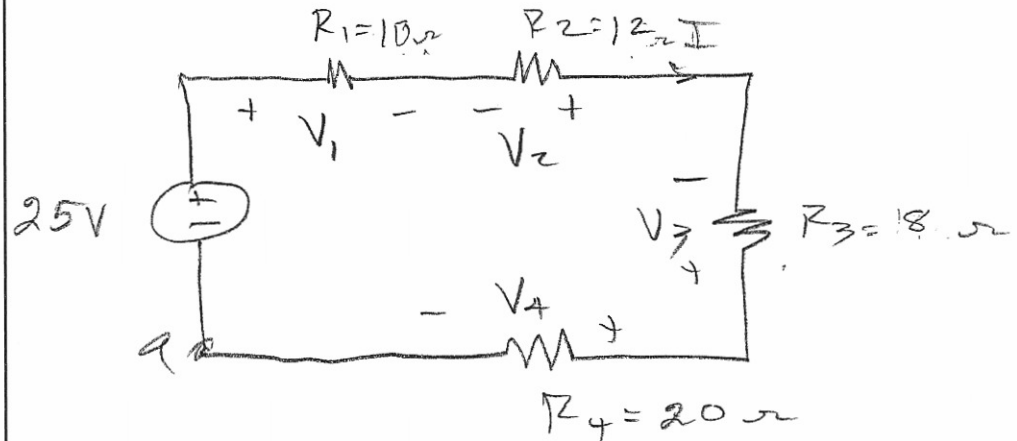


$V = +iR$



$V = -iR$

How does this work?



FIND I

FIND V_1, V_2, V_3, V_4

Σ drops = 0, CW start at a

$$-25 + V_1 - V_2 - V_3 + V_4 = 0$$

$$-25 + 10I - (-12I) - (-8I) + 20I$$

$$(10 + 12 + 8 + 20)I = 25$$

$$50I = 25$$

$$I = 0.5\,A$$

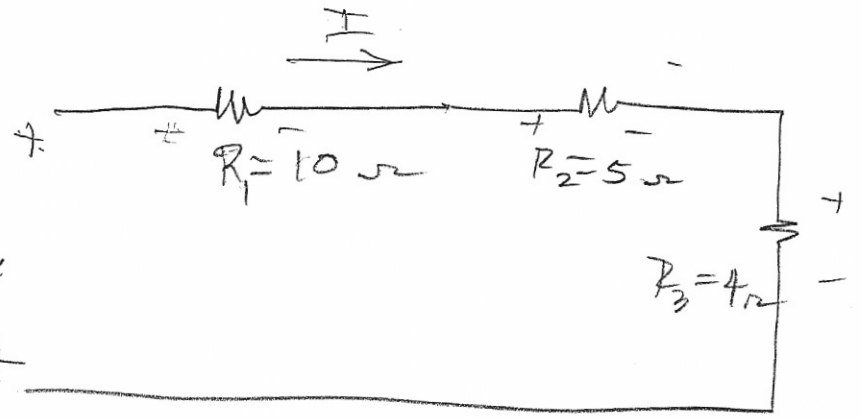
Now we can calculate any of the voltages.

$V_1 = +IR_1 = 0.5 \times 10 = 5\,V$

$V_2 = -12I = -12 \times 0.5 = -6\,V$

What does this mean?

Default sign convention.



Says that you assume voltage is positive at the terminal where the current enters the element,

$-V_x + 10I + 5I + 4I = 0$

$V_x = 19I$