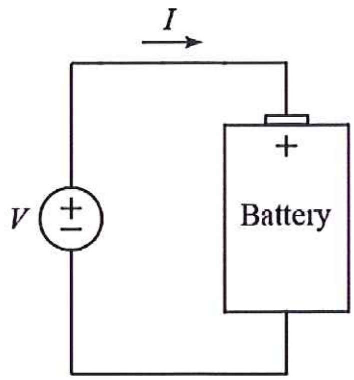
Ex:



V	I
12 V	1 A
10 V	0 A
8 V	–1 A

When voltage V is applied to the above battery, the currents shown in the table are measured.

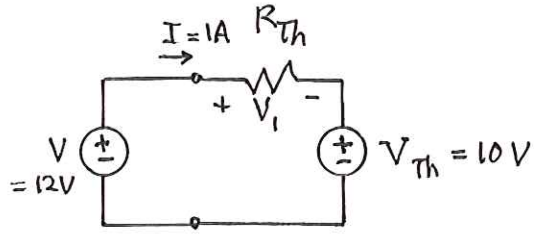
a) Find a Thevenin equivalent model of the battery.

b) If a 3 Ω resistor is connected across the battery (instead of V), how much power is dissipated in the 3 Ω resistor?

sol'n: a) V_{Th} = V across battery when nothing is connected to the battery, i.e., when no current is flowing

From the table, we see that no current flows when $V = 10V$. But V is the voltage across the battery. So $V_{Th} = V = 10V$.

$$V_{Th} = 10V$$



The above diagram shows the circuit model when $V = 12V$ (and $I = 1A$ according to the table).

Using a voltage loop, we can determine the voltage drop across R_{Th}, and then we can use Ohm's law to find the value of R_{Th} from I and V_1. Starting in the lower left corner of the circuit, we have the following v-loop eq'n:

$$+V - V_1 - V_{Th} = 0V$$

or

$$12V - V_1 - 10V = 0V$$

or

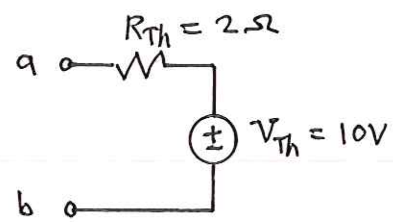
$$2V - V_1 = 0V$$

or

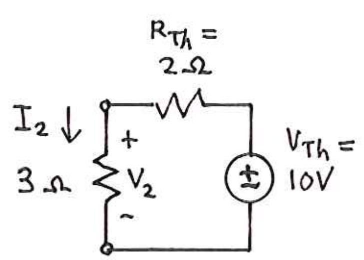
$$V_1 = 2V$$

So we can now compute R_{Th}:

$$R_{Th} = \frac{2V}{I} = \frac{2V}{1A} = 2\Omega$$



b)



We have a voltage divider circuit.

$$V_2 = V_{Th} \frac{3\Omega}{2\Omega + 3\Omega} = 10V\left(\frac{3}{5}\right) = 6V$$

We can compute I_2 from Ohm's law:

$$I_2 = \frac{V_2}{3\Omega} = \frac{6V}{3\Omega} = 2A$$

Our power is $P = I_2 V_2 = 2A \cdot 6V = 12W.$

Note: we could also say $P = \frac{V_2^2}{3\Omega} = \frac{(6V)^2}{3\Omega} = 12W.$