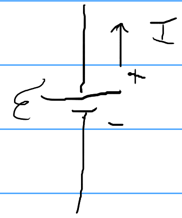
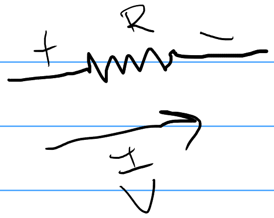
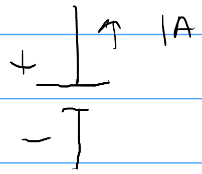
$P = VI$ source







$P = V \cdot I = I^2 R = \frac{V^2}{R}$ W

$P = (10V)(1A) = 10W$

Ω

$K\Omega = 10^3 \Omega$

$M\Omega = 10^6 \Omega$

A

$mA = 10^{-3} A$

$\mu A = 10^{-6} A$

$P = V \cdot I = \frac{1}{2} W$

V $\cdot$ mA = mW

500 mW is $I = 100mA$

$P = V \cdot I$

$V = \frac{P}{I}$

$V = \frac{500mA}{100mA} = 5$ ✓

kwh:

$P = \frac{W}{t} = \frac{\text{energy}}{\text{time}}$

$P \cdot t = W$ Joule

kW $\cdot$ hour

100W $\cdot$ 10hrs

$100W \cdot \frac{1kW}{100W} \cdot 10hr = 1kWhr$

$100W \cdot \frac{1kW}{1000W} \cdot 10 = 1kWh$

$100 \cdot 1 \cdot 10 = 1000$

200 W   36000 Sec

$$200\cancel{W} \cdot \frac{1\,kW}{1000\,\cancel{W}} \cdot \left(\underset{10}{36000}\right)\cancel{sec} \left(\frac{1\,hr}{\underset{1}{3600}\,\cancel{sec}}\right) = 2\,kWh$$

$$200 \cdot 1 \cdot 10 = 2000 =$$

Selecting the power rating for an application

When a resistor is used in a circuit, its power rating must be greater than the maximum power that the resistor will have to handle

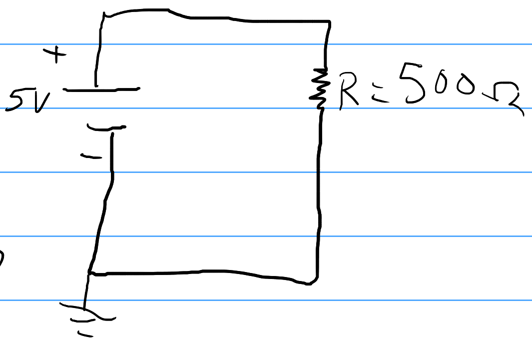
ideally: a rating that is at least twice the actual power

practically: the rating should be at least the next higher standard

$$\frac{1}{8},\ \frac{1}{4},\ \frac{1}{2},\ 1,\ \ldots$$

Example:

1. Calculate the consumed power



$$P = V \cdot I = \frac{V^2}{R} = I^2 R$$

$$P = \frac{(5)^2}{500} = 0.05\,W$$

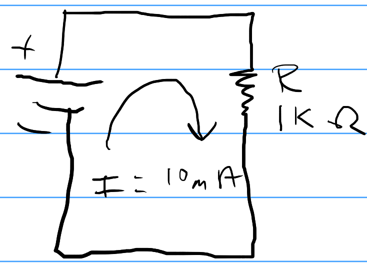
$$\frac{1}{8}\,W = 0.125\,W \approx 0.05 \cdot 2$$

$P = I^2 R$

$= \left(10\,mA \; \frac{1\,A}{1000\,mA}\right)^2 (100\,\Omega)$

$= (0.01\,A)^2 (1000\,\Omega)$ V

$= 0.1\,W$



$\frac{1}{8}$ or $\frac{1}{2}$

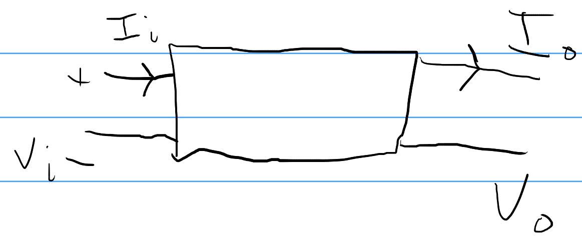
resistor value (W)
for power rating

Ampere-hour rating of a battery

it is the length of time that a battery can deliver a certain amount of current to a load at the rated voltage

Ampere hour = 15 · A hr = 15

$hr = \frac{15}{1} = 15$ hours



$P_i = V_i I_i$

$P_o = V_o I_o$

η = efficiency $= \frac{P_o}{P_i} \cdot 100\%$

$P_i = 100W$

$P_o = 80W$

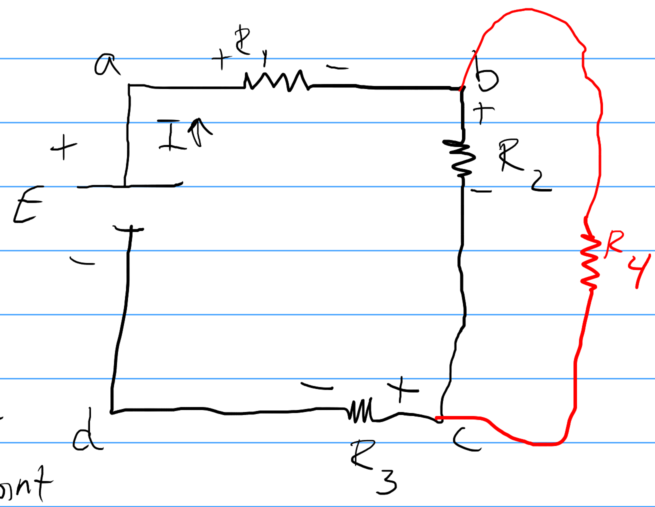
$\eta = \frac{80}{\cancel{100}} \cdot \cancel{100} = 80\%$

$P_{loss} = 100 - 80 = 20W$

Node: a junction of two or more elements

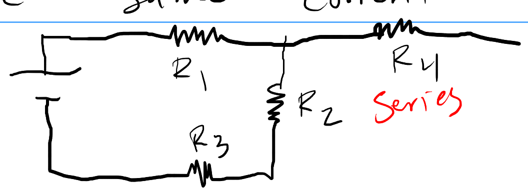
a, b, c, d

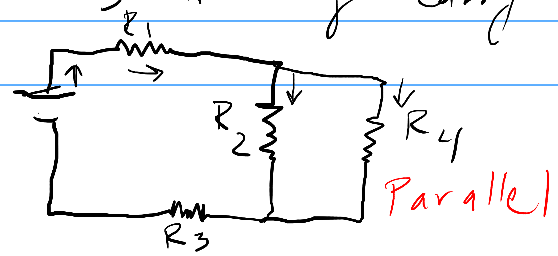
aka junction



Two elements are in series if they have only one point in common that is not connected to other current carrying elements of the circuit

Two elements are in series if they carry the same current

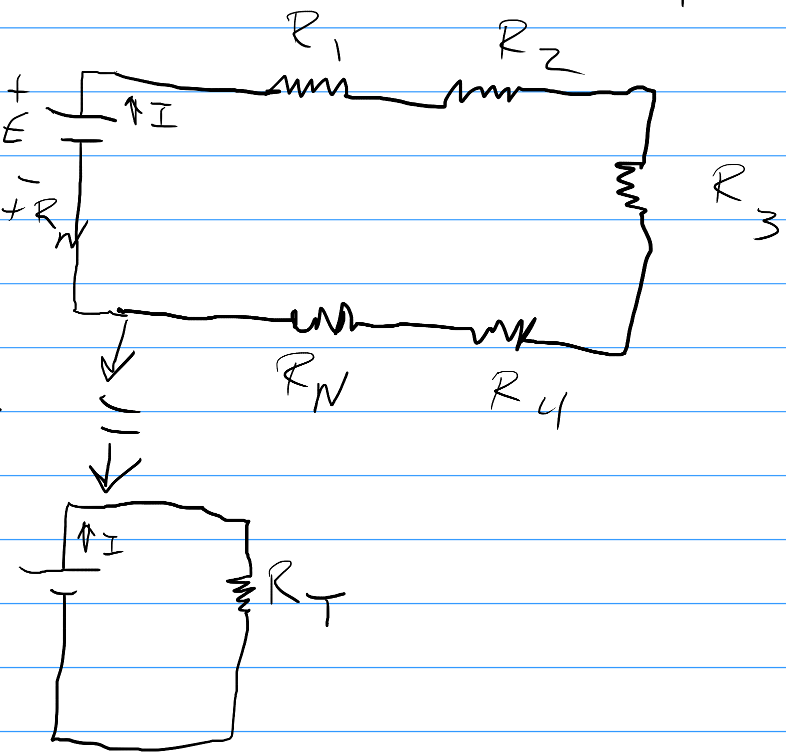




$V_{R_1} = I \cdot R_1$

$V_2 = I \cdot R_T$

Resistor in series



$R_T = R_1 + R_2 + R_3 + R_4 + R_N$

$= \sum_{i=1}^{N} R_i$

= sum of R_T

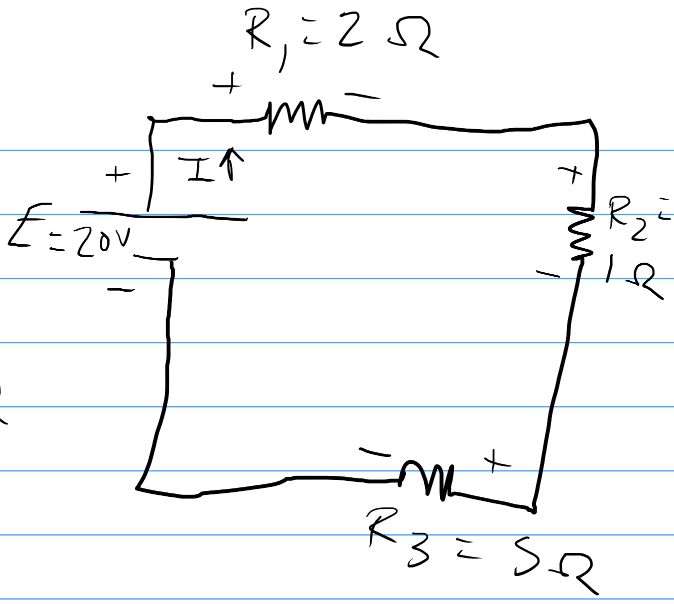
$= R_1 + R_2 + \dots + R_N$

$$I = \frac{E}{R_T}$$

$$P = \frac{V_2}{R} \qquad P_1 = \frac{V_1^2}{R_1}$$

$$\boxed{P_{\text{delivered}} = \sum \text{Power consumed}}$$

Find current I



$$R_T = R_1 + R_2 + R_3$$
$$= 2 + 1 + 5 = 8\,\Omega$$

$$I = \frac{20V}{8\,\Omega} = 2.5A$$

$$V_1 = I \cdot R_1 = 2.5A(2\Omega) = 5V$$
$$V_2 = I \cdot R_2 = 2.5A(1\Omega) = 2.5V$$
$$V_3 = I \cdot R_3 = 2.5A(5\Omega) = 12.5V$$

$$5 + 2.5 + 12.5 = 20V$$ ✓