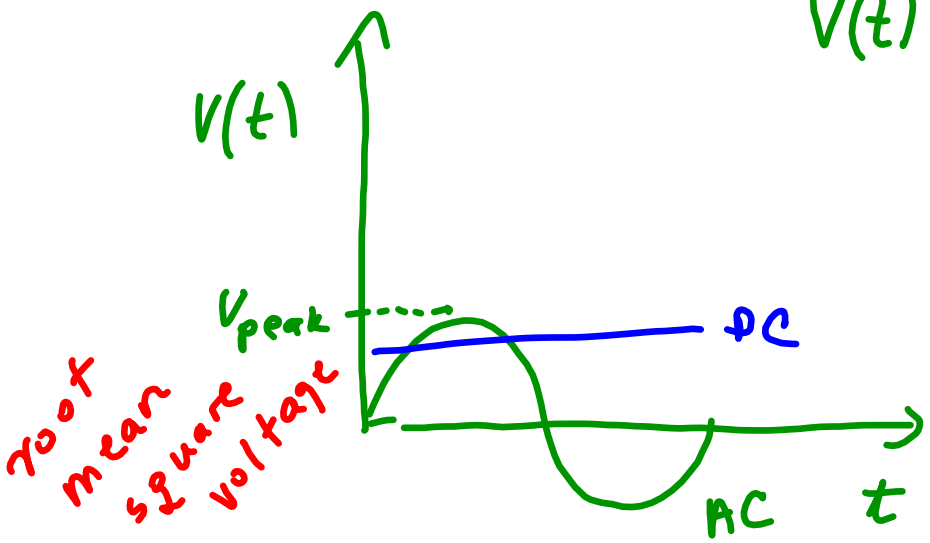
AC / DC



$$V(t) = V_{peak} \cdot \sin \omega t$$

$$\omega = \frac{2\pi}{T} = 2\pi f$$

$$P(t) = \frac{V^2}{R} = \frac{V_p^2 \sin^2 \omega t}{R}$$

$$I(t) = \frac{V(t)}{R} = \frac{V_p \sin \omega t}{R}$$

$$V_{RMS} = \sqrt{\frac{1}{T}\int_0^T [V(t)]^2 dt} = \frac{V_{peak}}{\sqrt{2}}$$

$V_{RMS} = \frac{V_{peak}}{\sqrt{2}}$ US $170\,V = V_{peak}$

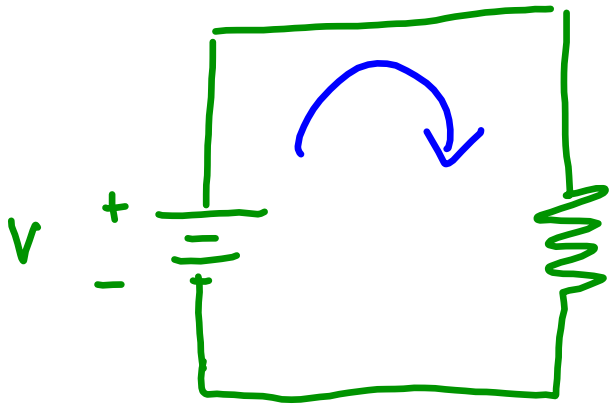
$f = 60\,Hz$

$V_{RMS} = 120\,V$  EU $V_{RMS} = 220\,V$

$f = 50\,Hz$

Basic circuit

- single resistor & battery



$V = 20\ V$

$R = 10\ \Omega$

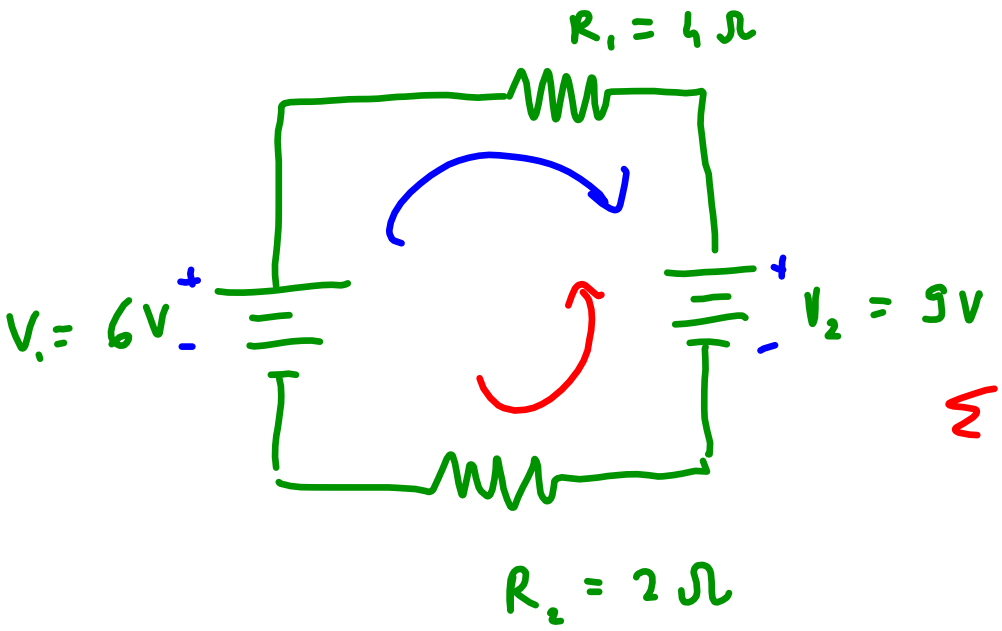
$I = ?$

$V - V_R = 0$

Ohm's law $V_R = IR$

$V - IR = 0$

$I = \frac{V}{R} = 2\ A$



$I = ?$

$\Sigma \Delta V_i = 0$

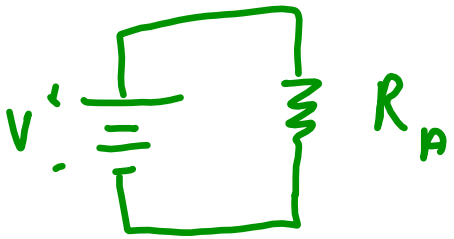
$V_1 - IR_1 - V_2 - IR_2 = 0 \qquad I = -0.5\,A$

$V_2 - IR_1 - V_1 - IR_2 = 0 \qquad I = +0.5\,A$

Resistors in series

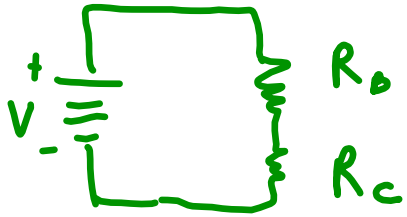
3 light bulb that are identical

note I is the same as there are no junctions

a) 

$V - IR_A = 0$

$V = IR_A$

b) 

$R_A = R_B + R_C$

$V - IR_B - IR_C = 0$

$V = I(R_B + R_C) = 0$

A battery is a source of V, it provides

I but the amount of it depends on

resistance of the load

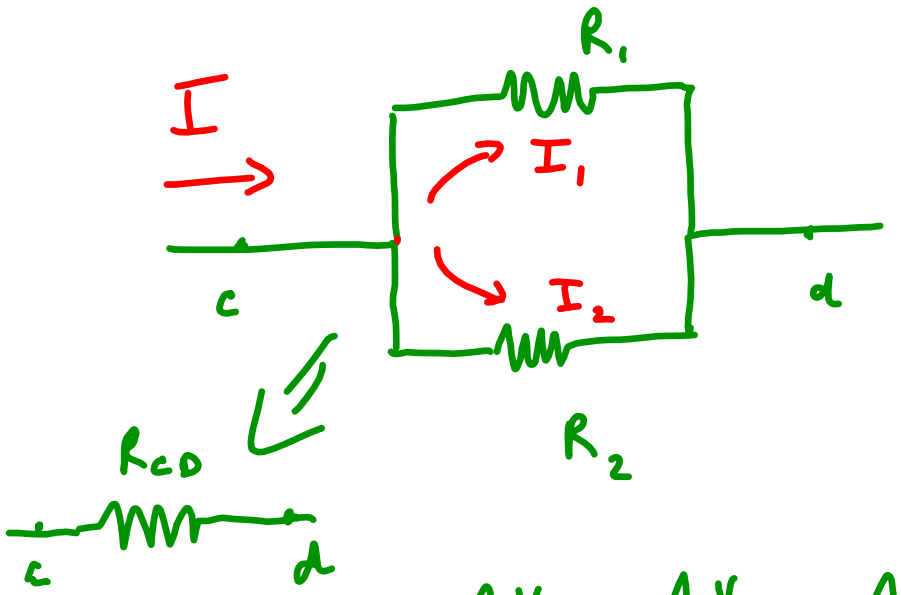
Ammeters – devices that measure the

current

(A) – must be placed in series with a

device that it measures

Parallel resistors



$$I = I_1 + I_2$$

$$I = \frac{\Delta V_1}{R_1} + \frac{\Delta V_2}{R_2}$$

$$I = \frac{\Delta V_{cd}}{R_{cd}}$$

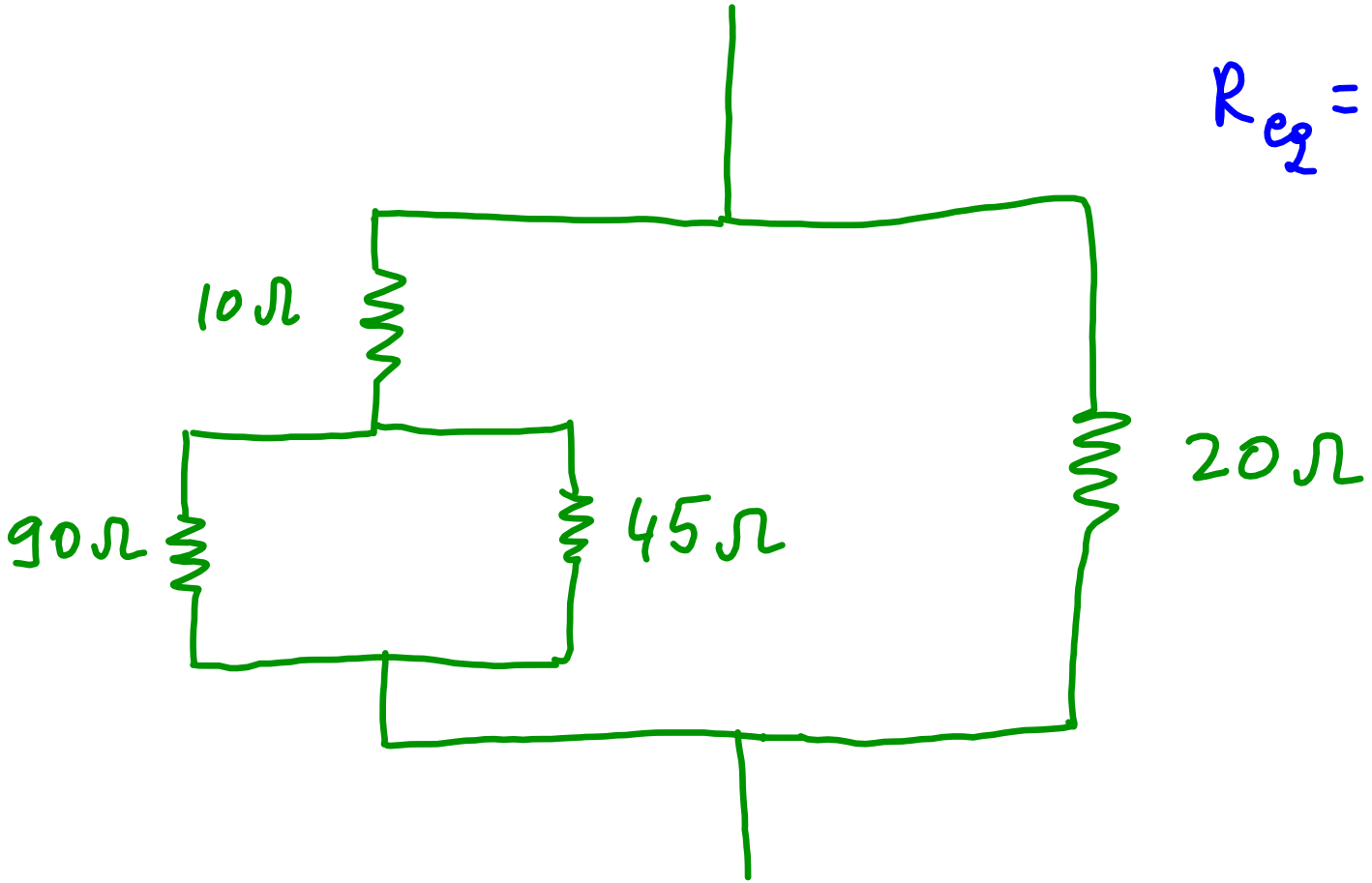
$$\Delta V_1 = \Delta V_2 = \Delta V_{cd}$$

$$\frac{1}{R_{cd}} = \frac{1}{R_1} + \frac{1}{R_2}$$

In series $R_{eq} = R_1 + R_2 + R_3 + \dots$

In parallel $\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_2} + \dots$

Ex



$R_{eq} = ?$