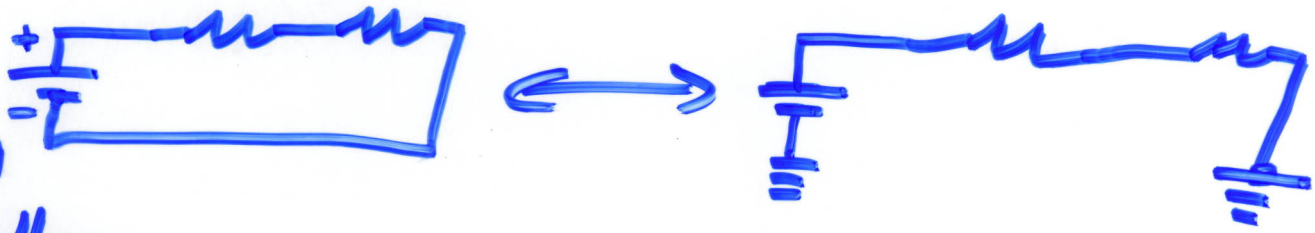
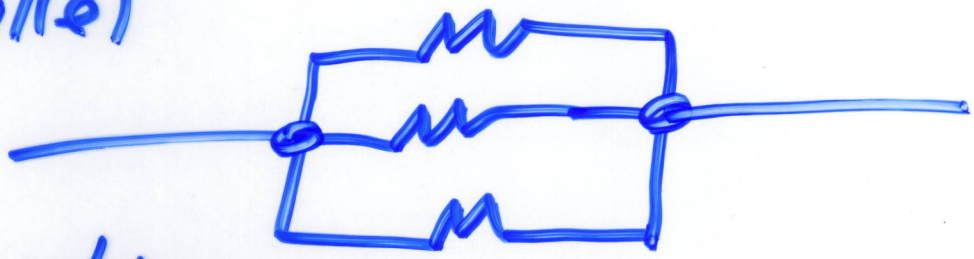


Battery
or
D.C. supply

Series

(same current)

Parallel



(same voltage across)

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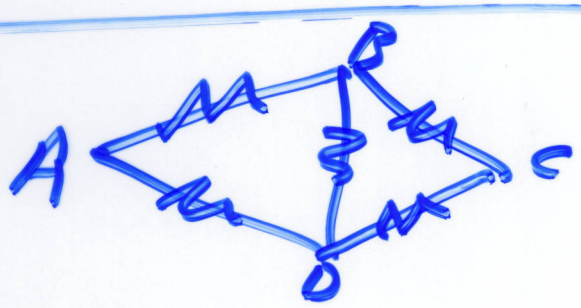
neither



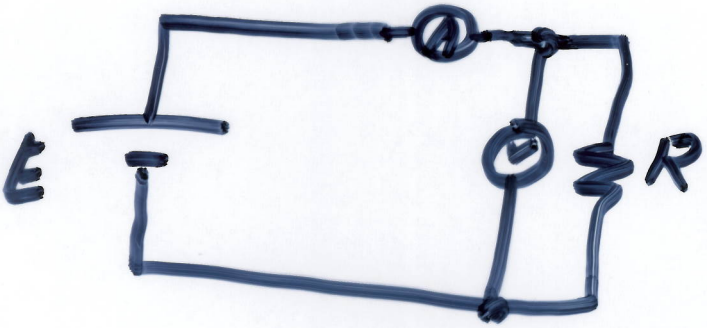
Resistance.

Determine

Measure voltage across R } V

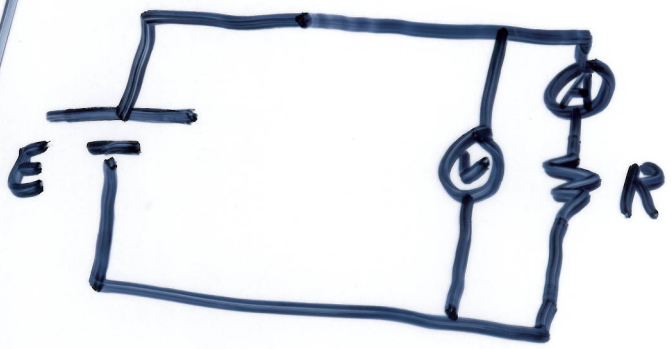
Measure current through R } I

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



$$R_{calc} = \frac{V}{I_R + I_V}$$

$$< R_{true}$$

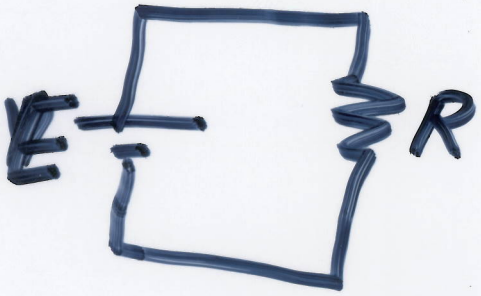


$$R_{calc} = \frac{V_R + V_A}{I}$$

$$> R_{true}$$

Resistance.

~~Measure~~ Determine

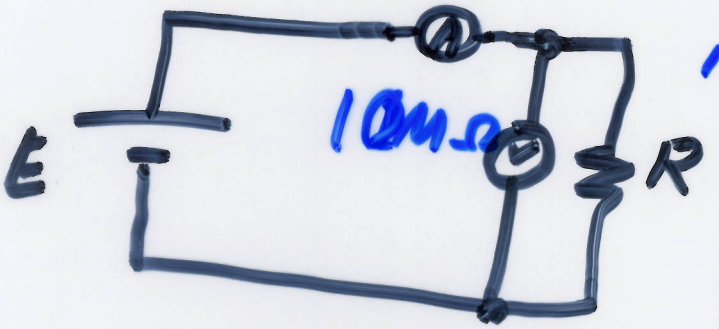


Measure voltage across R } V

Measure current through R } I

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

Suppose R is small ~ 10 Ω

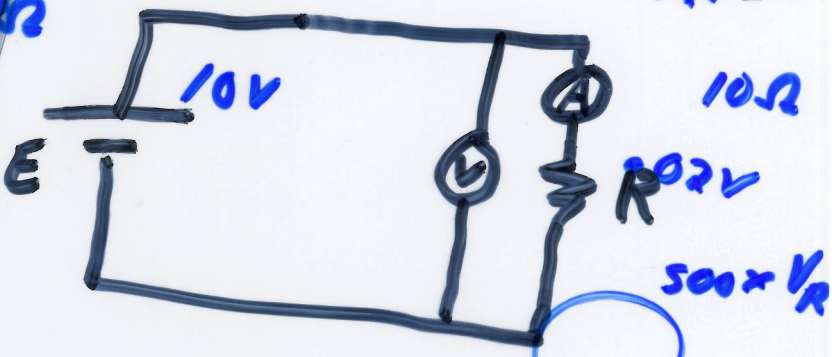


$$R_{calc} = \frac{V}{I_R + I_{10^6 I_R}}$$

$< R_{true}$

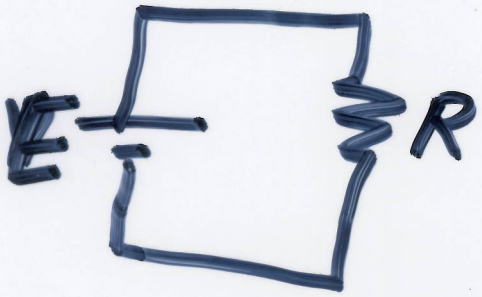
↑ use for small R

10Ω



$$R_{calc} = \frac{V_R + V_A}{I} > R_{true}$$

~~Measure~~ Determine Resistance.

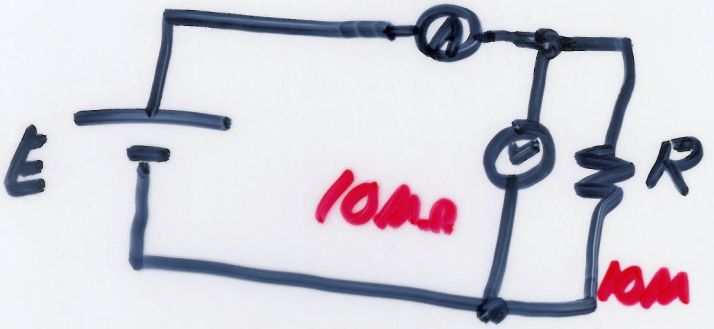


Measure voltage across R } V

Measure current through R } I

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

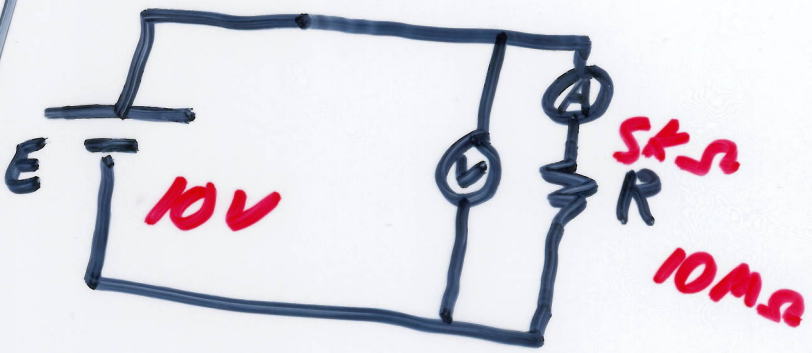
Large R ~ 10 MΩ



$$R_{calc} = \frac{V}{I_R + I_V}$$

$I_V \sim I_R$

$R_{calc} < R_{true}$



$$R_{calc} = \frac{V_R + V_A}{I}$$

$V_A \sim \frac{1}{2000} V_R$

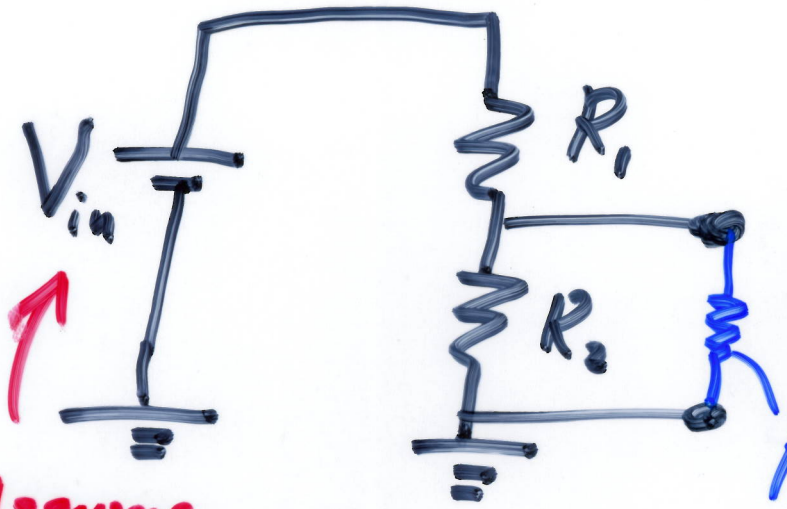
$R_{calc} > R_{true}$

↑ Use this for Large R

0 Black
1 Brown
2 Red
3 Orange
4 Yellow
5 Green
6 Blue
7 Violet
8 Grey
9 White

$20 \times 10^3 = 20k\Omega$

Voltage Divider / Thévenin's Theorem



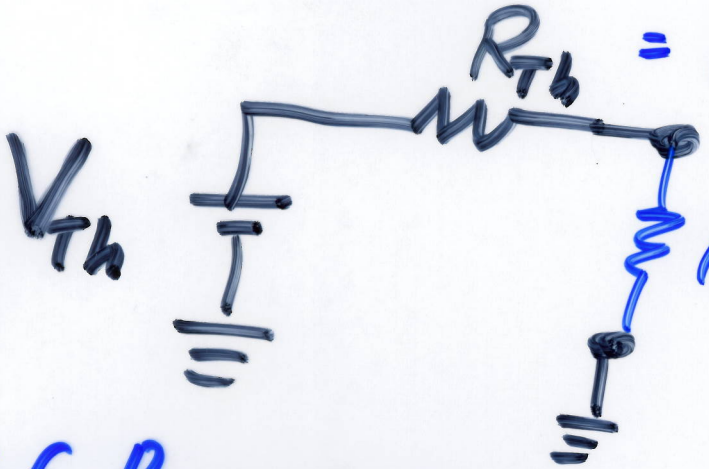
$V_{measured} = V_{out}$

Assume no output impedance

$$I = \frac{V_{in}}{R_1 + R_2}$$

$$V_{out} = IR_2 = V_{in}\left(\frac{R_2}{R_1 + R_2}\right)$$

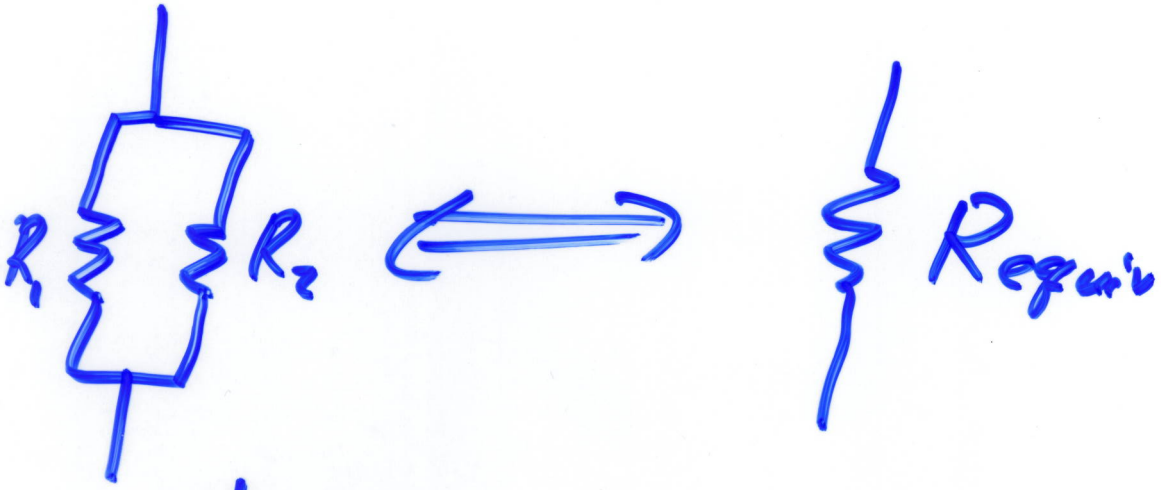
$R_{Th} = (R_1 \parallel R_2)$



Set $R_{LOAD} \to \infty \Rightarrow V_{Th} = V_{in}\left(\frac{R_2}{R_1 + R_2}\right)$

Set $R_{LOAD} = 0 \Rightarrow$ get short circuit current

$$(R_1 \parallel R_2) = \frac{R_1 R_2}{R_1 + R_2} = R_{equiv}$$



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

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e.g. $20\Omega \parallel 20\Omega = 10\Omega$