

# KVL      KCL

Voltages  
meshes

currents  
nodes

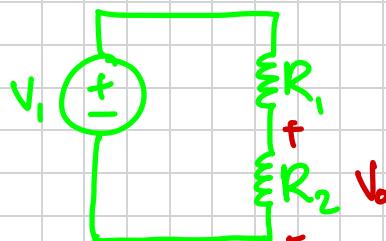
e.g. 2 components share the same current and are in series

KCL  
Voltage  
KVL

parallel

voltage ↔ current  
short ↔ open  
parallel ↔ series  
mesh ↔ node  
outer loop ↔ ground node  
across ↔ through

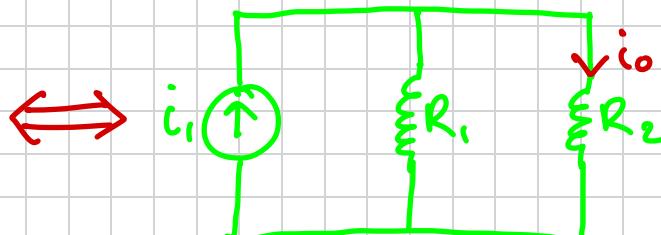
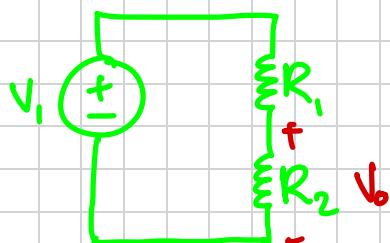
e.g.



Voltage divider  
series  
Voltage source  
output voltage ( $V_0$ )  
across  $R_2$

↔ current divider  
↔ parallel  
↔ current source  
↔ output current  
through  $R_2$

e.g.



$$V_0 = V_1 \frac{R_2}{R_1 + R_2}$$

$$i_0 = i_1 \frac{R_1}{R_1 + R_2}$$

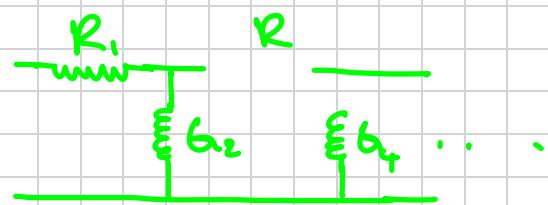
- (1)  $R_1, R_2 \uparrow$   $i \uparrow$
  - (2)  $G_1, G_2 \uparrow$   $i \downarrow$
- Series:  $R_1 + R_2 + \dots$   
Parallel:  $G_1 + G_2 + \dots$

Parallel: Complex  
Series: Complex

$$[R] = \frac{V}{A} \leftrightarrow [G] = \frac{A}{V}$$

↓  
conductance

Ladder circuit



General Methodology: Given a circuit:

1. Draw nodes inside each mesh; draw one node on the outside
2. Connect the nodes through components; replacing them w/ duals
3. Keep note of polarity by labeling voltage across each component

