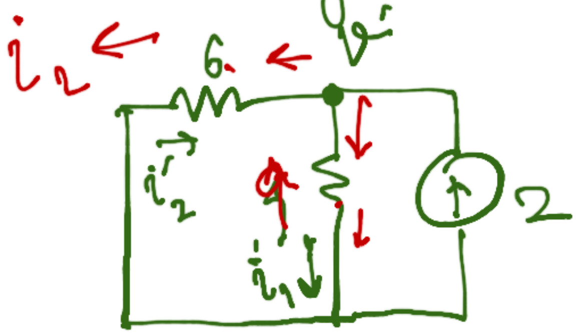
Sub 2

Keep i_{in} 2A as it is

But voltage source V_{in} will be shorted

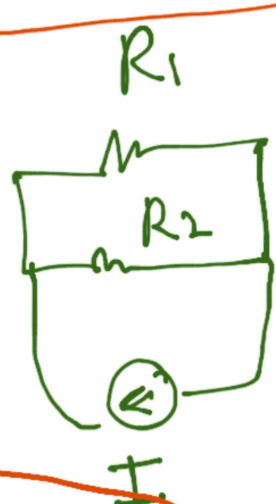


$i_1' = \frac{6}{15} \times 2 = 4/5$ A

$i_2' = \frac{6}{5}$ A ✓

$\frac{9}{6+9} \times 2$

$\frac{18}{15} = \frac{6}{5}$



$i_{R_1} = \frac{R_2}{R_1+R_2} I$

$i_{R_2} = \frac{R_1}{R_1+R_2} I$

Current Division.

$v' = i * R = (\text{Branch 1 } 6\Omega) = 6\Omega * i_2' = 6 \times \frac{6}{5}$

$= i_1' * 9\Omega = \frac{4}{5} * 9 = \frac{36}{5}$

Net

	v	i_1	i_2
Sub 1	9/5	1/5	1/5
Sub 2	36/5	4/5	-6/5
Total	$\frac{36+9}{5} = \frac{45}{5} = 9$V	1A $\left(\frac{1}{5} + \frac{4}{5}\right)$	$\frac{-6+1}{5} = -1$A

$\boxed{(3V, 2A)}$

$\boxed{\text{Ideal means = supplies } i \text{ or } V \text{ over time}}$ & for diff load

$R_s = 0$

i^2

$50\,\Omega$ (Load)

$500\,\Omega$

5V

~~?~~

Ideal

$$\underline{i} = \frac{5\,V}{50\,\Omega} = 0.1A \quad \text{(ideal)}$$

$i = 0.01A$

e^-

e^- lost energy = $\underline{\text{work done}}$

⇓

heat or light (W bulb)

i , v , energy.

↓ $\underline{\text{constant}}$ ↓ $\underline{\text{constant}}$ ↓

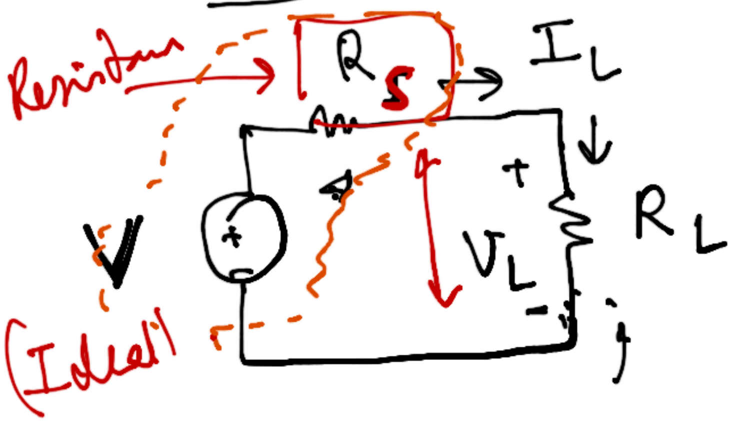
$$E = \int i^2 R \, dt$$

$(0.1)^2 \times 50$

$(.01)^2 \, 500$

Power will ↓ ✓

Source Resistance



As we include wire resistance (R_s), there is drop across it.

Suppose we increase I_L, drop across the R_s also increase.

	1 A	10 A	100 A
	R_L	R_L	R_L
Drop across R_s only	R_s	$10 R_s$	$100 R_s$
What supply voltage V_L across R_L	$V - 1.R_s$	$V - 10R_s$	$V - 100R_s$

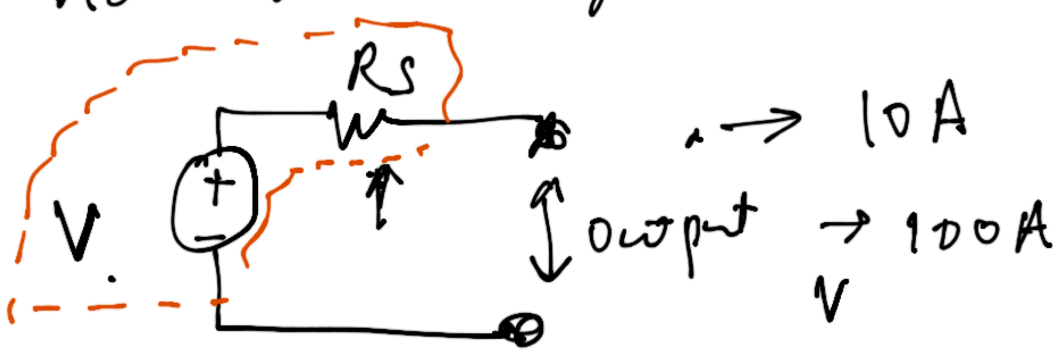
Actual voltage seen by R_L

$$\boxed{V_L = V - I_L R_s}$$

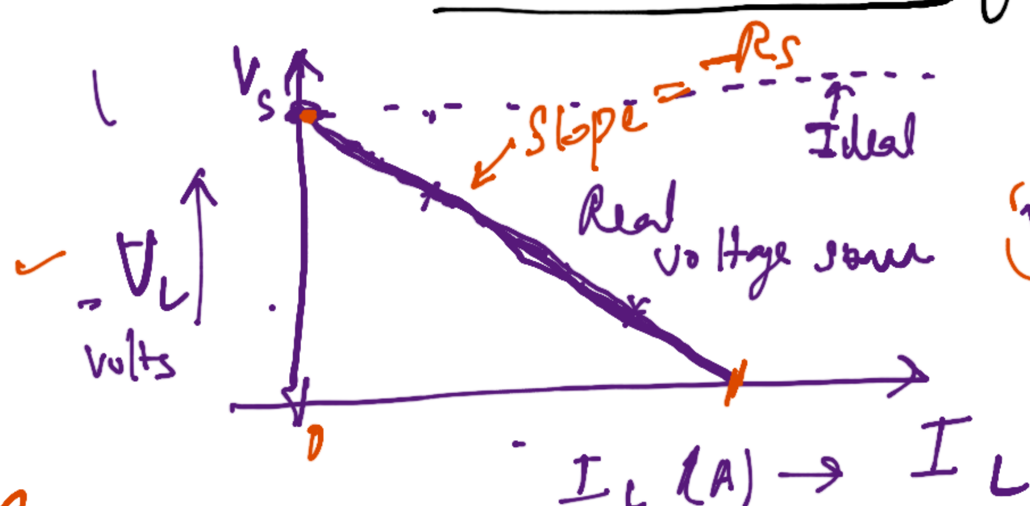
Non ideal voltage source

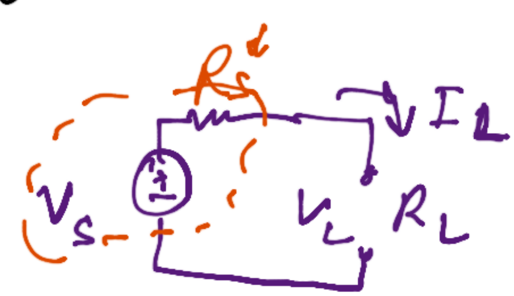
- A real (non ideal) voltage is source whose output / performance changes with load.

We non-ideal voltage source as



Non ideal battery



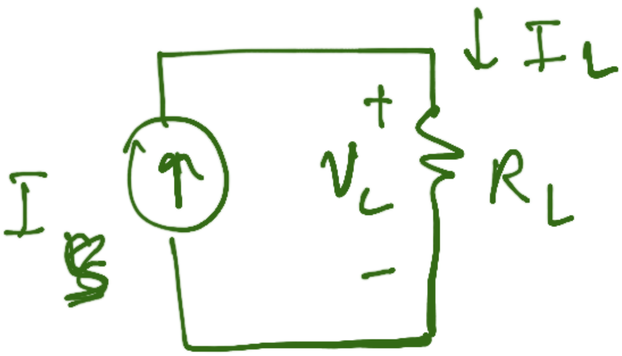


Voltage Source – Series

R_s is source resistance

Ideal current source

Supplies const. current for all loads



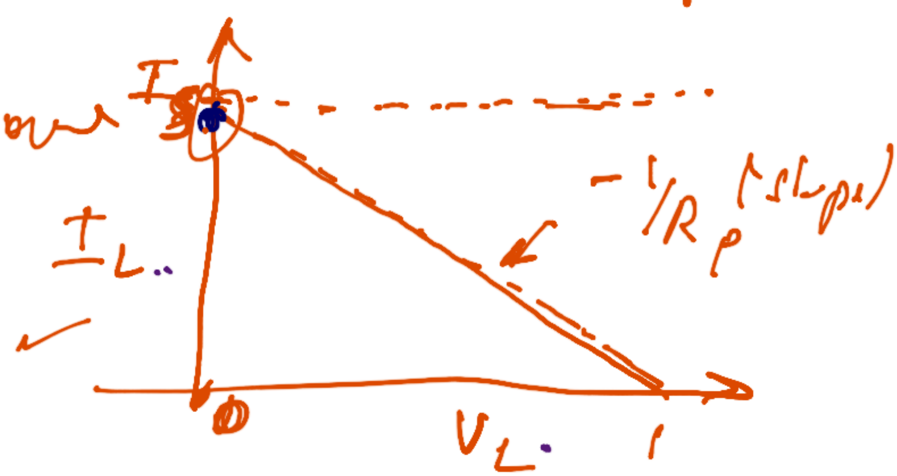
$I_L = I_s$

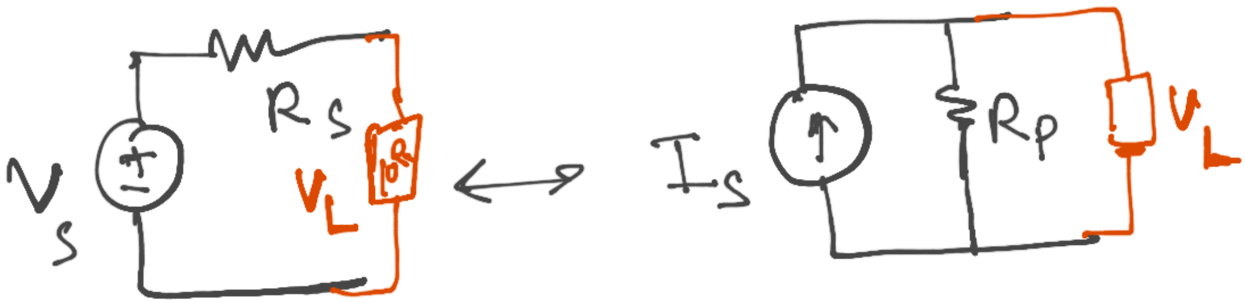
Non ideal current source.

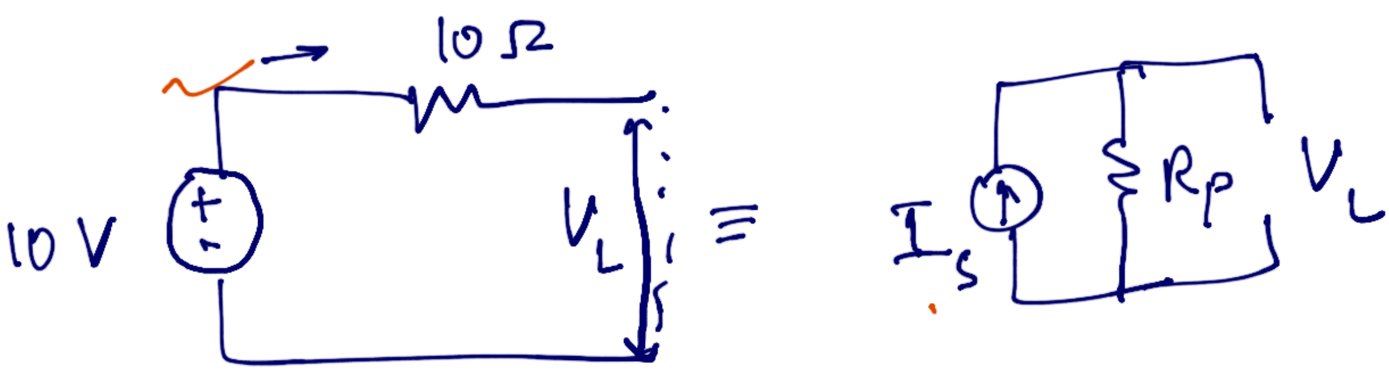
Supply current to load drops with increase in load.

$$I_L = I_s - \frac{V_L}{R_p}$$

Non ideal voltage source



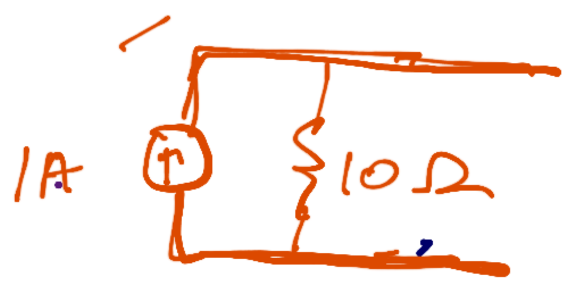




$$I_s = \frac{10V}{10\,\Omega} = 1A$$

[No load, $V_L = 0$]

$$R_p = R_s$$



Current Source

$\boxed{I_s , R_p}$ $\Longrightarrow$ Voltage Source $\left[\begin{array}{l} V_s = R_p I_s \\ R_s = R_p \end{array} \right.$

Voltage

$\boxed{V_s , R_s}$ $\Longrightarrow$ Current Source $\left\{ \begin{array}{l} I_s = \dfrac{V_s}{R_s} \\ R_p = R_s \end{array} \right.$

<u>Norton</u> & <u>Thevenin</u>