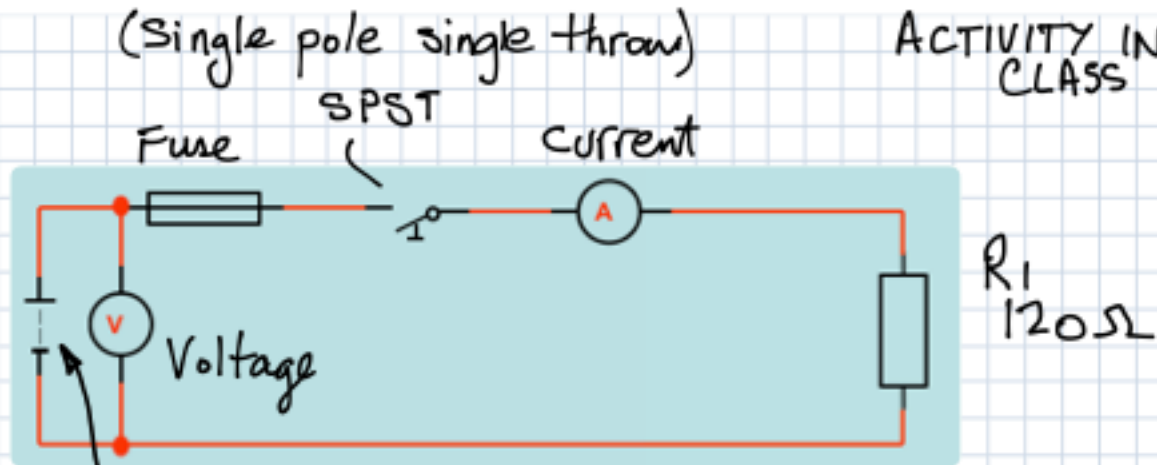


ACTIVITY IN CLASS



12 Volts

- ① Construct this circuit in circuit maker 2000
- ② Be sure to set the meters for Voltage & current.

- ③ Show your teacher when you finish.

- ④ What current was seen? 100mA $I = \frac{V}{R} = \frac{12}{120} = 0.1A$

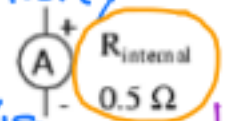
- ⑤ modify your current meter to have a high internal resistance. Note: the default for the meter is $1\mu\Omega$. Let's make it 50Ω .

- ⑥ Note the new current reading in the circuit. 70.59mA Why is the current now lower?

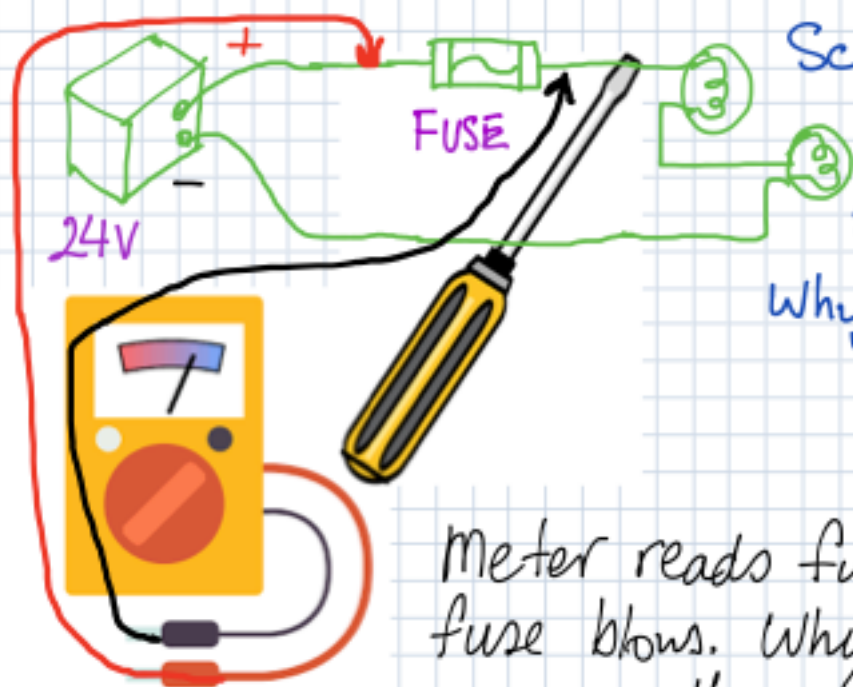
Answer: Ammeters must have low internal resistance so they do not interfere with circuit operation

$$50\Omega + 120\Omega = 170\Omega \quad I = \frac{V}{R} = \frac{12}{170} = 70.59mA$$

I have shown more about this further down the pages here. There are many poor quality meters on the market & an ammeter with $500\text{milli}\Omega$ is



BAD!



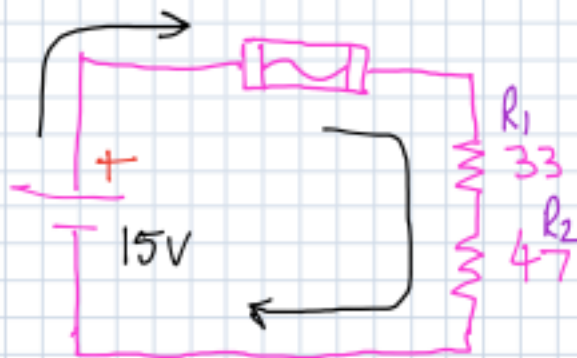
Screwdriver dropped into the circuit.

Result: Fuse Blows

Why: short circuit current (high)

Meter reads full 24V when fuse blows. Why? effectively measures the power supply voltage & will conduct via the screwdriver.

Even with the screwdriver taken away, the lamps represent a very low resistance & the voltmeter is a high resistance, so tiny current flows through the voltmeter & no appreciable voltage drop will be seen & the full circuit voltage is measured.



$$R_{TOTAL} = R_1 + R_2$$

$$= 33 + 47$$

$$= 80 \Omega$$

$$I = \frac{V}{R_T} = \frac{15}{80} = 187.5 \text{ mA}$$

$$(0.187 \text{ A})$$

$$V = I \times R \quad \therefore V_{R_1} = 0.187 \times 33 = 6.19 \text{ V}$$

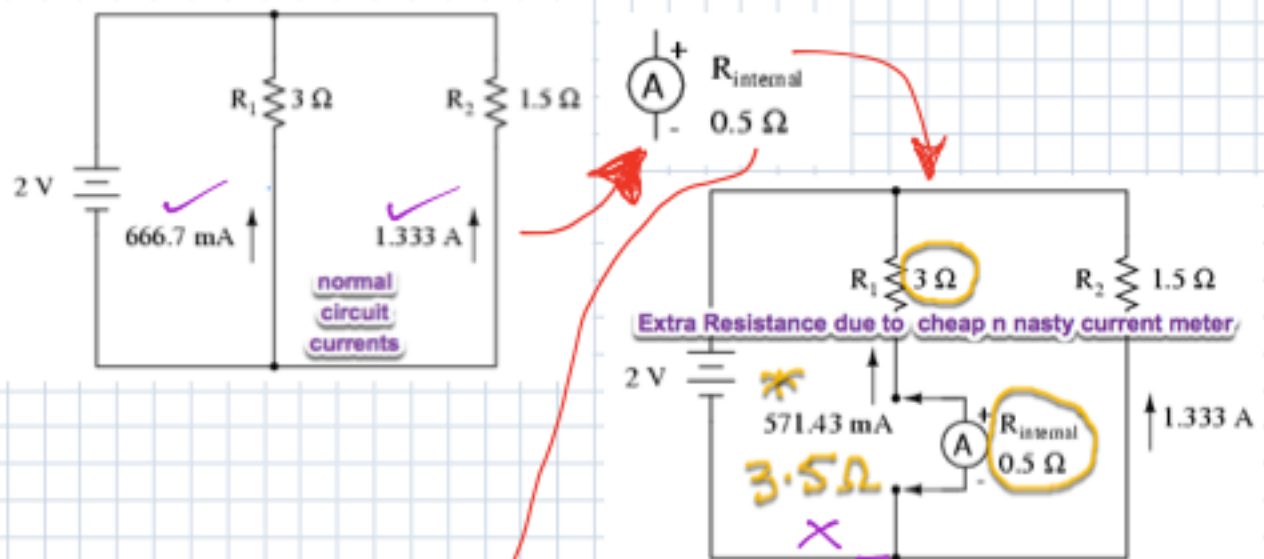
$$V_{R_2} = 0.187 \times 47 = 8.81 \text{ V}$$

Question Do the individual voltage drops add to equal the supply voltage?

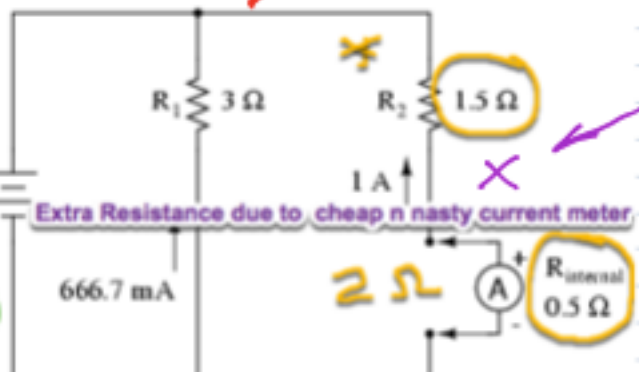
$$\begin{array}{r} 6.19 + \\ 8.81 \\ \hline 15.0 \text{ V} \end{array}$$

more about ammeter R_{int}

<https://www.allaboutcircuits.com/textbook/direct-current/chpt-8/ammeter-impact-measured-circuit/>



This can be a big problem in industry where



wrong

exact measurements are important!

Never use cheapo ammeters & VOLTMETERS!