Parallel Circuit Practice Problems

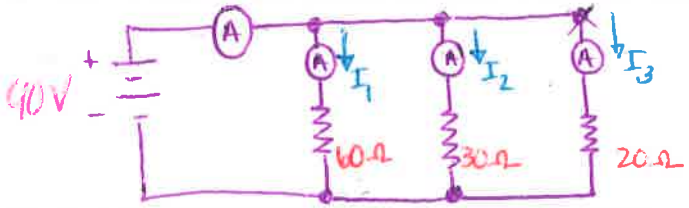
Remember.... 1) **Equivalent Resistance** $\frac{1}{R_{total}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$

2) **Current is Added** ($I_{total} = I_1 + I_2 + I_3$)

3) **Potential Difference (Voltage) is the Same**

1. Three resistors, 60.0-Ω, 30.0-Ω, and 20.0-Ω are connected in parallel across a 90.0-V battery.

a) Draw a diagram and include an ammeter after the battery and before each resistor.



b) Find the current through each branch of the circuit.

I_1: $90\,V = I \cdot 60\,\Omega$ $\quad I_1 = 1.5\,A$

I_2: $90\,V = I \cdot 30\,\Omega$ $\quad I_2 = 3\,A$

I_3: $90\,V = I \cdot 20\,\Omega$ $\quad I_3 = 4.5\,A$

} Total current = 9 A

c) Find the equivalent resistance of the circuit.

$$\frac{1}{R_T} = \frac{1}{60} + \frac{1}{30} + \frac{1}{20}$$

$$= \frac{1}{60} + \frac{2}{60} + \frac{3}{60}$$

$$\frac{1}{R_T} = \frac{6}{60} \rightarrow R_T = \frac{60}{6} = 10\,\Omega$$

Always smaller than smallest resistor

d) Find the current through the battery.

$V = IR$

$90\,V = I \cdot 10$

$I = 9\,A$

Power

$P_1 = 135\,W$

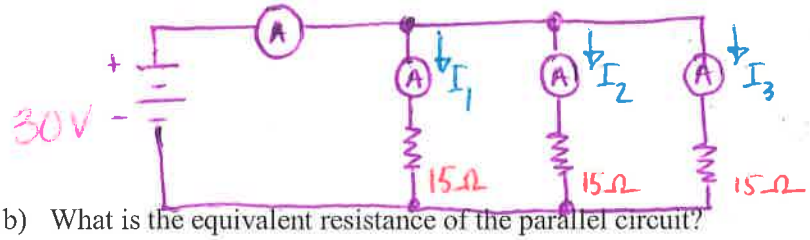
$P_2 = 270\,W$

$P_3 = 405\,W$

$P_T = 810\,W$

2. Three 15-Ω resistors are connected in parallel and placed across a 30-V battery.

a) Draw a diagram and include an ammeter after the battery and before each resistor.



b) What is the equivalent resistance of the parallel circuit?

$$\frac{1}{R_T} = \frac{1}{15} + \frac{1}{15} + \frac{1}{15} = \frac{3}{15} \rightarrow R_T = \frac{15}{3} = 5\,\Omega$$

Always smaller than smallest resistor

c) What is the current through the entire circuit?

$V = IR$

$30\,V = I \cdot 5$

$I = 6\,A$

Power

$P_1 = 60\,W$

$P_2 = 60\,W$

$P_3 = 60\,W$

$P_T = 180\,W$

d) What is the current through each branch of the circuit?

divided by 3 b/c all same resistors

$I_1 = I_2 = I_3 = 2\,A$

$V = IR$

$30 = I \cdot 15$