Power

- When current flows in an electrical circuit it does work. The rate at which work is done is called power. Power is measured in units called watts (W) and is represented by the letter P in equations.
- The power delivered to, or absorbed by, a component in an electrical circuit is directly proportional to the voltage applied to and the current drawn by that component.
- Stated Mathematically: $P = V I$

Where : P is the power; in Watts
V is the potential difference; in Volts
I is the current; in Amperes

Power Equation – Other Forms

$$P = V I$$

$$P = I^2 R \qquad P = V I = (I R) I = I^2 R \qquad \{ \text{subs Ohm's Law} : V = IR \}$$

$$P = \frac{V^2}{R} \qquad P = V I = V\left(\frac{V}{R}\right) = \frac{V^2}{R} \qquad \left\{ \text{subs Ohm's Law} : I = \frac{V}{R} \right\}$$

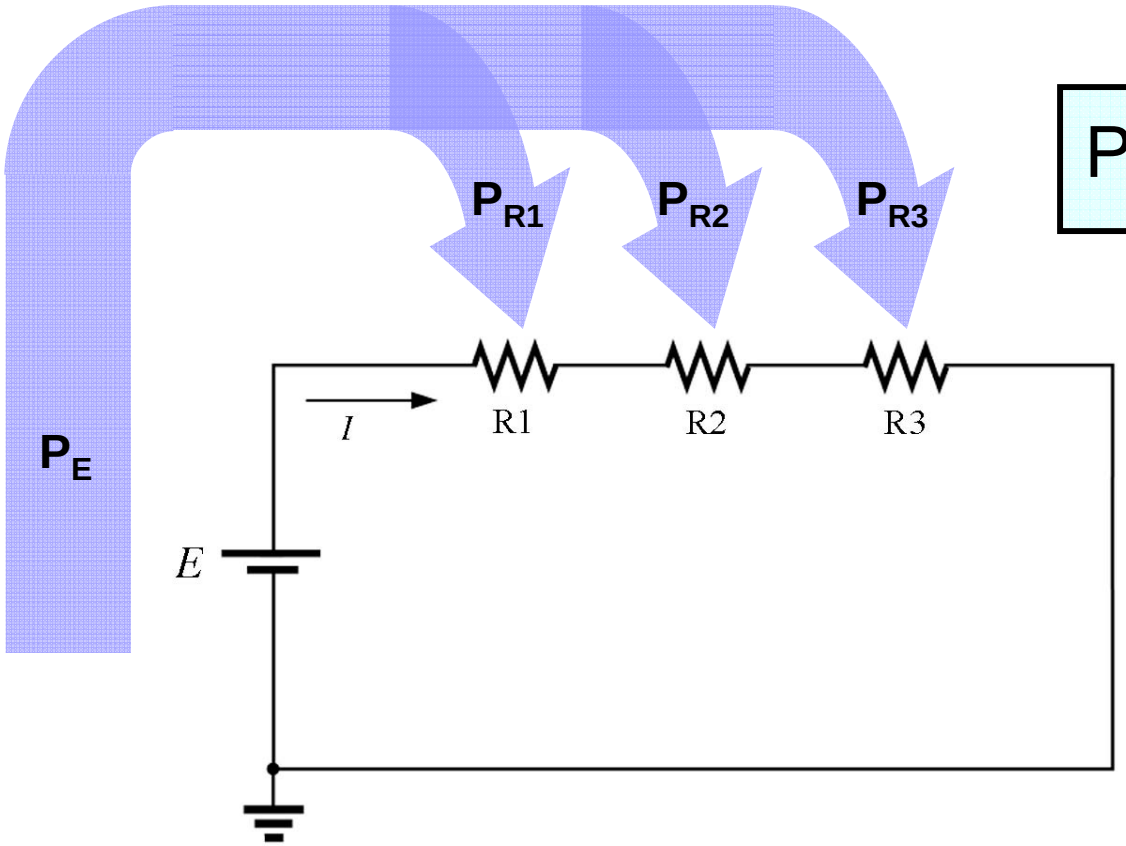
Example – Power

How much power does a portable black-and-white television dissipate if it draws 875 mA from a 12 volt battery?

$$P = \mathrm{V\ I} = 12\ \mathrm{V\ x\ 875\ mA} = 10.5\ \mathrm{W}$$

Power in a Series Circuit

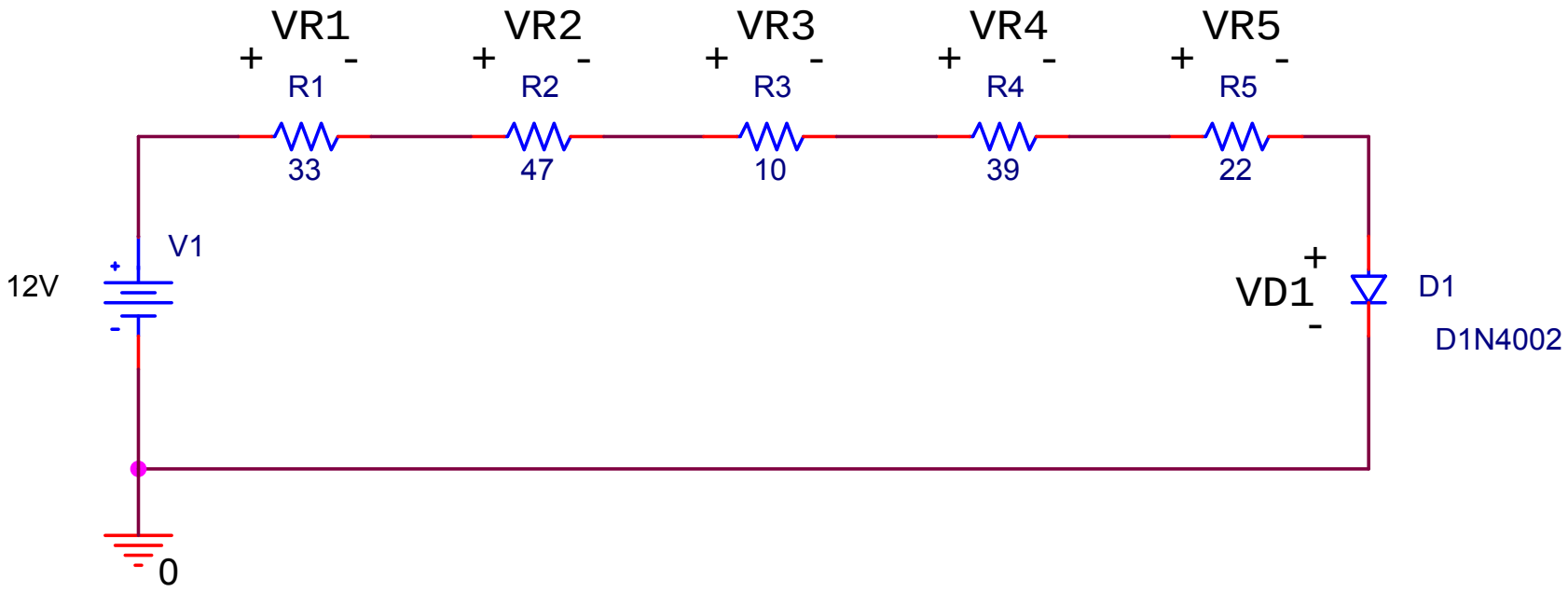
The total power delivered by the voltage source must equal the total power absorbed by the resistive elements.



$$P_E = P_{R1} + P_{R2} + P_{R3}$$

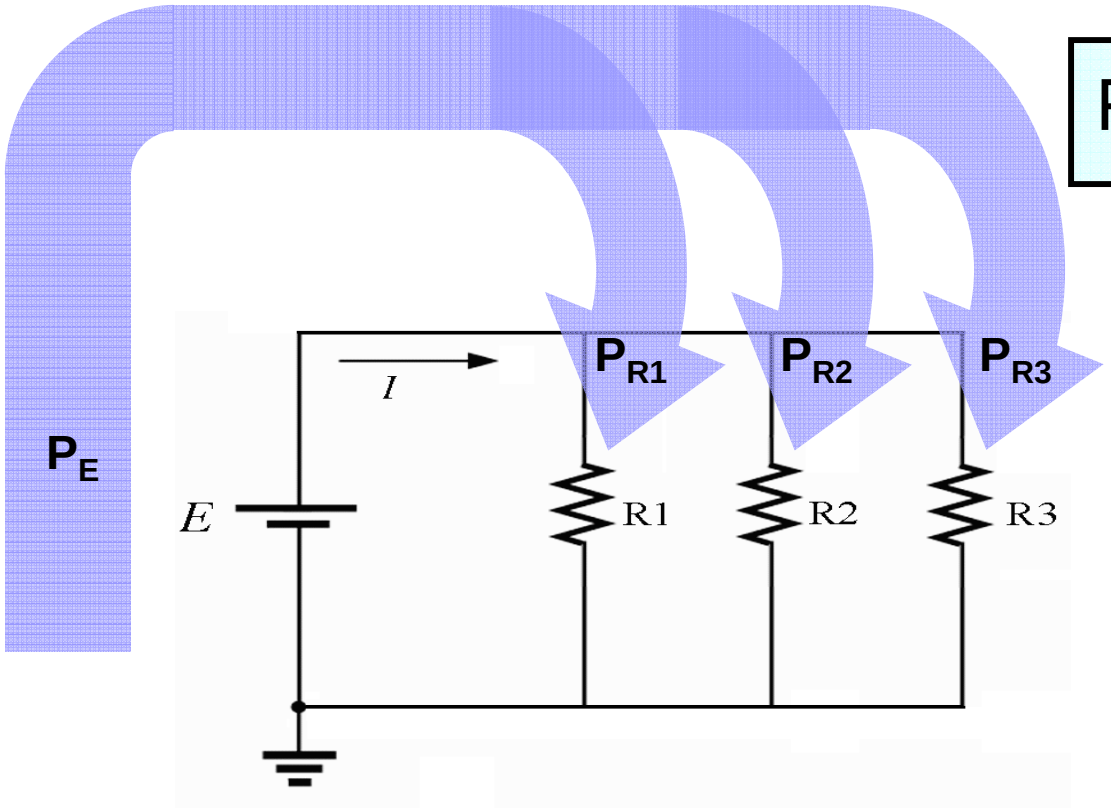
Breakout Exercise #1

- Assuming V_{D1} = 0.7V, How much power is dissipated by R3? By R5? R1 through R5 combined?
- Assuming V_{D1} = 0.7V, How much power is supplied by the source, V1?



Power in a Parallel Circuit

The total power delivered by the voltage source must equal the total power absorbed by the resistive elements.



$$P_E = P_{R1} + P_{R2} + P_{R3}$$

Breakout Exercise #2

- How much power is dissipated by R2? R4?
- How much power is supplied by the source, V1?
- How much power is dissipated by the combination of R1 through R5?