

Parallel Circuits

Mr. Sudbury

Parallel Circuit

- ▶ Has multiple paths for current to flow.
- ▶ If 1 bulb burns out (or is turned off), the other bulbs stay lit.

Which Switch?

- ▶ Which switch turns off all lights?
- ▶ Which switch turns off Light # 1 only?
- ▶ Which switch turns off Light # 2 only?
- ▶ Can you turn off light #3 and leave the others on?

Parallel Circuit Rules

1. Each device connects to the same two points, therefore **the voltage is the same throughout the circuit.** (No voltage drops)
2. **The total current in the circuit divides among the branches and comes back together.** (Total current = sum of current in branches.)
3. More branches = lower R_T
4. R_T in parallel $\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} \dots$

Solving Parallel Circuits

Parallel Circuit Practice

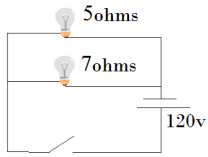
$I = \frac{V}{R}$ $V = IR$ $R = \frac{V}{I}$

- ▶ What is the R_T ?
- ▶ What is the I_T ?
- ▶ What is the current through each branch?

Parallel Circuit Practice

$I = \frac{V}{R}$ $V = IR$ $R = \frac{V}{I}$

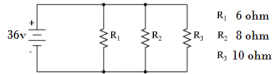
- ▶ What is the R_T ?
- ▶ What is the I_T ?
- ▶ What is the current through each branch?



Parallel Circuit

$I = \frac{V}{R}$ $V = IR$ $R = \frac{V}{I}$

- ▶ What is the R_T ?
- ▶ What is the I_T ?
- ▶ What is the Voltage through each branch?
- ▶ What is the I through each branch?

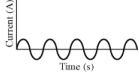


Series vs Parallel

<p>▶ Series</p> <ul style="list-style-type: none"> ◦ Constant current ◦ Voltage drops. ◦ Resistance: $R_T = R_1 + R_2 + R_3 + \dots$ 	<p>vs</p>	<p>▶ Parallel</p> <ul style="list-style-type: none"> ◦ Current splits in branches. ◦ Constant voltage. ◦ Resistance: $\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} \dots$
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Household Circuits

- ▶ Your house is wired as a giant parallel circuit.
- ▶ The circuit breaker acts as a giant safety switch. (usually 13–15 amps.)
- ▶ Your plugs are 120–v.
- ▶ You house gets alternating current.
 - Current is produced so that it switches direction 60 times per second (60 Hertz)
- ▶ Batteries are direct current



The End

- ▶ Parallel Circuits
 - Multiple paths for current to flow.
 - Voltage is constant throughout the circuit.
 - Current splits through each branch.
 - Total resistance is the sum of the inverse of the resistances.

