Series vs Parallel Circuit

**Complex Circuits**

**Objectives**
- Identify series and parallel circuits.
- Calculate equivalent resistance, current and voltage for series and parallel circuits.

**Series Circuit**
- Single pathway
- Light is dimmer
- When one device fails, all fail!

**Series Circuit**
- 3 Ω 3 Ω
- 6 V
- Resistance: \( R_s = R_1 + R_2 \ldots \)
- Current is the same
- Voltage is shared

**Series Circuit Calculations**
- What is the total resistance? \( R_T = R_1 + R_2 \)
- What is the total current? Each bulb? \( I = \frac{V}{R} = \frac{6V}{3Ω} = 2A \)
- What is the total power? Each bulb? \( P = IV = 2A \times 6V = 12W \)

**parallel Circuit**
- Multiple pathways
- Household circuits
- Bulbs are brighter
- One bulb burns out, others stay on!

**Parallel Circuit**
- \( R_p \) decreases as the number of branches increases
- \( \frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} \ldots \)
- Current is shared
- Voltage same across each device
Series vs Parallel Circuit

**Parallel Circuit Calculations**

What is the total resistance? 
\[ R_{\text{total}} = \frac{1}{\frac{1}{R_1} + \frac{1}{R_2}} = \frac{1}{\frac{1}{3} + \frac{1}{3}} = \frac{3}{2} \Omega \]

What is the total current? Each bulb?
\[ I = \frac{V}{R_1} = \frac{6}{3} = 2 A \]

What is the total power? Each bulb?
\[ P = IV = 2A \cdot 6V = 12W \]

**Comparing Series & Parallel Circuits**

<table>
<thead>
<tr>
<th>If you add in a resistor in:</th>
<th>Series</th>
<th>Parallel</th>
</tr>
</thead>
<tbody>
<tr>
<td>total resistance</td>
<td>increases</td>
<td>decreases</td>
</tr>
<tr>
<td>Current</td>
<td>same</td>
<td>shared</td>
</tr>
<tr>
<td>Voltage</td>
<td>shared</td>
<td>same</td>
</tr>
</tbody>
</table>

**Circuit Breaker Box**

Emergency switch to protect against too much current flowing at once.

Fuses vs. Circuit Breakers

**Assignments . . .**

- Begin Chapter 35 Homework #1 - 4