

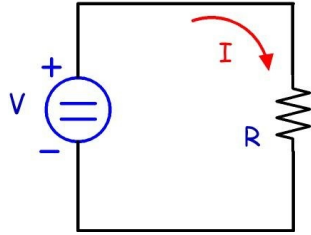
# Series vs Parallel Circuit

## Complex Circuits

### Objectives

Identify series and parallel circuits.

Calculate equivalent resistance, current and voltage for series and parallel circuits.

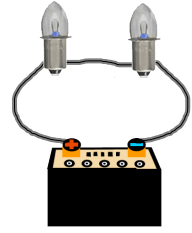


## Series Circuit

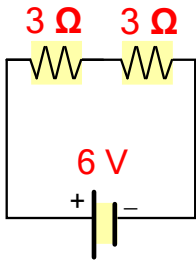
Single pathway

Light is dimmer

When one device fails, all fail!



## Series Circuit

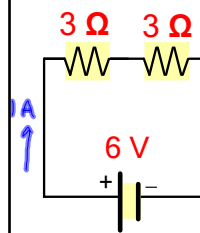


Resistance *Overall (R) ↑*  
 $R_s = R_1 + R_2 \dots$

Current is the same

Voltage is shared

## Series Circuit Calculations



What is the total  $R_s$ ?

$$R_T = R_1 + R_2 \quad | \quad 3\Omega + 3\Omega = 6\Omega$$

What is the total current? Each bulb?

$$I = \frac{V}{R} \quad \frac{6V}{6\Omega} = 1A \quad \frac{3V}{3\Omega} = 1A$$

What is the total power? Each bulb?

$$P = I \cdot V$$

$$P = 1A \cdot 6V = 6W \quad 1A \cdot 3V = 3W$$

## Parallel Circuit

Multiple pathways

Household circuits

Bulbs are brighter

One bulb burns out, others stay on!



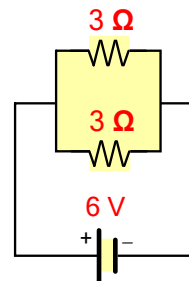
## Parallel Circuit

$R_p$  decreases as the number of branches increases

$$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} \dots$$

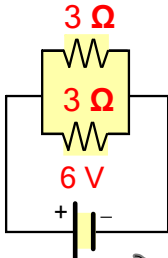
Current is shared

Voltage same across each device



# Series vs Parallel Circuit

### Parallel Circuit Calculations



What is the total  $R_p$ ?  
 $\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} \quad \left| \quad \frac{1}{3} + \frac{1}{3} = \frac{2}{3} \quad \text{inv} \quad \right| \quad R_p = 1.5\Omega$

What is the total current? Each bulb?  
 $I = \frac{V}{R} \quad \frac{6V}{1.5\Omega} = 4A \quad \quad \frac{6V}{3\Omega} = 2A$


What is the total power? Each bulb?  
 $P = I \cdot V \quad \quad 2A \cdot 6V = 12W$   
 $24W = 4A \cdot 6V$

### Comparing Series & Parallel Circuits


If you add in a resistor in:	Series	Parallel
total resistance	increases	decreases
Current	same	shared
Voltage	shared	same

### Circuit Breaker Box

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




Fuses vs. Circuit Breakers



120V - outlets in home  
 240V - big 3 prong plug-ins  
 ex. oven, frig.

### Assignments . . .



- Begin Chapter 35 Homework #1 - 4

