What are Series and Parallel Circuits?

Worksheet

In series, resistances add directly (R = R1+R2+); in parallel, their reciprocals add (1/R = 1/R1+1/R2+), which always lowers the total resistance below the smallest branch.

$$V_{total}=V_1+V_2; I_{total}=I_1+I_2$$

Questions

1. Two 5 resistors are connected in series. What is the total resistance?

A) 2.5
B) 10
C) 5
D) 25

2. Two 5 resistors are connected in parallel. What is the total resistance?

A) 10
B) 5
C) 2.5
D) 0.4

3. In a series circuit, what stays the same through every component?

A) Voltage
B) Resistance
C) Current
D) Power

4. Why do household outlets use parallel wiring instead of series?

A) It uses less wire
B) Each device gets full voltage and works independently
C) It reduces total current
D) It's required by law only

5. Two resistors, 4 and 6 , are connected in series. Find the total resistance.

6. The same two resistors, 4 and 6 , are connected in parallel instead. Find the total resistance.

7. Three identical 2 bulbs are wired in series across a 12 V battery. Find the current.

8. Define: What happens to total resistance in a series circuit?

9. Define: What happens to total resistance in a parallel circuit?

10. Define: Is current the same everywhere in a series circuit?

Answer Key

1. B) 10 - In series, R = R1+R2 = 5+5 = 10 .

2. C) 2.5 - 1/R = 1/5+1/5 = 2/5 R = 2.5 .

3. C) Current - There is only one path, so current is constant throughout.

4. B) Each device gets full voltage and works independently - Parallel wiring gives every device the same voltage, so one device failing doesn't cut power to others.

5. R = R1 + R2 R = 4 + 6 R = 10

6. 1/R = 1/R1 + 1/R2 1/R = 1/4 + 1/6 = 3/12 + 2/12 = 5/12 R = 12/5 = 2.4

7. R_total = 2+2+2 = 6 I = V/R = 12/6 I = 2 A

8. It increases: resistances simply add up, R = R1+R2+

9. It decreases: 1/R = 1/R1+1/R2+, always less than the smallest resistor.

10. Yes - there's only one path, so current is identical through every component.