Name: _____

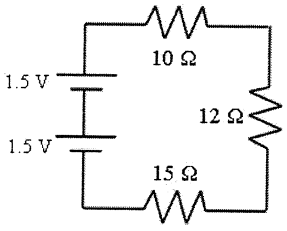
Period: _____

Total Resistance

Resistors in Series

$$R_{total} = R_1 + R_2 + R_3 \ldots$$

As you add resistors in series, you increase resistance. Simply add the amounts together.

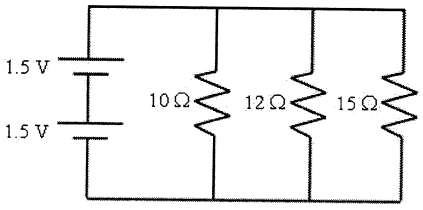


***Example**: Calculate the total resistance of this circuit.*

$R_T = R_1 + R_2 + R_3 \ldots$
$R_T = 10 + 12 + 15$
$R_T = 37\Omega$

Resistors in Parallel

$$\frac{1}{R_{total}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} \ldots$$



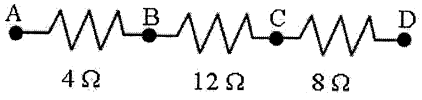
***Example**: Calculate the total resistance of this circuit.*

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

$$\frac{1}{R_T} = \frac{1}{10} + \frac{1}{12} + \frac{1}{15} = .1 + .083 + .067$$

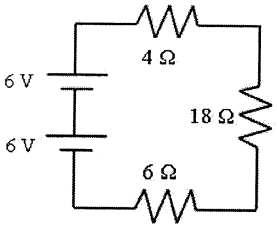
$$\frac{1}{R_T} = .25 \qquad R_T = \frac{1}{.25} = 4\Omega$$

As you add resistors in series, you open more paths for the electricity to flow, increasing total current, and decreasing total resistance. For resistors in parallel, the total resistance is always less than the smallest resistor.



1. What is R_{total} from A to C? 16Ω
2. What is R_{total} from B to D? 20Ω
3. What is R_{total} from A to D? 24Ω
4. As these resistors are added, is resistance increasing or decreasing?
5. As these resistors are added, does current increase or decrease?

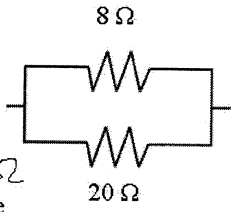
6. Calculate the total resistance.
28Ω



7. Calculate total voltage.
12V

8. Calculate total current.
$I = \frac{V}{R} = \frac{12}{28}$

9. Calculate the total resistance.

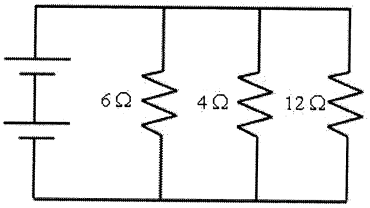


$\frac{1}{8} + \frac{1}{20} = \frac{1}{R_T}$
$.175 = \frac{1}{R_T}$ $R_T = \frac{1}{.175} = 5.7\Omega$

10. How does the total resistance compare with the individual resistors? small

11. Why? more I (paths) less R

12. The total resistance must be less than what? 4Ω

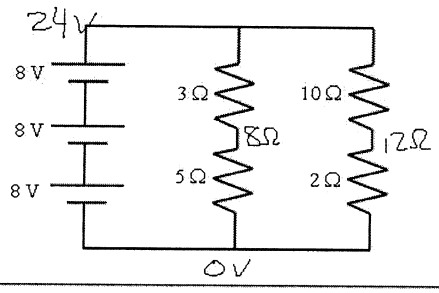


13. Which branch will have the most current?
4Ω

14. Calculate the total resistance.
$\frac{1}{6} + \frac{1}{4} + \frac{1}{12} = \frac{1}{R_T}$ $R_T = 2\Omega$
$\frac{2}{12} + \frac{3}{12} + \frac{1}{12} = \frac{6}{12} = \frac{1}{2} = \frac{1}{R_T}$

15. Calculate and label the total resistance for each pair of resistors in series.

16. Calculate the total resistance for the two parallel branches.
$\frac{1}{8} + \frac{1}{12} = \frac{1}{R_T}$ $R_T = 4.8\Omega$



17. Calculate and label total voltage.

18. Using R_T and V_T, calculate the total current in the circuit.
$I = \frac{V}{R} = \frac{24}{4.8} = 5A$