## Resistors in Series

Circuit elements in series have the same current flowing through them. However, elements in series may have differing voltages across them.
The total resistance of series connected resistors is the sum of their values. For example, in the circuit below, the equivalent resistance of the series connected resistors is simply $1+2+5+$ $10=18$ ohms:


Thus, in this circuit, the four series connected resistors can be replaced by a since 18 ohm resistor. We can prove this by doing a KVL analysis of the left hand circuit:

$$
\begin{aligned}
& -10+1 \mathrm{I}+2 \mathrm{I}+5 \mathrm{I}+10 \mathrm{I}=0 \\
& -10+\mathrm{I}(1+2+5+10)=0 \\
& 18 \mathrm{I}=10 \\
& \mathrm{I}=18 / 10
\end{aligned}
$$

Since we know in general that $\mathrm{I}=\mathrm{V} / \mathrm{R}$, the "V" is obviously 10 and the " R " is 18 .

