|  |  |  |  |
| --- | --- | --- | --- |
| Worked Example – Series Circuit  Find the voltage running through each resistor for the series circuit on the right. The resistance values are . | | **A picture containing object, clock  Description generated with very high confidence** | |
| * We have three resistors connected in series, and according to *Kirchoff’s Current Law*, the current passing through each resistor is the same. Thus, if we know the total current is running through the circuit, we know the current running through each resistor. | | | |
| * We start by combining the three resistors connected in series into one equivalent resistor | | A picture containing object, clock  Description generated with very high confidence | |
|  | |
| * The total current running through the whole circuit is: | |  | |
| * Thus, the voltage across each resistor is: | | | |
|  |  | |  |
| * To check if we calculated the voltage correctly, make sure the sum of the voltages across each resistor is equal to (*Kirchoff’s Voltage Law*). | |  | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Worked Example – Parallel Circuit  Find the current running through each resistor for the parallel circuit on the right. The resistance values are . | | |  | |
| * The three resistors are connected in parallel and the current entering and exiting the node of the resistors is the same. The voltage across each resistor is the same. | | | | |
| * We combine the three resistors into on equivalent resistor | | | A picture containing object  Description generated with very high confidence | |
|  |  | |
| * The total current running through the whole circuit is: | | |  | |
| * The voltage running through each resistor is and thus the current through each resistor is: | | | | |
|  | |  | |  |
| * Check that the sum of the currents is equal to the total current: * Observe that adding resistances (e.g. , 2 and ) in parallel decreases the total resistance ( | | |  | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Worked Example – Combined Series and Parallel Circuit  Find the voltage and current running through each resistor for the series-parallel circuit on the right. The resistance values are . | | | **A picture containing object, clock  Description generated with high confidence** | |
| * For this circuit, the current flows through in series and then splits on a node to and in parallel. Much like solving the series and parallel only circuit we want to reduce the circuit into a one resistor circuit. | | | | |
| * We first combine the resistors connected in parallel and then combine the resistors in series. Pictorially we perform the transformation below. | | | | |
| A picture containing clock  Description generated with high confidence | | | | |
| * Below is the working out of combining the resistors as shown above | | | | |
|  | |  | |  |
| * The total current is: | | |  | |
| * Once we have the total current, we work our way back and expand the circuit to get the current and voltages | | | | |
| * The current is constant for resistors connected in series. Thus flows through both and .   A picture containing object  Description generated with high confidence | | | * The voltage across and is: | |
|  | |
| * Check sum of voltage is equal to : | |
|  | |
| * Now that we have the voltage running through we can calculate the current through and . | | | | |
|  |  | |  | |
| * Check that the sum of the currents is equal to | | |
|  | | |
| * Summary of the current and voltages: | | | | |
| |  |  |  |  | | --- | --- | --- | --- | | **Voltage (V)** | | **Current (A)** | | |  | 3.70 |  | 3.70 | |  | 5.30 |  | 2.65 | |  | 5.30 |  | 1.05 | |  | 9.00 |  | 3.70 | | | | | |