|  |  |
| --- | --- |
| Worked Example – Series CircuitFind 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 CircuitFind 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 CircuitFind 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 |

 |