# Voltages in Parallel

**You can only place voltage sources in parallel if they have the same voltage!**

The primary reason or advantage for combining voltage sources in parallel is to increase the current output above that of any single source. When in parallel, the total current produced by the combined source is equal to the sum of currents of each individual source, all while maintaining the original voltage.

Example

The following illustration shows a battery used as a power source to drive a starter coil. The battery has the capacity to supply up to 60 cranking amps to the load (starter coil), as shown on the amperage meter.
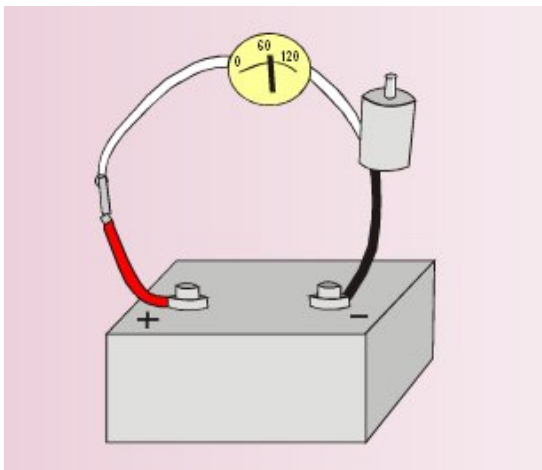

This figure shows a second battery connected in parallel with the first. Because the 12-V batteries are in parallel, 12-V are applied to the starter coil, which has a 12-V rating. The advantage of using two batteries is that **twice** the amperage can be supplied to the starter than is possible from one battery.
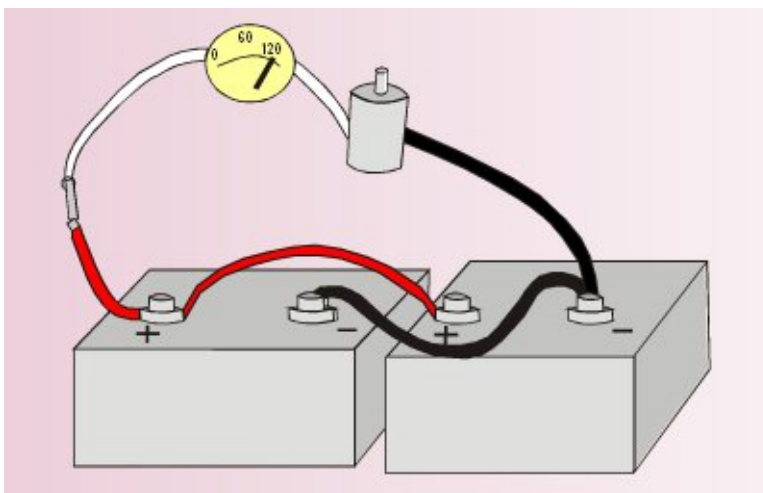
Example

Determine the current i_1, i_2 and i_3 for the following circuit.
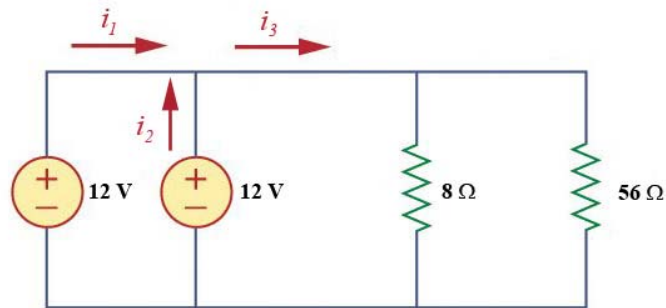
The resisters can be reduced to a single equivalent resistor since they are in parallel.

$R_{eq} = 7\ \Omega$

Since both voltage sources are identical, the voltage across R_{eq} is 12V. Using Ohm's law, the current (i_3) through R_{eq} is:

$12\ V = i_3\ (7\ \Omega)$

   $i_3 = 1.714\ A$

Since both sources are in parallel and are at the same voltage, each battery contributes exactly half of the i_3 current. Therefore:

   $i_1 = i_2 = i_3/2 = 0.857\ A$

Example

Jumping a dead car battery

When jumping a car battery, the good battery **MUST** be placed in *parallel* (+ to + and – to –) with the bad battery so that the good battery takes the place of the dead one. Otherwise, connecting the + terminal on the good battery to the – on the bad battery will quickly run down the good battery and cause it to get super hot and possibly explode.