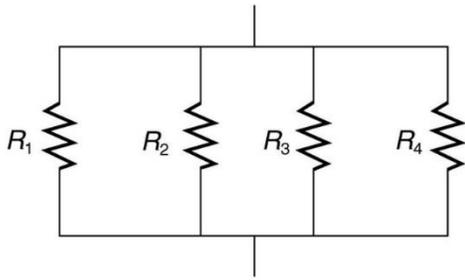


# Parallel Resistances



$R_{total} = \frac{1}{r_1} + \frac{1}{r_2} + \frac{1}{r_3} + \frac{1}{r_4}$  This equation, the one usually used to calculate parallel resistances, works just fine but it is tedious and prone to error. A much simpler method is  $R_{total} = \frac{\text{product}}{\text{sum}}$

There are a few rules to using this method which I will outline here.

**Rule 1** - For 2 resistors of different values. This is straightforward, say R1 is 75 ohms and R2 is 50 ohms... this means  $R_{total} = \frac{75 \times 50}{75 + 50}$  or  $\frac{3750}{125}$  or 30 ohms.

**Rule 2** – For 2 resistors of the same values. This is even easier, if the values are identical then simply take one half of the value and that is the total resistance. Say R1 is 75 ohms and R2 is 75 ohms.

$R_{total} = \frac{75 \times 75}{75 + 75}$  or  $\frac{5625}{150}$  or 37.5. This is exactly one half of 75 ohms. This works for ANY other value.

**Rule 3** – For multiple resistors of the same value. Take the value of one resistor and divided it by the number of resistors. On our drawing above let's say that there are 4 resistors and they are 100 ohms each. This is simply Rule 2 done 3 times. Two pair of 100 ohm resistors in parallel. This works out to an equivalent circuit of 2-50 ohm resistors in parallel then do it again for the other pair.. Now let's do it again with the 2-50 ohm resistors and we end up with 25 ohms. So, at the beginning, if we had taken our 100 ohm resistor and divided it by 4, the number of resistors, we would have ended up with 25 ohms.

**Rule 4** – The final answer is always less than the smallest resistor. On our drawing above, let's say there were three 100 ohm resistors and one 30 ohms resistors. From our rules above it's easy to visualize this as 33.3 ohms (Rule 3) in parallel with 30 ohms (Rule 1). The answer is almost 15.8 ohms. If your final answer is NOT less than the smallest value resistor in the parallel circuit, you had better recalculate it.

## (B)

B-005-005-008 If ten resistors of equal value were wired in parallel, the total resistance would be:

- A 10 + R
- B R / 10
- C 10 / R
- D 10 x R

## (B)

B-005-005-009 The total resistance of four 68 ohm resistors wired in parallel is:

- A 272 ohms
- B 17 ohms
- C 12 ohms
- D 34 ohms