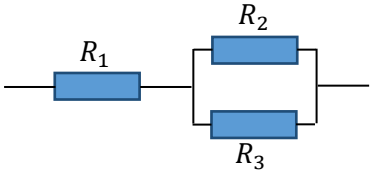
Answer Question #65737, Physics – Electric Circuits

We have a ton of 47 Ω resistors in the lab. I need a resistor that is closer to 70 Ω. Come up with some way to wire multiple 47 Ω resistors (using series and parallel rules) to produce an equivalent resistance of 70±3 Ω (your equivalent resistance can be anything between 67 and 73 Ω). You can use as many resistors as you would like.

Solution.

Consider the scheme of the resistances



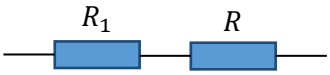
Find the total resistance of the circuit. According to the condition of the problem

$$R_1 = R_2 = R_3 = 47\Omega$$

Resistors R1 and R2 connected in parallel. Therefore their equivalent resistance R we find using the formula

$$\frac{1}{R} = \frac{1}{R_2} + \frac{1}{R_3} \rightarrow R = \frac{R_2 \cdot R_3}{R_2 + R_3} = \frac{47 \cdot 47}{47 + 47} = 23.5\Omega$$

The scheme of connection of resistors you can imagine as



These resistors are connected in series and therefore the equivalent resistance using the formula

$$R' = R_1 + R = 47 + 23.5 = 70.5\Omega$$

70.5Ω equivalent resistance between 67 and 73 Ω

Answer. 70.5Ω