A SELF EVIDENT SOLUTION TO THE RESISTOR CUBE QUESTION USING THE BANDSAW METHOD.

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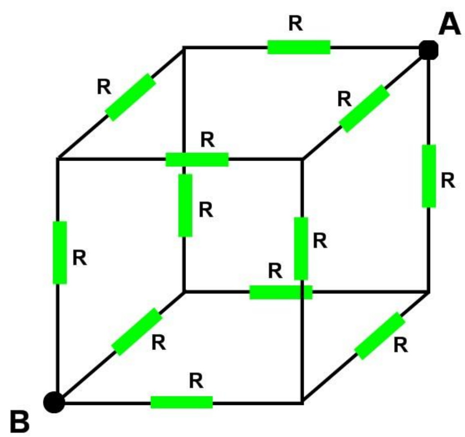
The resistor cube problem has been posed in many Physics textbooks and solved well using a number of methods. These include Kirchoff's Laws, network theory, loop current theory and circuit node techniques. It has even been solved in Spice circuit simulators.

The method presented here solves the puzzle with one rule and a few simple diagrams:

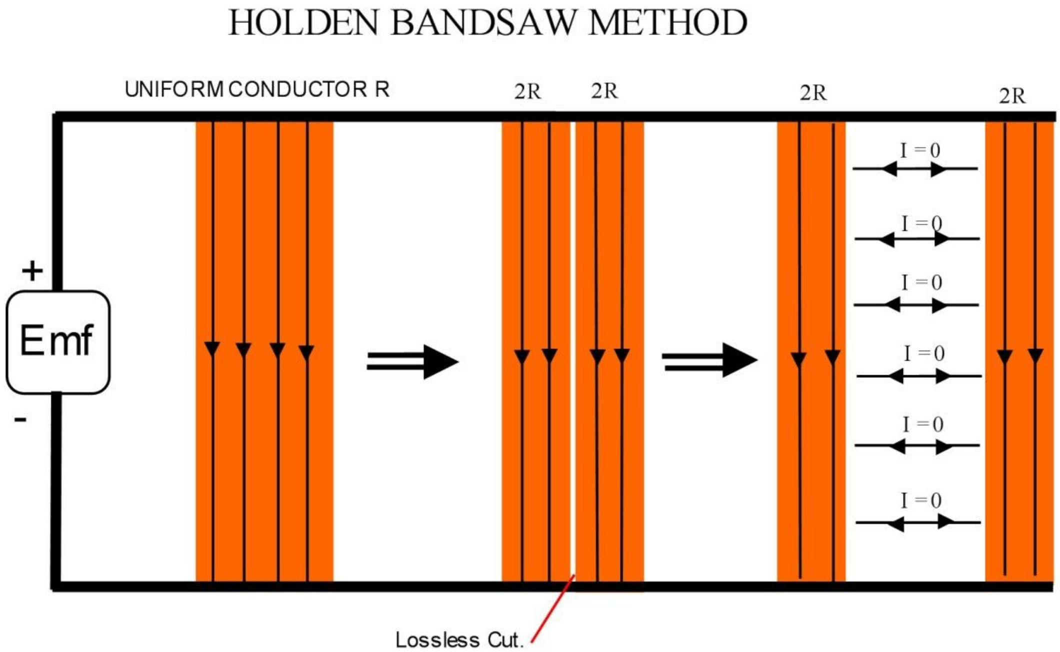
If two points in an electrical circuit always have an identical electrical potential then no current flows between them and these two points can be disconnected or connected without change to the functionality of the circuit.

The diagram below poses this Cube question:

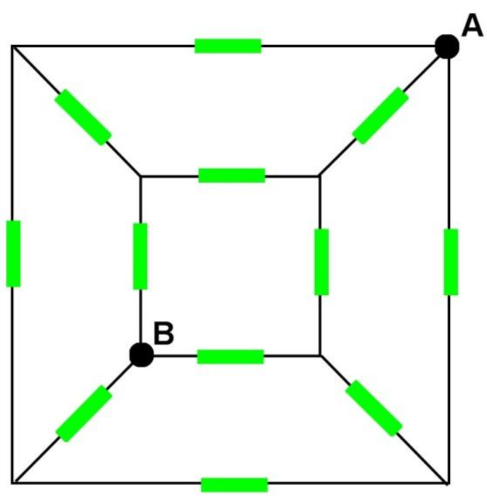
The Question: What is the resistance between any opposite corners of the cube , between A & B, in a resistor cube comprised of 12 resistors of uniform value R ?



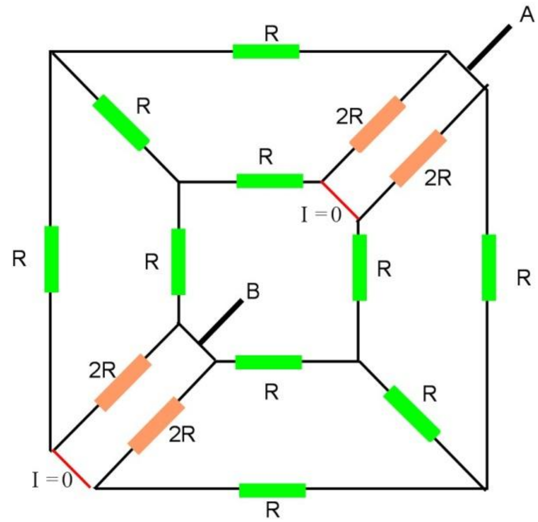
The following diagram demonstrates the simple rule. When a uniform copper conductor is cut in two in a lossless manner with an imaginary Bandsaw the resistance of each of the remaining halves is doubled. Also along the cut edges of the conductor the potential differences are identical so no current flows whether or not the edges of the cut conductor are connected or not:



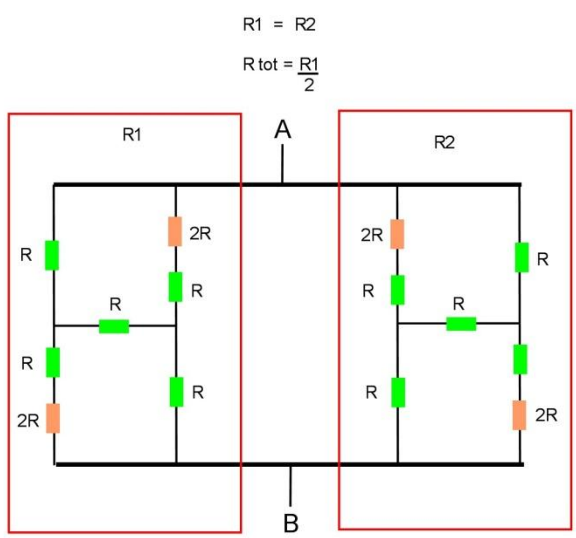
Re drawing the cube to a flat surface:



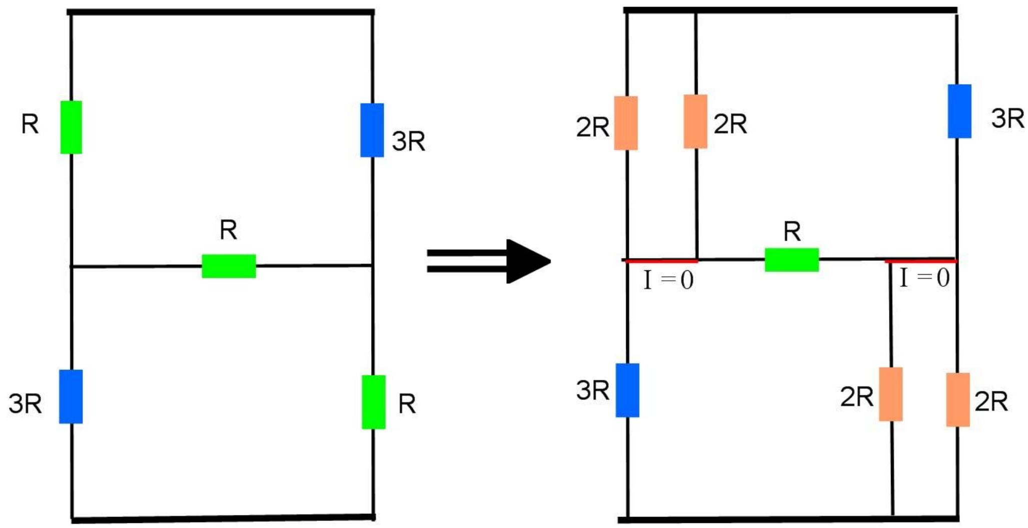
Two of the resistors are split in two and the resistance doubles:



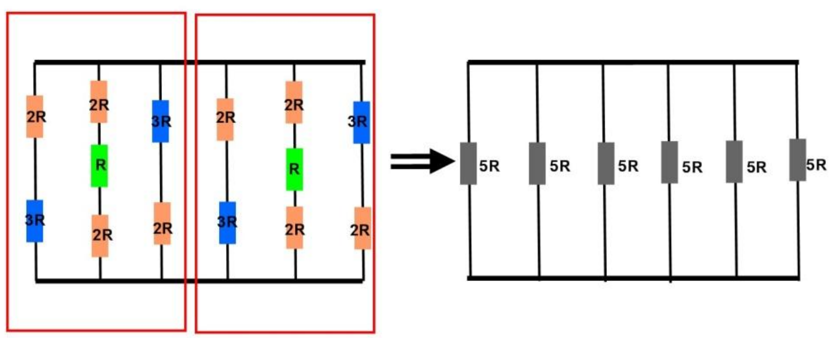
The emf on either side of the two links in red are identical (as can be seen by circuit symmetry) so no current flows in these. They can be removed with no other effect and the circuit re-drawn:



There are now two identical circuits in parallel so only one need be solved. Again a resistor is split in two:



This creates another situation where there are links with identical emf on each side so they can be removed with no other effect and the circuit re-drawn and the solution to the cube question is **self evident**:



$$R_{tot} = \frac{5}{6} R$$

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