Edwin Field has a tetrahedron in which all six edges are perfect 1-ohm resistors and the faces and interior have infinite resistance. What is the resistance measured between any two vertices?

The key, as several readers noted, is that, by symmetry, one of the edges will carry no current (equivalently has equal potential at each endpoint). The following is from Glen Stith.

It has been 48 years since I took 6.01 under Dr. Amar G. Bose, whom I consider the best lecturer I ever had. Even though I was a course XVIII major, I think I remember how Dr. Bose taught me to solve this problem.

Label the four vertices of the tetrahedron as points A, B, C and D. The objective is to determine the equivalent resistance between any two vertices, say A and B, when there is one ohm resistance along each edge and infinite resistance elsewhere. The applicable equation is Ohm's law, $I = V / R$, which says current equals voltage divided by resistance.

If a voltage V is applied across two vertices, say A and B, then the current that flows between A and B will be the sum of the currents through all possible paths. However, from symmetry, the net current through the edge CD will be zero. Therefore, the current will flow through paths AB, ACB and ADB. The resistance $R sub ab$ in path AB is 1 ohm and the resistances $R sub acb$ and $R sub adb$ in the other two paths are each 2 ohms. Hence, the net current will be

$$I = V/R_{ab} + V/R_{acb} + V/R_{adb} = V \times (1/1 + 1/2 + 1/2) = V \times 2 = V/(1/2)$$

So the effective resistance between any two vertices is ½ ohm.

R. Ellis was not content with just the tetrahedron and furnished the table below along with solution techniques for all the Platonic solids. For the larger solids, the nodes between which the resistance is to calculated may not be adjacent; the ''Node Spacing'' column gives the distance between those nodes.

Shape	Node Spacing	Resistance
Tetrahedron	1	1/2
Cube	1	7/12
	2	3/4
	3	5/6
Octahedron	1	5/12
	2	1/2
Dodecahedron	1	19/30
	2	9/10
	3	16/15
	4	17/15
	5	7/6
Icosahedron	1	11/19
	2	7/15
	3	1/2