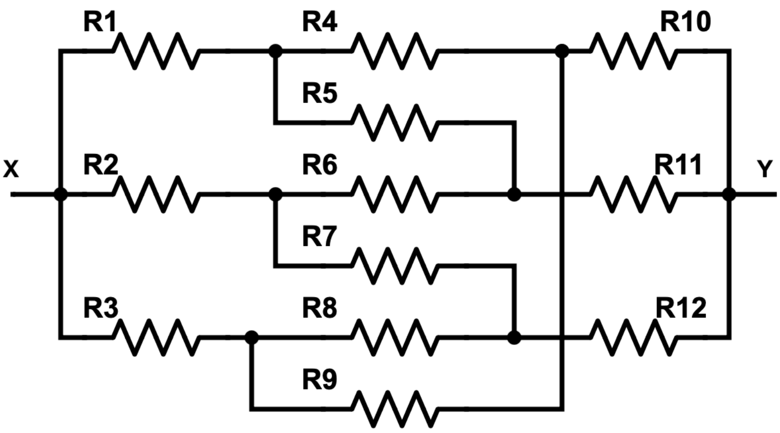
Resistor Cube Direct formula

The schematic of a flattened resistor cube. (Revised Numbering)



I have been giving the solution to a direct equation some thought as it would remove the need for circuit analysis each time the resistor value were changed. I have re-numbered the resistors on my schematic in a more logical fashion to help me with the equations but the numbering system can be what is preferred as long as the formula for each equation is coherent.

The method I have derived uses the current divider principle and the ratios thereof to determine the assume current in each branch and ultimately the total equivalent resistance between the point X and Y.

$$Eq_1 = R_1 + R_4\left(\frac{R_5}{R_4 + R_5}\right) + R_{10}\left(\frac{R_5}{R_4 + R_5} + \frac{R_8}{R_8 + R_9}\right)$$

$$Eq_2 = R_2 + R_6\left(\frac{R_7}{R_6 + R_7}\right) + R_{11}\left(\frac{R_7}{R_6 + R_7} + \frac{R_4}{R_4 + R_5}\right)$$

$$Eq_3 = R_3 + R_8\left(\frac{R_9}{R_8 + R_9}\right) + R_{12}\left(\frac{R_9}{R_8 + R_9} + \frac{R_6}{R_6 + R_7}\right)$$

Finally

The equivalent resistance between points X and Y is; $R_{eq} = \left[\left(\frac{1}{Eq_1}\right) + \left(\frac{1}{Eq_2}\right) + \left(\frac{1}{Eq_3}\right)\right]^{-1}$

$$R_{EQ} = \left[\left(R_1 + R_4\left(\frac{R_5}{R_4 + R_5}\right) + R_{10}\left(\frac{R_5}{R_4 + R_5} + \frac{R_8}{R_8 + R_9}\right)\right)^{-1} + \left(R_2 + R_6\left(\frac{R_7}{R_6 + R_7}\right) + R_{11}\left(\frac{R_7}{R_6 + R_7} + \frac{R_4}{R_4 + R_5}\right)\right)^{-1} + \left(R_3 + R_8\left(\frac{R_9}{R_8 + R_9}\right) + R_{12}\left(\frac{R_9}{R_8 + R_9} + \frac{R_6}{R_6 + R_7}\right)\right)^{-1}\right]^{-1}$$