THE GOLDEN RATIO IN AN ELECTRICAL NETWORK

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At the end of June 1967, Poland called together an international physics olympiad for grammar-school students in Warsaw. Five countries participated: Bulgaria, Poland, Romania, Czechoslovakia, and Hungary.

During this competition, the following problem was presented, among others:

An infinite network consists of the resistors r. Calculate the resistance between points A and B.
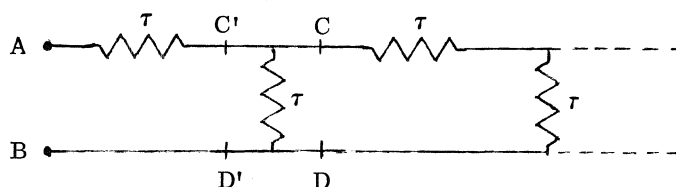
The solution of this problem can be presented in different ways. One quite brief version is possible as follows:

Suppose the resistance of the infinite network on the right-hand side of points C and D is equal to r_n.

If we go one step to the left from points C and D to C' and D', the resistance of the network would be

$$r_{C'D'} = \frac{r \cdot r_n}{r + r_n}$$

in accordance with relation:

$$\frac{1}{r_{C'D'}} = \frac{1}{r} + \frac{1}{r_n} \quad .$$

The next resistor r is added on the left behind the resistance $r_{C'D'}$: therefore, the resistance between A and B is

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