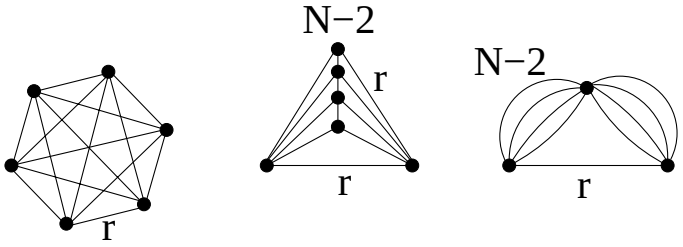
Web of Resistors

There are 2014 points on a giant circuit board. Each point is connected to each of the other points by a wire with resistance r. Find the resistance R between any two points.

Answer of problem **Web of Resistors**

If the number of point is N, then we have two points (IN and OUT) that are connected directly. Then we also have $N-2$ points that are connected to the IN and OUT points and all interconnected among themselves. Since all resistors are the same, all the $N-2$ points have same potential, and can be connected into one point. In other words, there is no current flowing between these middle points due to symmetry.



So our equivalent electric configuration is ($N-2$ parallel resistors in series with $N-2$ parallel resistors) in parallel with one resistor.

If the number of points is N the resistance between any two points is then

$$\boxed{R = \left(\frac{1}{r} + \frac{N-2}{2r}\right)^{-1} = \frac{2}{N}r}$$