4. Black box *(9 points)* Independetly of whether there is a triangular or a star connection, one can measure the ratio of the resistances a pair of resistors by connecting the battery to two outlets — let these be the outlets 1 and 3, and measuring the voltages between the outlets 1 and 2, and between the outlets 2 and 3. For a star connection,

$$\frac{R_3}{R_1} = \frac{V_{23}}{V_{12}},$$

where R_i denotes the resistor closest to the i-th outlet; for a triangular connection,

$$\frac{R_3}{R_1} = \frac{V_{12}}{V_{23}},$$

where R_i denotes the resistor farthest away from the i-th outlet; for a triangular connection,

In such a way we find

$$\frac{R_3}{R_1} \approx 4{,}7, \quad \frac{R_3}{R_2} \approx 3{,}3, \quad \text{and} \quad \frac{R_2}{R_1} \approx 1{,}4,$$

implying $R_1 = 100\,\Omega$, $R_2 = 140\,\Omega$ and $R_3 = 470\,\Omega$; or

$$\frac{R_1}{R_3} \approx 4{,}7, \quad \frac{R_2}{R_3} \approx 3{,}3, \quad \text{and} \quad \frac{R_1}{R_2} \approx 1{,}4,$$

$R_3 = 100\,\Omega$, $R_2 = 330\,\Omega$ and $R_1 = 470\,\Omega$. So, we can conclude that the largest resistance is $470\,\Omega$, and the middle-valued resistance is either $330\,\Omega$ or $140\,\Omega$.