

# task\_x357drkaqv84jnsc\_with\_calculation

## Student Group

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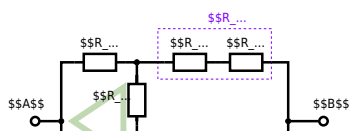
**Exercise E1 Pure Resistor Network Simplification**  
**(written test, approx. 13 % of a 60-minute written test, WS2022)**

The following shall now be closed. Calculate the equivalent resistance  $R_{eq}$  between A and B.

Solution

$$R_{eq} = 133.8 \Omega$$

Now a wye-delta transformation is necessary.



Since  $R_2=R_3$  and based on the equations for the transformation, the transformed  $R_Y$  is given as:

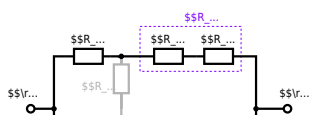
$$R_Y = \frac{R_2 \cdot R_2}{R_2 + R_2 + R_2} = \frac{(100 \Omega)^2}{3 \cdot 100 \Omega} = \frac{1}{3} \cdot 100 \Omega = 33.33 \Omega$$

The equivalent resistor is given by a parallel configuration of resistors in series:

$$R_{eq} = R_Y + (R_Y + R_1 + R_1) \parallel (R_Y + R_2) \parallel R_{eq} = 33.33 \Omega + (33.33 \Omega + 400 \Omega) \parallel (33.33 \Omega + 100 \Omega) \parallel$$

The switch shall now be open. Calculate the equivalent resistance  $R_{eq}$  between A and B.

Solution



The equivalent resistor is given by a parallel configuration of resistors in series:

$$R_{eq} = (R_2 + R_1 + R_1) || (R_2 + R_2) || R_{eq} = (100 \Omega + 200 \Omega + 200 \Omega) || (100 \Omega + 100 \Omega) || R_{eq} = (500 \Omega) || (200 \Omega) || R_{eq} = \frac{\{500 \Omega \cdot 200 \Omega\}}{500 \Omega + 200 \Omega} || R_{eq}$$

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