Resistors in parallel

(a.) The equivalent resistance of two resistors in parallel is R_{eff} where

$$\begin{aligned} \frac{1}{R_{\text{eff}}} &= \frac{1}{R_1} + \frac{1}{R_2} = \frac{R_2}{R_1 R_2} + \frac{R_1}{R_1 R_2} = \frac{R_2 + R_1}{R_1 R_2} \\ R_{\text{eff}} &= \frac{R_1 R_2}{R_1 + R_2}. \end{aligned}$$

(b.) The dimensions of

$$\frac{R_1 R_2 R_3}{R_1 + R_2 + R_3} \quad \text{are} \quad \frac{[\text{ohm}]^3}{\text{ohm}} = [\text{ohm}]^2,$$

so this expression can't equal a resistance.

(c.) The equivalent resistance of three resistors in parallel is R_{eff} where

$$\begin{aligned} \frac{1}{R_{\text{eff}}} &= \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} = \frac{R_2 R_3}{R_1 R_2 R_3} + \frac{R_1 R_3}{R_1 R_2 R_3} + \frac{R_1 R_2}{R_1 R_2 R_3} = \frac{R_2 R_3 + R_1 R_3 + R_1 R_2}{R_1 R_2 R_3} \\ R_{\text{eff}} &= \frac{R_1 R_2 R_3}{R_2 R_3 + R_1 R_3 + R_1 R_2}, \end{aligned}$$

which has the proper dimensions of [ohm]!

Grading: Part (a), 3 points. Part (b), 3 points. Part (c), 4 points. Not required to point out that the proper formula for R_{eff} has the proper dimensions.