

Chapter 1: Foundations

Exercise 1.1

(a) $R = 5\text{k} + 10\text{k} = \boxed{15\text{k}\Omega}$

(b) $R = \frac{R_1 R_2}{R_1 + R_2} = \frac{5\text{k} \cdot 10\text{k}}{5\text{k} + 10\text{k}} = \boxed{3.33\text{k}\Omega}$

Exercise 1.2

$$P = IV = \left(\frac{V}{R}\right) V = \frac{(12\text{V})^2}{1\Omega} = \boxed{144\text{W}}$$

Exercise 1.3

TODO: Solve this problem

Exercise 1.4

TODO: Solve this problem

Exercise 1.5

Given that $P = \frac{V^2}{R}$, we know that the maximum voltage we can achieve is 15V and the smallest resistance we can have across the resistor in question is 1k Ω . Therefore, the maximum amount of power dissipated can be given by

$$P = \frac{V^2}{R} = \frac{(15\text{V})^2}{1\text{k}\Omega} = \boxed{0.225\text{W}}$$

This is less than the 1/4W power rating.

Exercise 1.10

(a) With two equal-value resistors, the output voltage is half the input voltage.

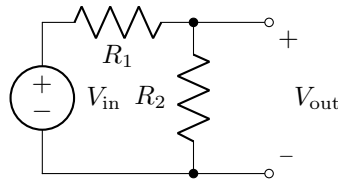
$$V_{out} = \frac{1}{2}V_{in} = \frac{30\text{V}}{2} = \boxed{15\text{V}}$$

(b) To treat R_2 and R_{load} as a single resistor, combine the two resistors which are in parallel to find that the combined (equivalent) resistance is 5k Ω . Now, we have a simple voltage divider with a 10k Ω resistor in series with

the $5\text{k}\Omega$ equivalent resistor. The output voltage is across this equivalent resistance. The output voltage is given by

$$V_{out} = V_{in} \frac{5\text{k}\Omega}{10\text{k}\Omega + 5\text{k}\Omega} = \frac{30\text{V}}{3} = 10\text{V}$$

- (c) We can redraw the voltage divider circuit to make the “port” clearer.



We can find V_{Th} by leaving the ports open (open circuit) and measuring V_{out} , the voltage across R_2 . This comes out to be half the input voltage when $R_1 = R_2$, so $V_{out} = 15\text{V}$. Thus $V_{Th} = 15\text{V}$.

To find the Thévenin resistance, we need to find the short circuit current, I_{SC} .

TODO: finish

