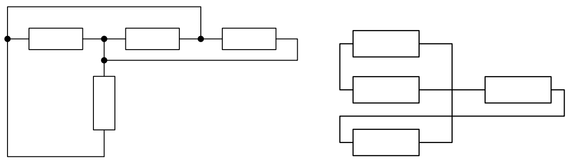
**E1.1 Circuit Analysis**

**Problem Sheet 1 (Lectures 1 & 2)**

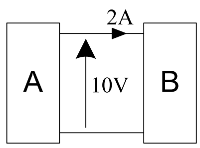
Key: [A]= easy ... [E]=hard

1. [A] One of the following circuits is a series circuit and the other is a parallel circuit. Explain which is which.

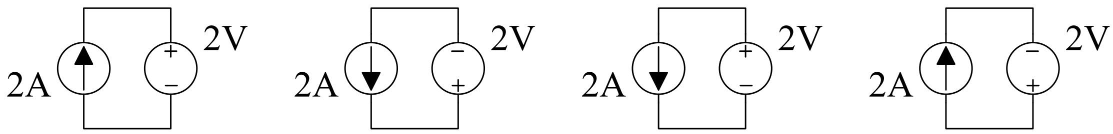


(a) (b)

2. [B] Find the power absorbed by by each of the subcircuits $A$ and $B$ given that the voltage and current are 10 V and 2 A as shown.

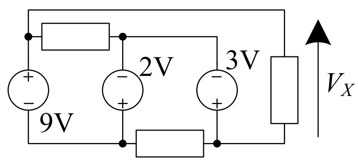



3. [B] For each of the four circuits below, find the power absorbed by the voltage source ($P_V$), the power absorbed by the current source ($P_I$) and the total power absorbed ($P_V + P_I$).

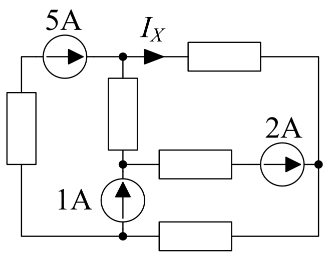



(a) (b) (c) (d)

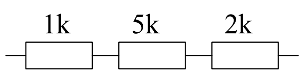
4. [B] Determine the voltage $V_X$ in the following circuit.



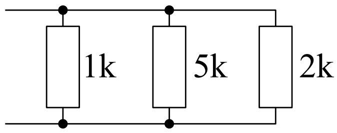

5. [B] Determine the current $I_X$ in the following circuit.



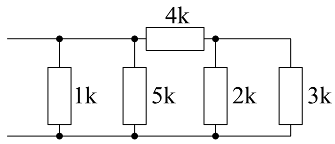

6. [B] What single resistor is equivalent to the three resistor sub-circuit shown below?



7. [B] What single resistor is equivalent to the three resistor sub-circuit shown below?

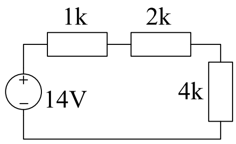



8. [C] What single resistor is equivalent to the five resistor sub-circuit shown below?

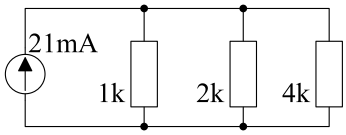



9. [A] If a resistor has a conductance of $8\,\mu$S, what is its resistance?

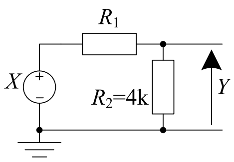
10. [B] Determine the voltage across each of the resistors in the following circuit and the power dissipated in each of them. Calculate the power supplied by the voltage source.



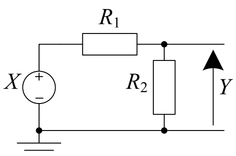

11. [B] Determine the current through each of the resistors in the following circuit and the power dissipated in each of them. Calculate the power supplied by the current source.




12. [B] Determine $R_1$ so that $Y = \frac{1}{4}X$.




13. [B] Choose $R_1$ and $R_2$ so that $Y = 0.1X$ and $R_1 + R_2 = 10\,\text{M}\Omega$.




14. [D] You have a supply of resistors that have the values $\{10, 12, 15, 18, 22, 27, 33, 39, 47, 56, 68, 82\} \times 10^n\,\Omega$ for all integer values of $n$. Thus, for example, a resistor of $390\,\Omega$ is available and the next higher value is $470\,\Omega$. Show how, by combining two resistors in each case, it is possible to make networks whose equivalent resistance is (a) $3\,\text{k}\Omega$, (b) $4\,\text{k}\Omega$ and (c) as close as possible to $3.5\,\text{k}\Omega$. Determine is the worst case percentage error that might arise if, instead of combining resistors, you just pick the closest one available.