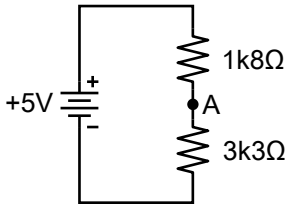
Activity: Voltage Divider as a Voltage Regulator

You must show the formula you use and all steps for each calcuation.



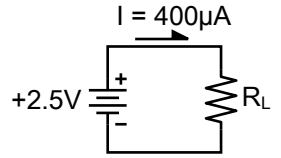
Diego, an electronics student, has a 5V power supply, but the chip they wish to use requires a 3.3V power supply. The student recalls their studies of resistors and remembers the voltage divider circuit, as shown to the right, will allow them to produce a voltage of 3.3V.

1. Calculate the following for this circuit.

a) The total resistance of the two resistors.

b) The current through the resistors.

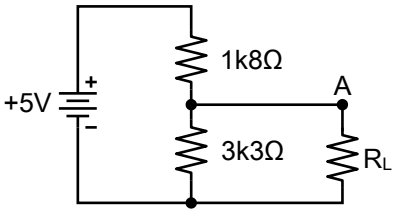
c) The voltage at point A.



The chip that Diego wishes to power may draw up to 400µA during its operation. We can model this amount of current draw using a resistor.

2. Calculate the value of resistor, R_L, that will produce the same current flow through the circuit as the chip will during its operation.

So, when Diego connects the chip to the voltage divider circuit given at the top of the page, he has the equivalent circuit shown to the right.



3. Using the value of resistance, R_L, that you calculated in question 2, calculate the following.

a) The total resistance, R_P, of the two parallel resistors (R_L in parallel with the 3.3kΩ resistor).

b) The total resistance, R_T, of all the resistors.

c) The current output by the supply.

d) The voltage at point A.

Conclusion: the voltage level of a resistor voltage divider is only valid when there is no load connected.