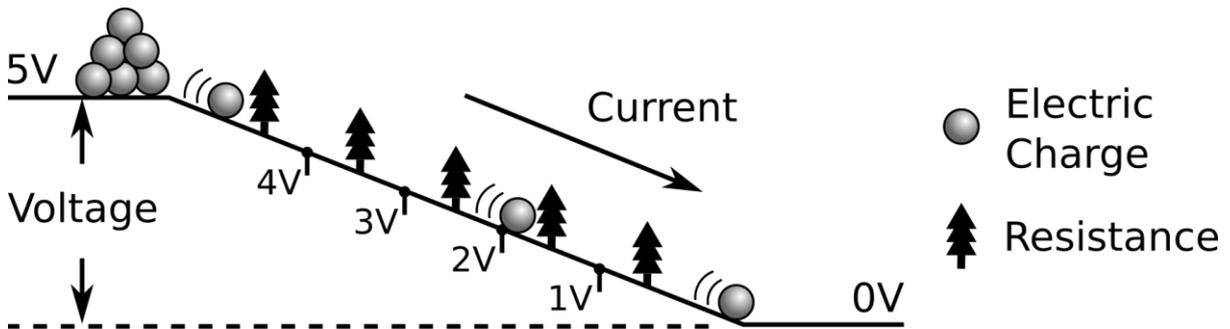


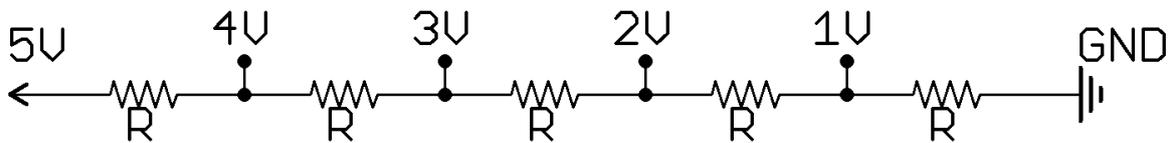
HIMALAYAN MAKERS GUILD

Activity 9 – Voltage Divider Night-Light

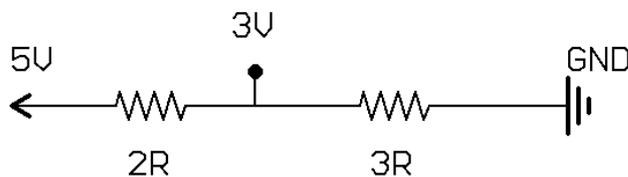
Voltage Divider



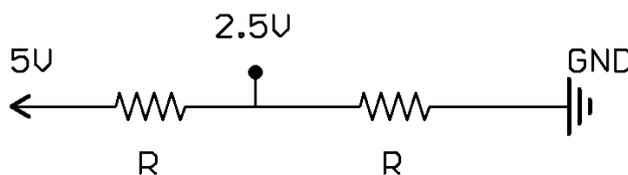
This is a rock-slide analogy for electricity, where the rocks are electric charge. As **current** (moving electric charge) flows through a **resistance** (trees), **voltage** (height of the hill) is dropped. All of the voltage must be dropped across the resistors. As a circuit diagram, it looks like this:



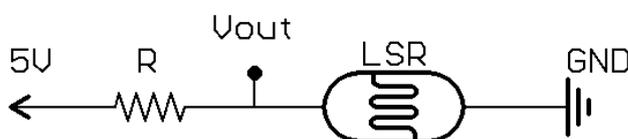
Here, all of the resistors are the same so an equal amount of voltage is dropped across each one (1 V per resistor). The amount of voltage dropped across a resistor depends on how big the resistance is compared to the total resistance between the 5V node to the 0V (GND) node. Since the voltage is divided across the resistors, we call this a **voltage divider**.



If we have one resistance of 2R, and another of 3R, more voltage will be dropped across the 3R resistor.



If we have two equal resistances, the voltage will be dropped equally across both of them (2.5V).

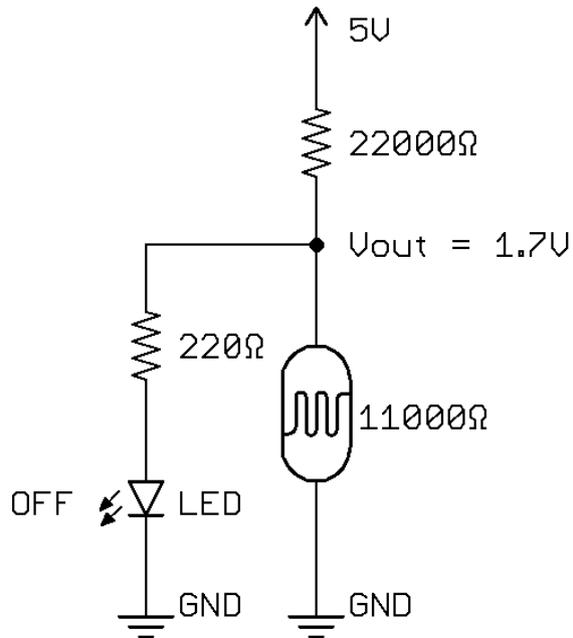


A Light Sensitive Resistor (**LSR**) changes resistance depending the amount of light shining on it. **Vout** will change depending on the amount of light.

Building a Night-Light

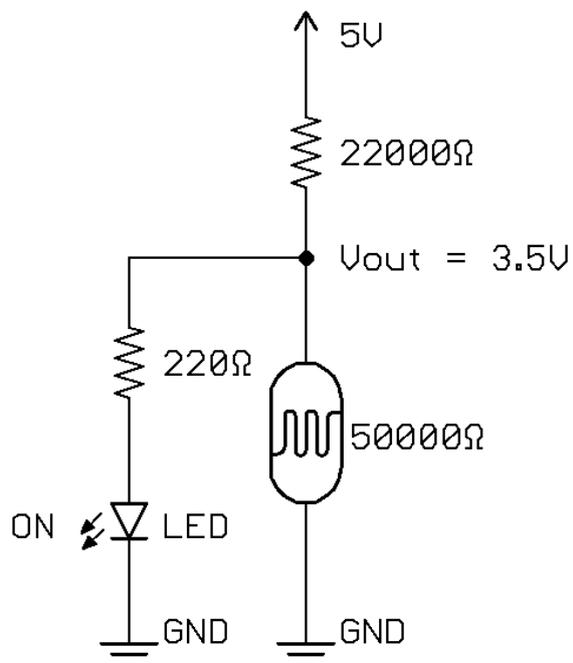
We can use an **LSR** in a voltage divider to make a night-light. If **V_{out}** is greater than 3 V the LED will be **ON**. If **V_{out}** is less than 3V, the LED turns **OFF**.

In this voltage divider, we have chosen R to have a resistance of 22000 Ω (an **Ohm** is a unit of resistance). The other resistor (220 Ω) is usually used protect the LED from high current when powering it from 5V.



When there is light, the LSR has a small resistance.

The LSR becomes much **less than** 22000 Ω , so **V_{out}** drops **below** 3V and the LED turns **OFF**.



When it is dark, the LSR has a big resistance.

The LSR much **greater than** 22000 Ω , so **V_{out}** rises **above** 3V and the LED turns **ON**.

How does the brightness of the LED compare to when we power it directly with 5V through the 220 Ω resistor? What could be causing this difference?