Circuit 1C: Photoresistor

In circuit 1B, you got to use a potentiometer, which varies resistance based on the twisting of a knob. In this circuit, you'll be using a photoresistor, which changes resistance based on how much light the sensor receives. Using this sensor you can make a simple night-light that turns on when the room gets dark and turns off when it is bright.

NEW COMPONENTS

PHOTORESISTORS are light-sensitive, variable resistors. As more light shines on the sensor's head, the resistance between its two terminals decreases. They're an easy-to-use component in projects that require ambient-light sensing.

NEW CONCEPTS

ANALOG TO DIGITAL CONVERSION:
In order to have the RedBoard sense analog signals, we must first pass them through an Analog to Digital Converter (or ADC). The six analog inputs (A0–A5) covered in the last circuit all use an ADC. These pins sample the analog signal and create a digital signal for the microcontroller to interpret. The **resolution** of this signal is based on the resolution of the ADC. In the case of the RedBoard, that resolution is 10-bit. With a 10-bit ADC, we get 2 ^ 10 = 1024 possible values, which is why the analog signal can vary between 0 and 1023.

VOLTAGE DIVIDERS CONTINUED:
Since the RedBoard can't directly interpret resistance (rather, it reads voltage), we need to use a voltage divider to use our photoresistor, a part that doesn't output voltage. The resistance of the photoresistor changes as it gets darker or lighter. That changes or "divides" the voltage going through the divider circuit. That divided voltage is then read in on the analog to digital converter of the analog input.

The voltage divider equation:

$$V_{out} = V_{in} \bullet \frac{R_2}{R_1 + R_2}$$

assumes that you know three values of the above circuit: the input voltage (V_{in}), and both resistor values (R_1 and R_2). If R1 is a constant value (the resistor) and R2 fluctuates (the photoresistor), the amount of voltage measured on the Vout pin will also fluctuate.