Project 3: 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.

Parts Needed

Grab the following quantities of each part listed to build this circuit:

NEW COMPONENTS

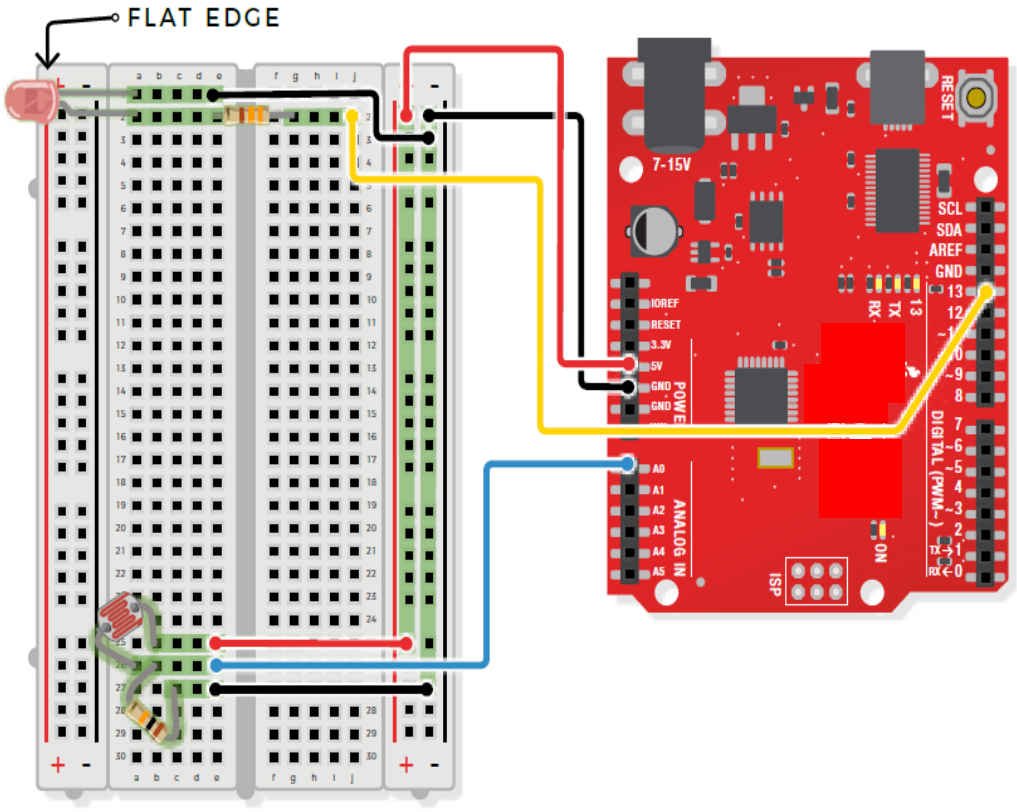
PHOTORESISTORS are lightsensitive, variable resistors. As more light shines on the sensor's head, the resistance between its two terminals decreases. They're an easy-to-use component in projects that require ambientlight sensing.

NEW CONCEPTS
ANALOG TO DIGITAL CONVERSION:
In order to have the microcontroller 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 microcontroller, 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 MICROCONTROLLER 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:
assumes that you know three values of the above circuit: the input voltage (Vin),
and both resistor values (R1 and R2). 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.

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



JUMPER WIRES	5V to 5V(+) · GND to GND (-) · D13 to J2 · A0 to E26 · E1 to GND(-) · E25 to 5V(+) · E27 to GND(-)
LED	A1(-) to A2(+)
330Ω RESISTOR (ORANGE, ORANGE, BROWN)	E2 to F2
10KΩ RESISTOR (BROWN, BLACK, ORANGE)	B26 to C27
PHOTORESISTOR	A26 to B25

Source Code:

```
//project3.ino
//Full Name:"Creator"
//COURSE SECTION:
```



```
int photoresistor = 0; //this variable will hold a value based on the brightness of the ambient light
int threshold = 750;  //if the photoresistor reading is below this value the light will turn on
void setup()
{
  Serial.begin(9600);               //start a serial connection with the computer
  pinMode(13, OUTPUT);       //set pin 13 as an output that can be set to HIGH or LOW
}

void loop()
{
  //read the brightness of the ambient light
  photoresistor = analogRead(A0);
 //set photoresistor to a number between 0 and 1023 based on how bright the ambient light is
  Serial.println(photoresistor);    //print the value of photoresistor in the serial monitor on the computer
  //if the photoresistor value is below the threshold turn the light on, otherwise turn it off
  if (photoresistor < threshold) {
    digitalWrite(13, HIGH);         // Turn on the LED
  } else {
    digitalWrite(13, LOW);          // Turn off the LED
  }
  delay(100);                       //short delay to make the printout easier to read
}
```