MICROBIT PROGRAMMING (BLOCK-BASED)

(Time required 30-45 minutes session)

Introduction

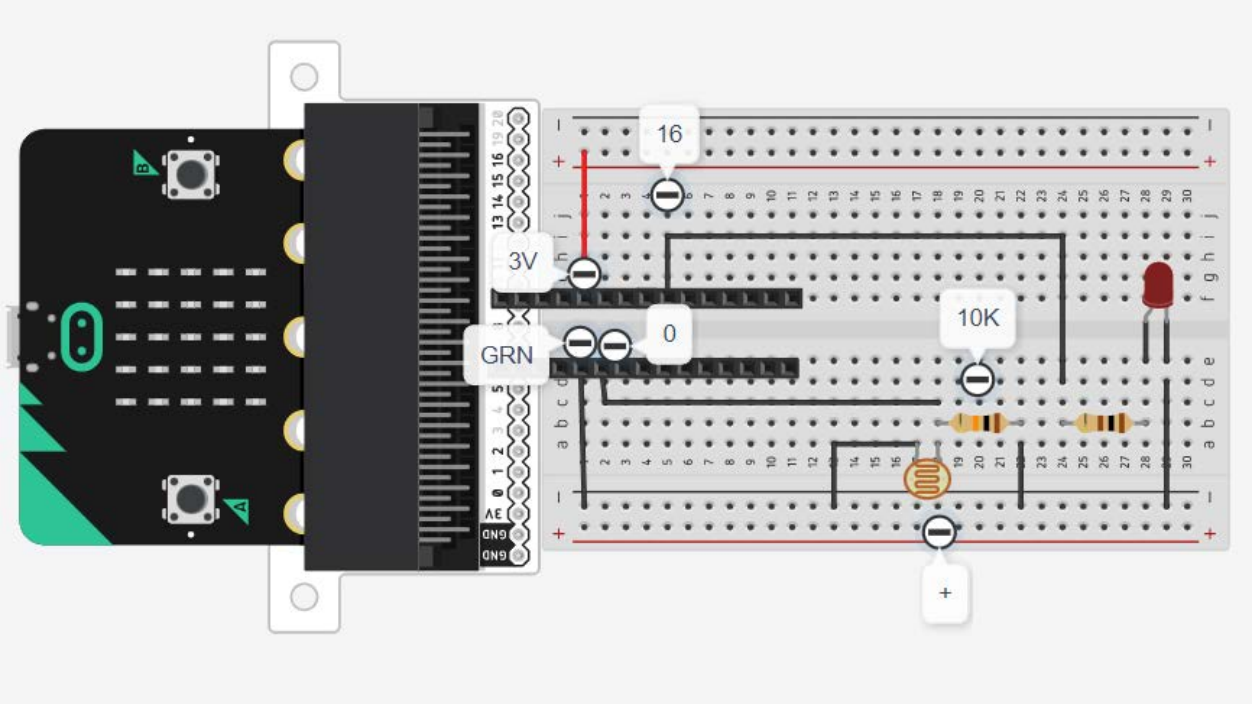
In this activity you'll be using a photoresistor, which changes resistance based on how much light the sensor receives. You will read the light value of the room and have an LED turn on if it is dark and turn off if it is bright. That's right; you are going to build a night light!

Parts Needed (included in the kit):
1x micro:bit
1x Micro B USB Cable
1x micro:bit Breakout (with Headers)
1x Breadboard
8x Jumper Wires
1x Photoresistor
1x 10kΩ Resistor
1x LED
1x 100Ω Resistor

Photoresistor Introduction

The photoresistor changes its resistance based on the light to which it is exposed. To use this with the micro:bit, you will need to build a voltage divider with a 10kΩ resistor. The micro:bit cannot read a change in resistance, only a change in voltage. A voltage divider allows you to translate a change in resistance to a corresponding voltage value.
The voltage divider enables the use of resistance-based sensors like the photoresistor in a voltage-based system.

Photoresistor Wiring Diagram



On Start

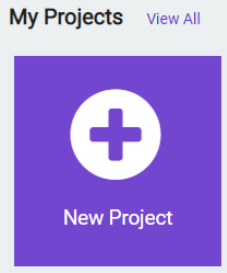
The On start block is a block of code that only runs once at the very beginning of your program. In this program we use it to set a calibration value once, and then compare the changing value in the forever loop. This is a great spot for code that you only want to run a single time. To update this value you can press the RESET button on the back of your micro:bit or power cycle the board.

If/Else

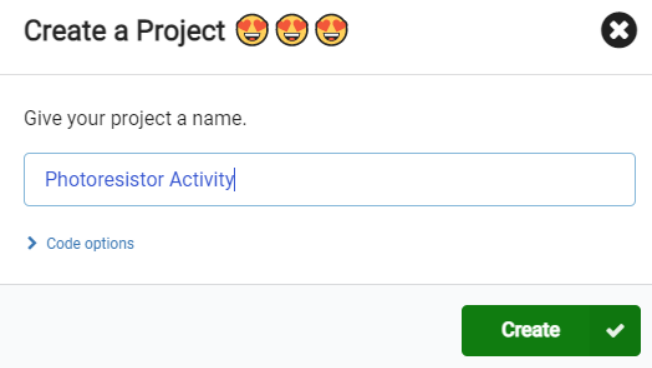
If the light value variable that is constantly being updated in the forever block is less than the calibration value minus 50, it is dark and the LED should turn on. The (-50) portion of the if block is a sensitivity value. The higher the value, the less sensitive the circuit will be; the lower the value, the more sensitive it will be to lighting conditions.
The if block is a logical structure. If the logical statement that is attached to it (item < calibrationVal -50) is true, then it will execute the code blocks inside of the if. If that statement is false, it will execute the else blocks. In this case if the statement is true (the room is dark), then the micro:bit will turn on the LED on pin 16; else (if the room is bright), it will turn the LED off using a digital write block.

Building the "Photoresistor Activity"

Step 1: Go to https://makecode.microbit.org/# and create a New Project

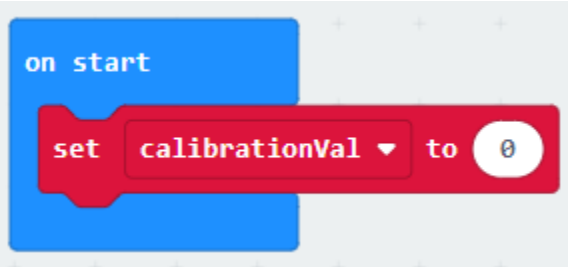


Step 2: Click on New Project and give it a project name **Push Button Activity** and click Create

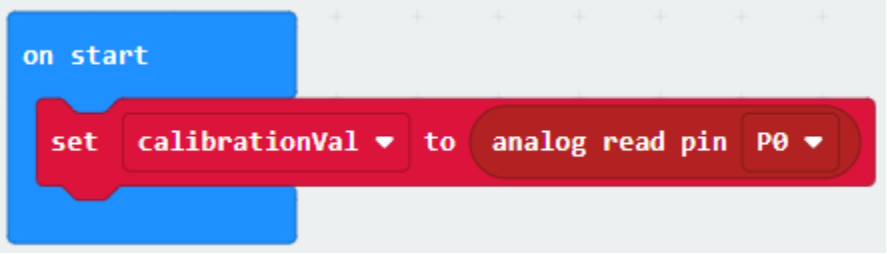


Step 3: Once the MakeCode is launched, click on the **Variables** category and then click on **Make a Variable.** In the New Variable name window type **calibrationVal** then click **Ok**.

Step 4: Once the **calibrationVal** variable has been created select and drag the **set calibrationVal to 0** block into the **on start block**



Step 5: Click on the **Advance** | **More** category and select and drag the **analog read pin P0** block into the **set calibrationVal to 0** block.



Step 6: click on the **Variables** category and then click on **Make a Variable.** In the New Variable name window type **item** then click **Ok**. Once the **item** variable has been created select and drag the **set item to 0** block into the **forever** block

Step 7: Click on the **Advance** | **More** category and select and drag the **analog read pin P0** block into the **set item to 0** block.

Step 8: Click on the **Logic | Conditionals** category then select and drag the **if <true> then <> else** block

Step 9: Click on the **Logic | Comparison** category then select and drag the **<0> = <0>** block into the **if <true> then** block. Change the equals to (=) to less than (<)

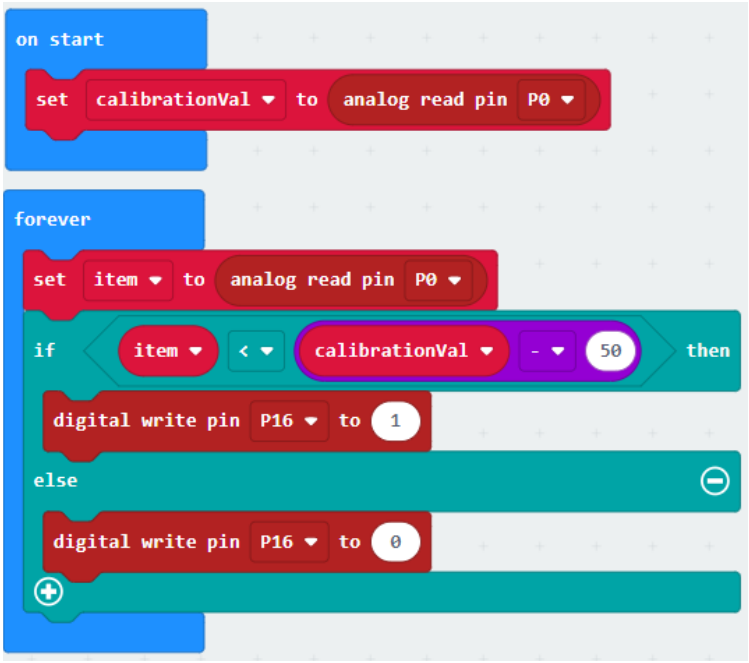
Step 10: Click on the **Variables** category then select and drag the **item** block into the **if <true> then** block

Step 11: Click on the **Math** category then select and drag the **<0> - <0>** block into the **if <true> then** block

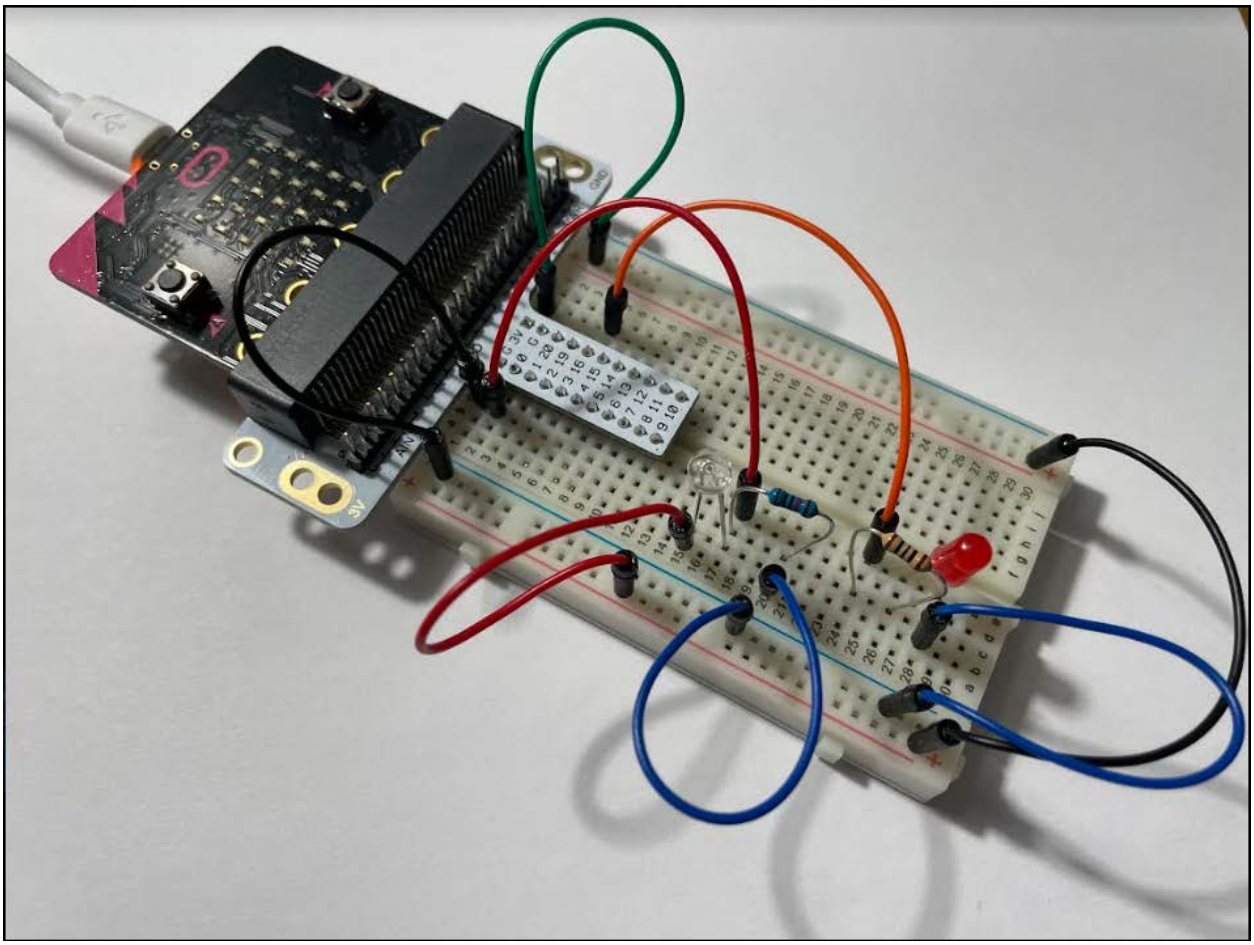
Step 12: click on the **Variables** category then select and drag the **calibrationVal** block into the **<0> - <0>** block. Change the value of 0 to 50.

Step 13: Click on the **Advance** category then **Pins** then select and drag the **digital write pin P0 to 0** block into the **if <true> then** block. Change pin **P0** to **P16** and its value to 1.

Step 13: Click on the **Advance** category then **Pins** then select and drag the **digital write pin P0 to 0** block into the **else** block. Change pin **P0** to **P16** and its value to 0



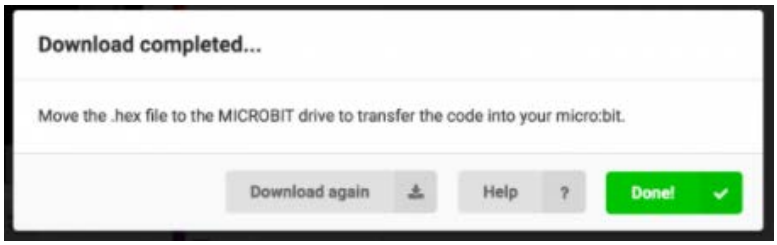
Final Prototype



Plug the USB cable to the micro:bit

Step 14: Click the download button in the lower lefthand corner of the code window. It will downloaded most probably in the Downloads folder

Step 15: Simply click and drag your program file from its download location to your micro:bit drive, which shows up as an external device.



Step 16: When the micro:bit runs the program it will take a single reading from the light sensor and use that as a calibration value of the "normal" state of the room. When you place your hand over the light sensor or turn the lights off, the LED will turn on. If you turn the lights back on or uncover the light sensor, the LED will turn off.

Congratulations! You have successfully completed this activity.

Reference: Sparkfun Inventor's Kit for micro:bit Experiment Guide
https://learn.sparkfun.com/tutorials/sparkfun-inventors-kit-for-microbit-experiment-guide