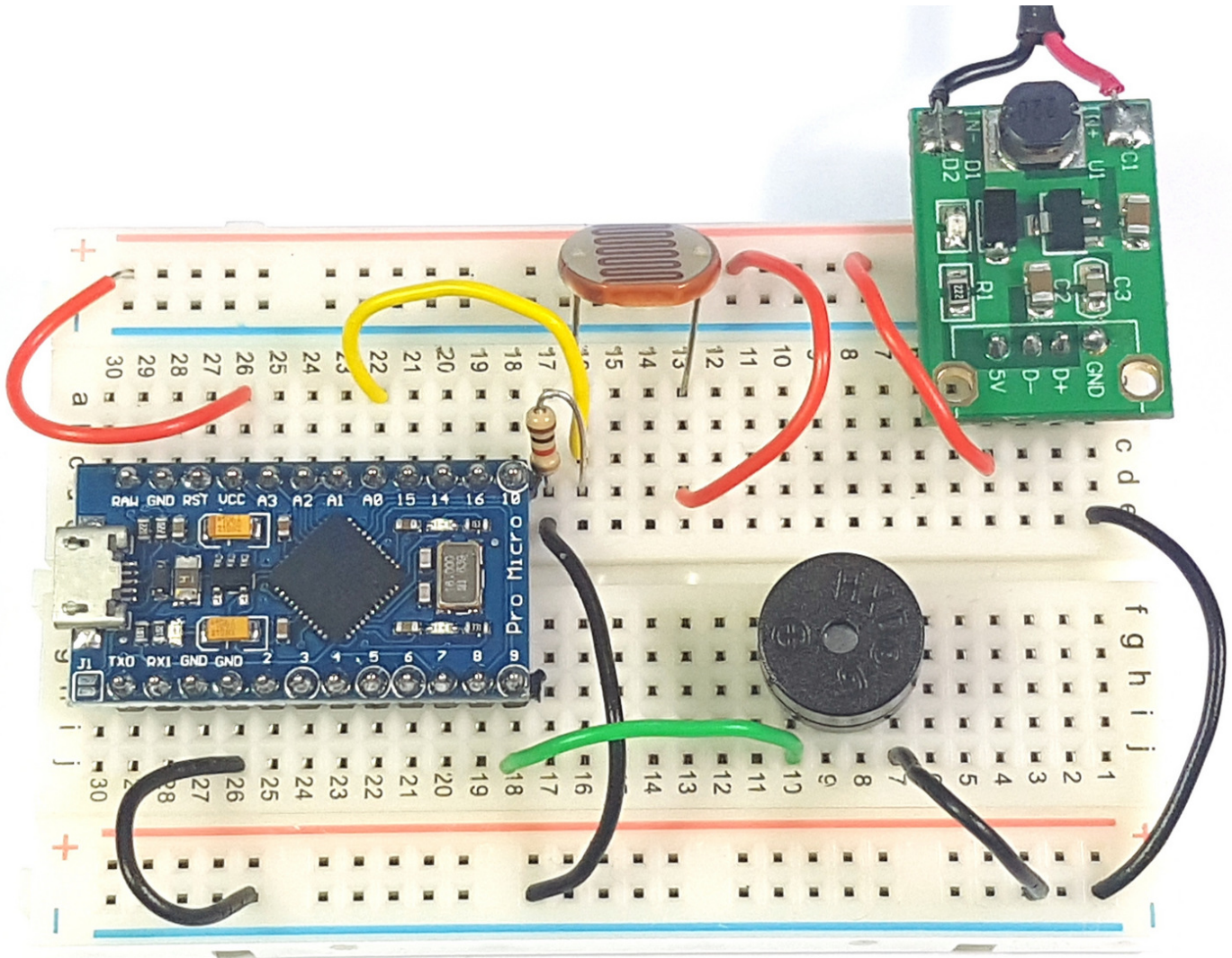


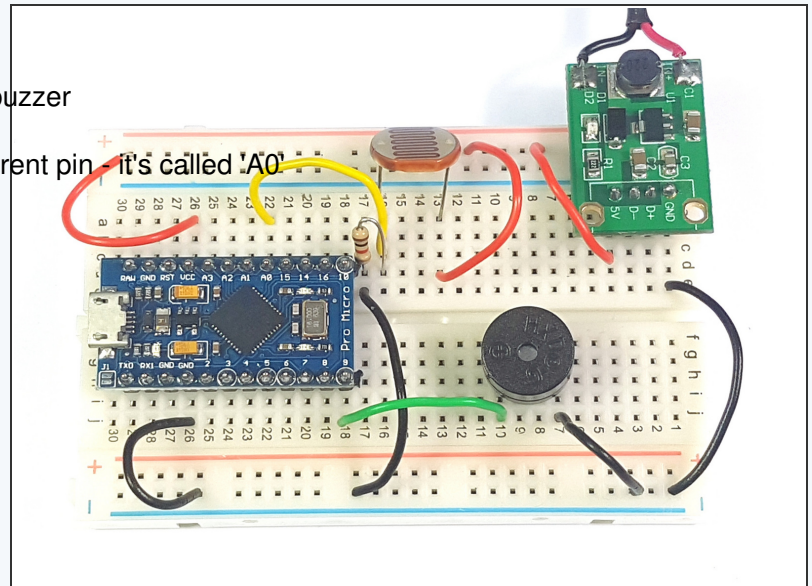
Inventor School Session 5 - Lights & Lasers



Step 1

— Wiring up the LDR

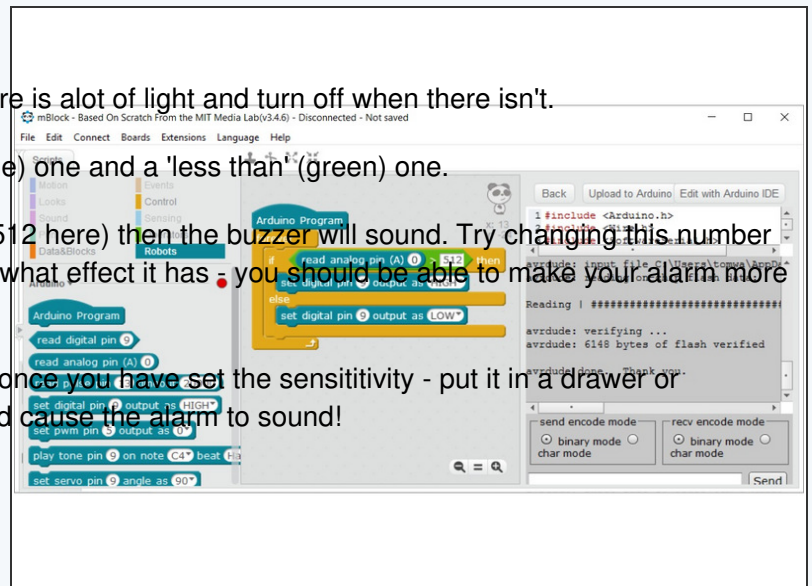
- Connect up the circuit shown using the LDR and the buzzer
- Note that this time we've connected the LDR to a different pin. It's called 'A0'



Step 2

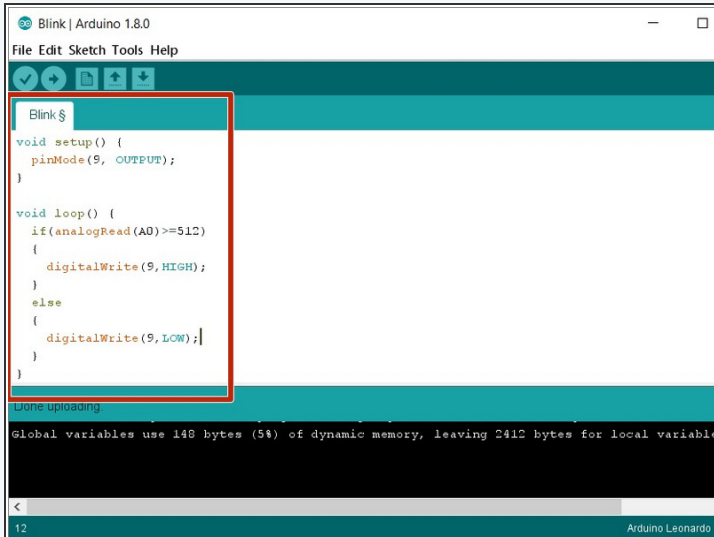
— The light alarm (M)

- Copy the programme shown. It should beep when there is a lot of light and turn off when there isn't.
- We've used two new blocks here - a 'read analog' (blue) one and a 'less than' (green) one.
- If the amount of light is larger than a certain amount (512 here) then the buzzer will sound. Try changing this number to something much bigger and much smaller and see what effect it has - you should be able to make your alarm more or less sensitive. You can use values from 0 to 1023.
- What you have here can make a great security alarm once you have set the sensitivity - put it in a drawer or cupboard and when someone opens it, the light should cause the alarm to sound!



Step 3

— The light alarm (A)

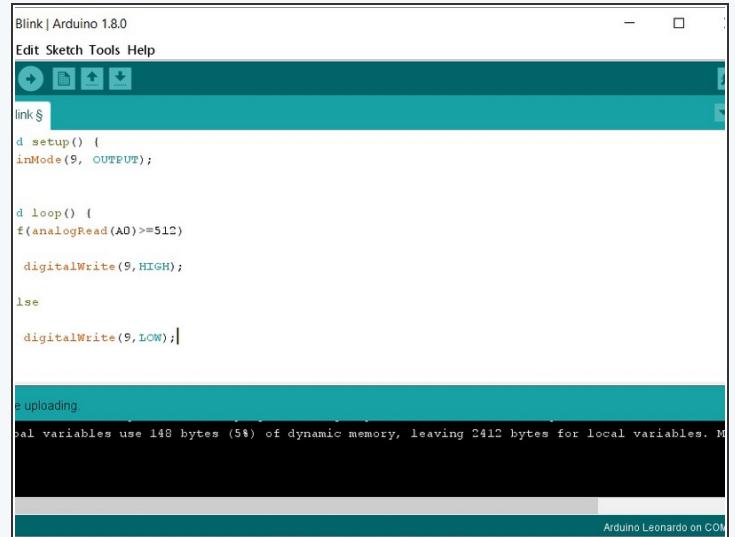


```

Blink $
File Edit Sketch Tools Help
void setup() {
  pinMode(9, OUTPUT);
}

void loop() {
  if(digitalRead(A0) == HIGH)
  {
    digitalWrite(9, HIGH);
  }
  else
  {
    digitalWrite(9, LOW);
  }
}

```



```

Blink $
File Edit Sketch Tools Help
void setup() {
  pinMode(9, OUTPUT);
}

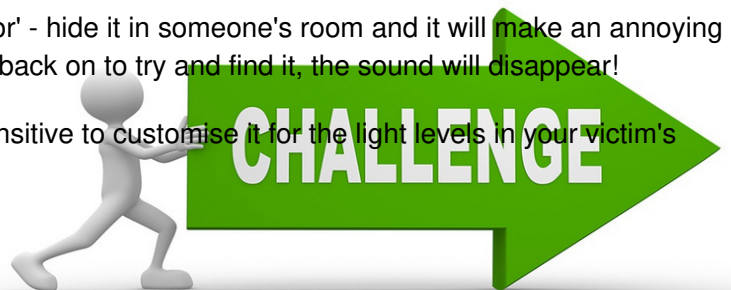
void loop() {
  if(analogRead(A0) >= 512)
  {
    digitalWrite(9, HIGH);
  }
  else
  {
    digitalWrite(9, LOW);
  }
}

```

- To create a light alarm, use the programme shown. Your device should beep when there is light shining on the LDR and stop beeping in the darkness.
- This programme should be nothing new to you but can you see how we've now changed the pin to 'A0' in both the setup function and the loop function? Even though we've connected our LDR to an analog pin, we can still use it in digital mode if we want!
- Now try changing the code to use it in analog mode as shown in the second picture. You can now adjust the sensitivity by changing the value '512' to something bigger or smaller - try it out!
- Note that we don't need a 'pinMode' command when using 'analogRead' as analog pins are always inputs.

— The annoyator

- Now change your alarm so that it sounds **only in the dark** and not in the light
- What you have here is what we like to call an 'annoyator' - hide it in someone's room and it will make an annoying sound when they turn the lights off. When they turn them back on to try and find it, the sound will disappear!
- By changing the number you can make it more or less sensitive to customise it for the light levels in your victim's room!



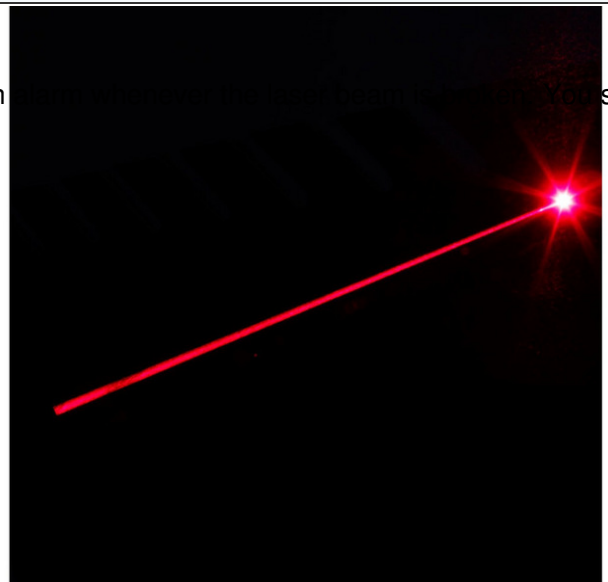
— Night light

- Now make a night light. It should turn on a light (an LED) in the dark and turn off again in the light.
- ① This gadget is useful even if you're not afraid of the dark! Use it to show you where something important is in your room - perhaps the light switch! You might like to change it to a flashing light that only flashes very briefly once in a while if you're going to use it to do this!



— Laser trip wire

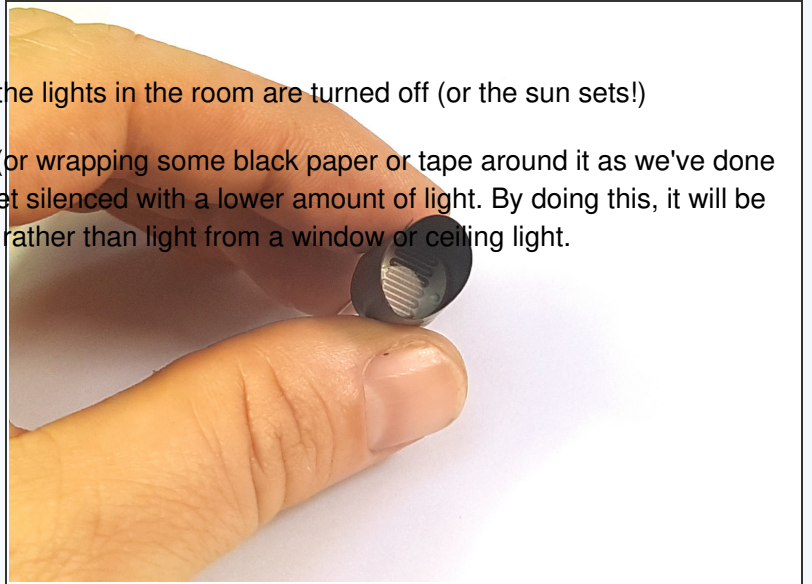
- Now you're ready to create a laser trip wire! It should sound an alarm when the laser is broken. You should be able to do this just by shining the laser on the LDR.



Step 7

— Laser trip wire hints

- You don't want your laser trip wire to be tripped when the lights in the room are turned off (or the sun sets!)
- ① To prevent this, you can put the LDR into a dark tube (or wrapping some black paper or tape around it as we've done here). Then you can adjust the sensitivity again so it gets silenced with a lower amount of light. By doing this, it will be mainly the light from the laser that can get in the tube, rather than light from a window or ceiling light.



Step 8

— Advanced trip wire

- Now let's make our trip wire more advanced!
- It should be tripped by breaking the beam but should not be silenced until a reset button is pressed ...



Step 9

— Multi-mirror trip wire

- Now for some real fun! You can make your laser trip wire take a much more complex path by reflecting off your two mirrors.
- ① First take the protective plastic off the two mirrors and use the blutack to position the laser, and the two mirrors - take your time as it will be tricky! Adjust the mirrors one by one until your laser beam hits the LDR.



— Reflective object sensor

- For a real challenge, try making a reflective object sensor. Using your high-intensity red led (the clear one), the idea is to shine a light towards an object. When the object is present, light will reflect back to the LDR.

