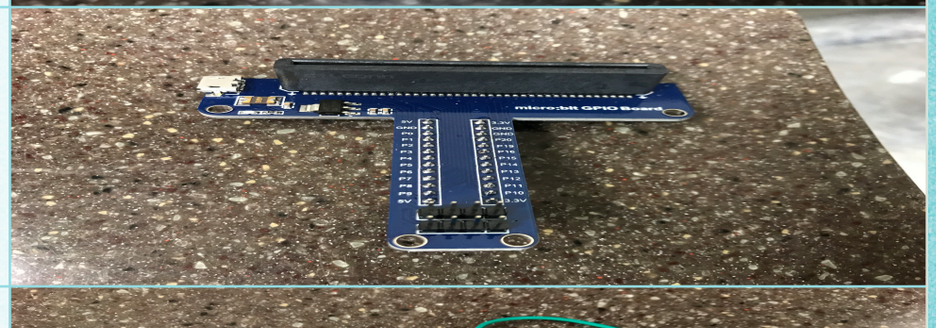
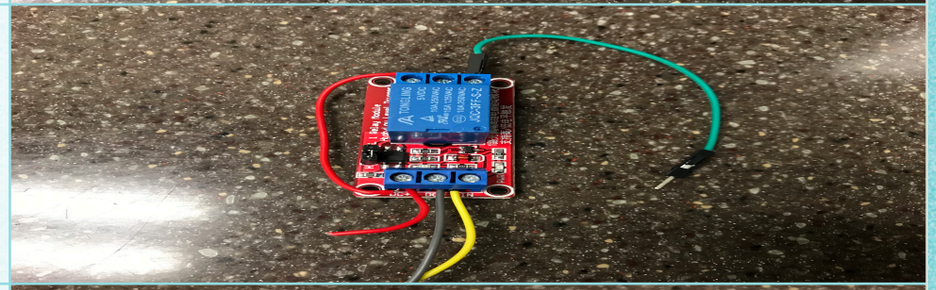
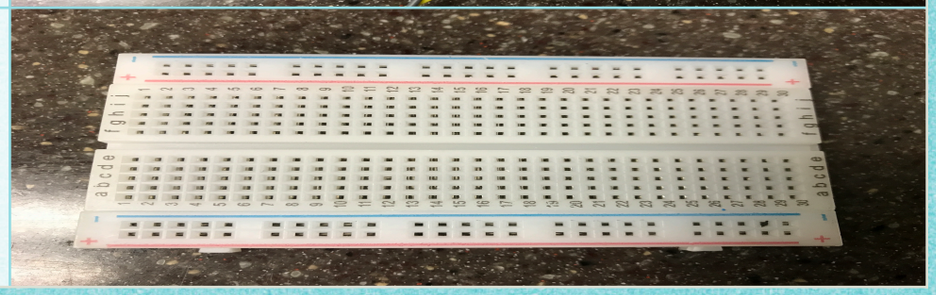
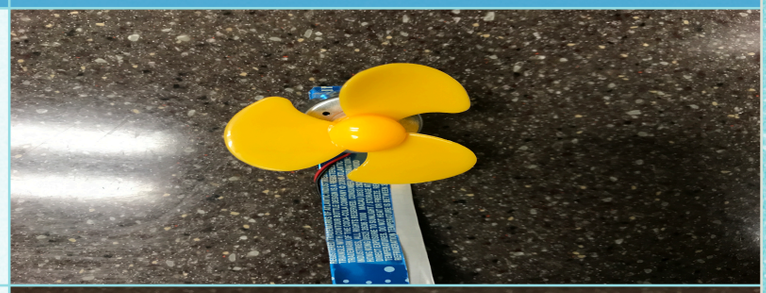
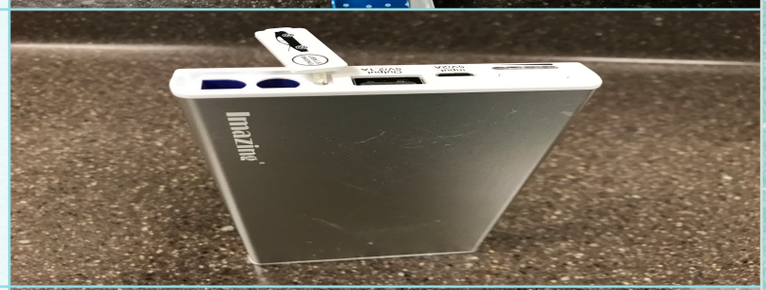
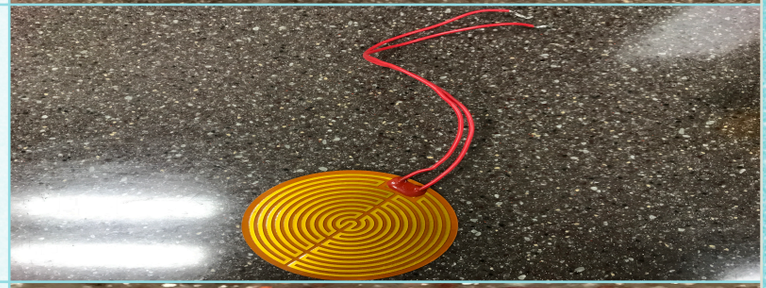
Micro:bit Beverage Warmer for the Elderly

Component	Quantity	Photo
Microbit	1	
Edge Connector	1	
Relay	2	
Breadboard	1	

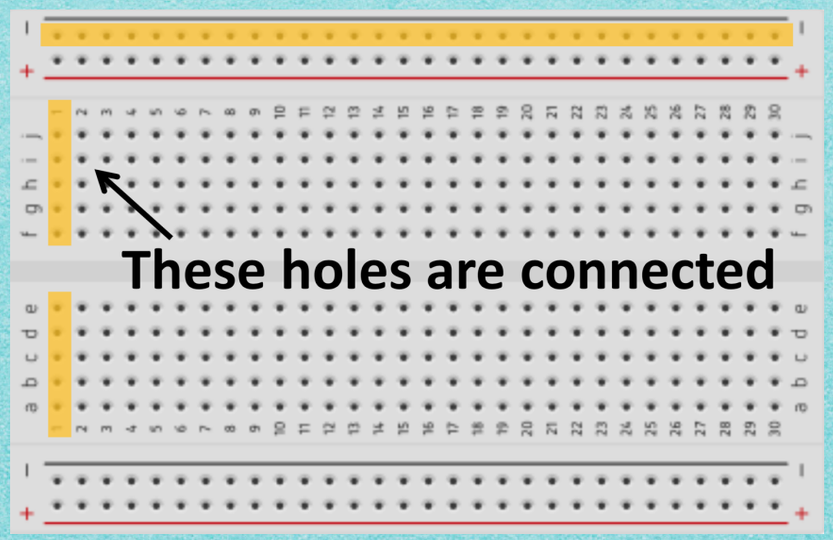
Major Electrical Components

Major Electrical Components

Component	Quantity	Photo
Fan	1	
12V Portable Car Battery Charger	1	
Heater	1	
TMP 36 (temperature sensor)	1	

Breadboard

- Holes highlighted in **the same row/column are connected**



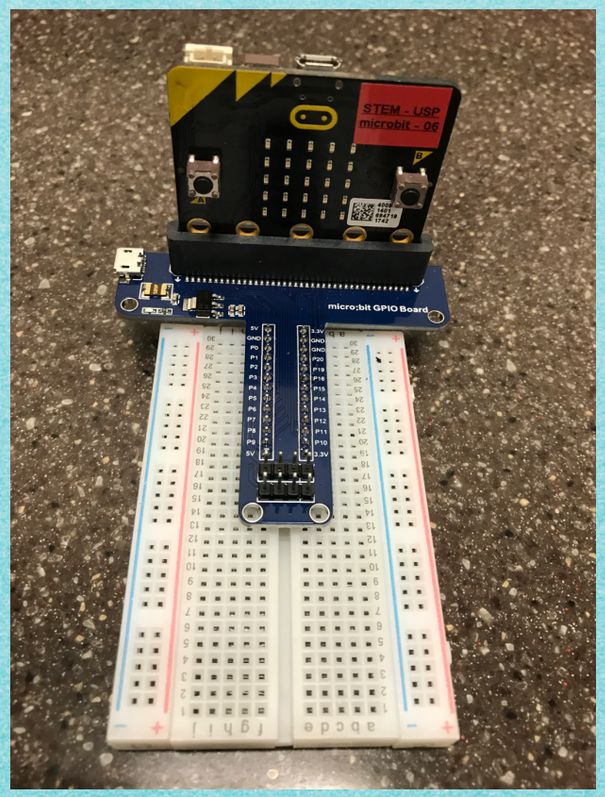
Temperature Sensor (TMP 36)

- We can use **TMP 36** to measure **temperature**

Step 1: insert **microbit** to **edge connector**

Temperature Sensor (TMP 36)

Step 2: Insert the **edge connector** to **breadboard**



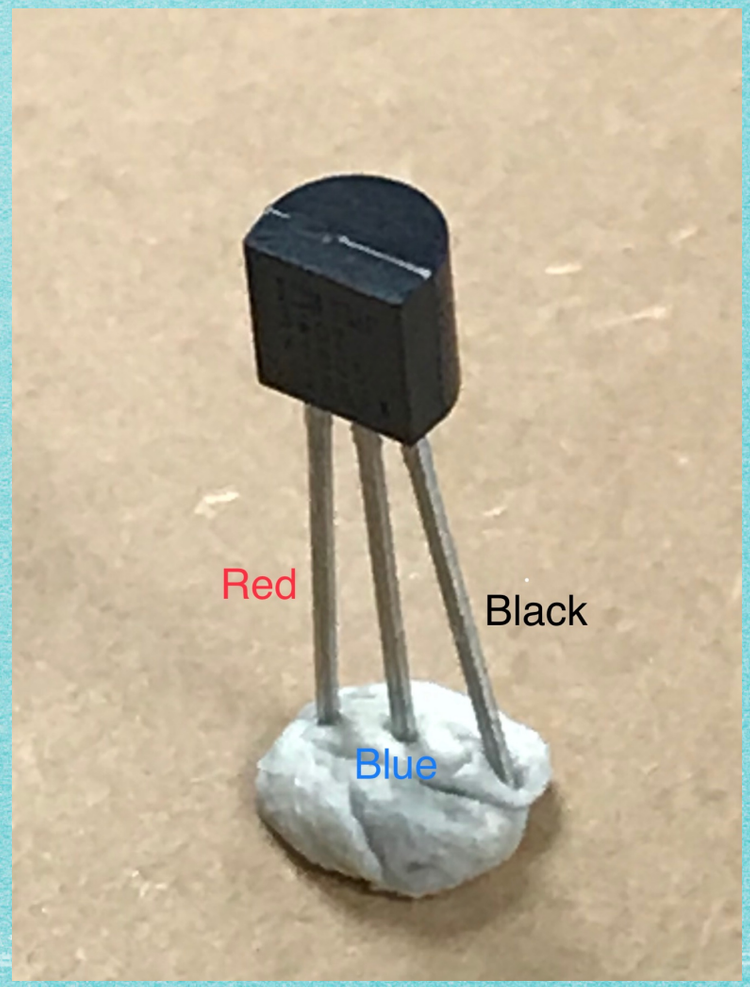
Temperature Sensor (TMP 36)

Step 3: On the flat side of TMP 36, connect the following wires as shown

Red -> left

Blue -> middle

Black -> right



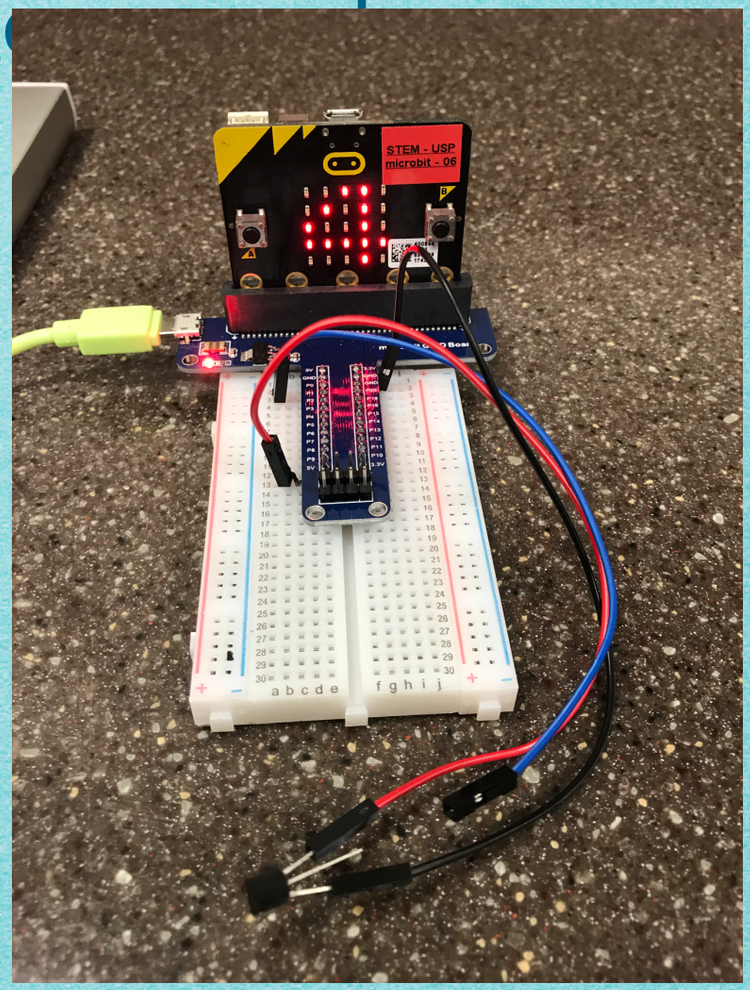
Temperature Sensor (TMP 36)

Step 4: Connect TMP 36 to edge connector as follows:

Red -> 5V

Blue -> pin 0

Black -> GND



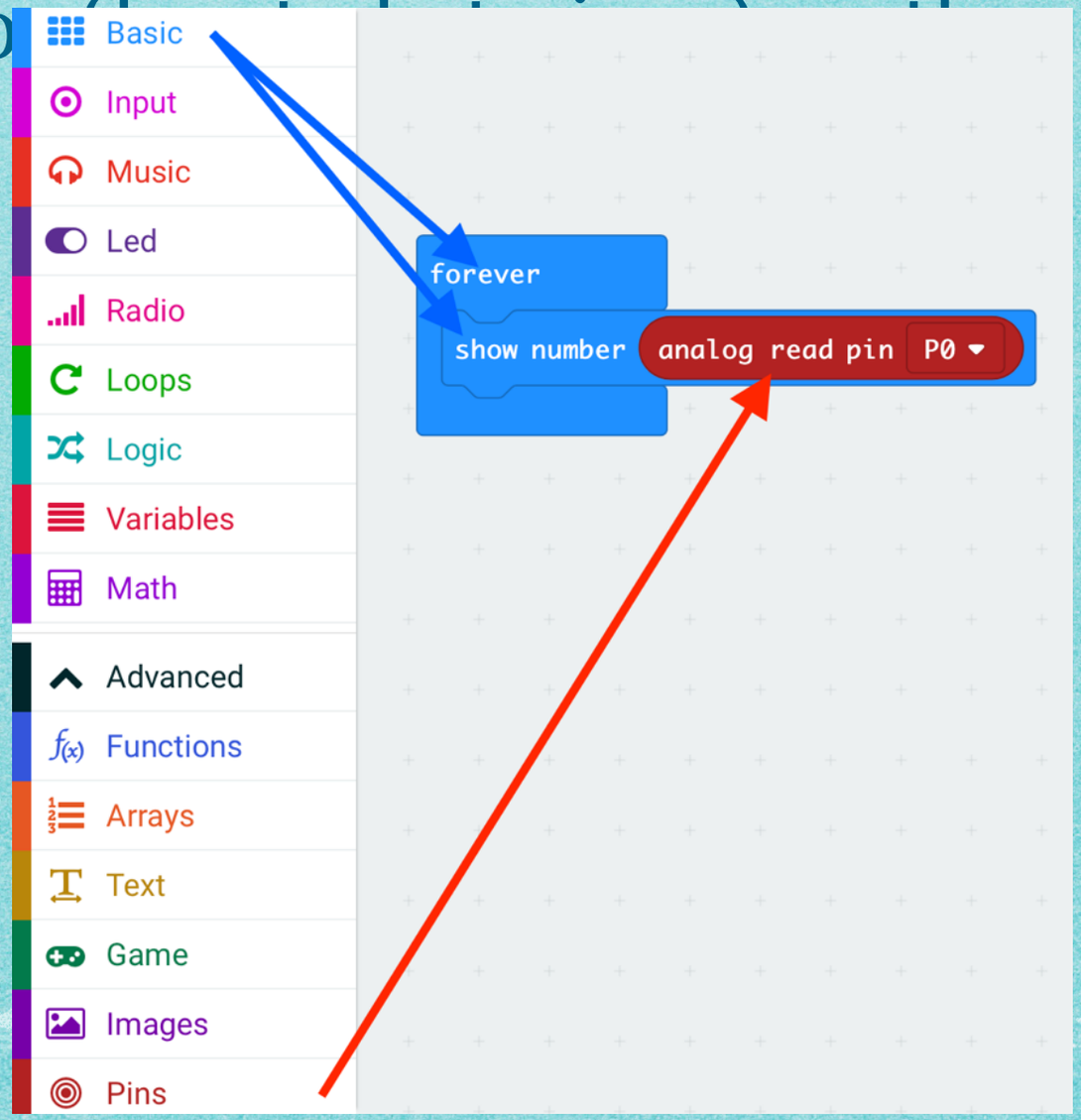
Caution: TMP 36 will burn if the wires are not connected correctly

Codes for Temperature Sensor (TMP 36)

go to http://microbit.org/code/, and choose **let's code**, we arrive at the coding area:

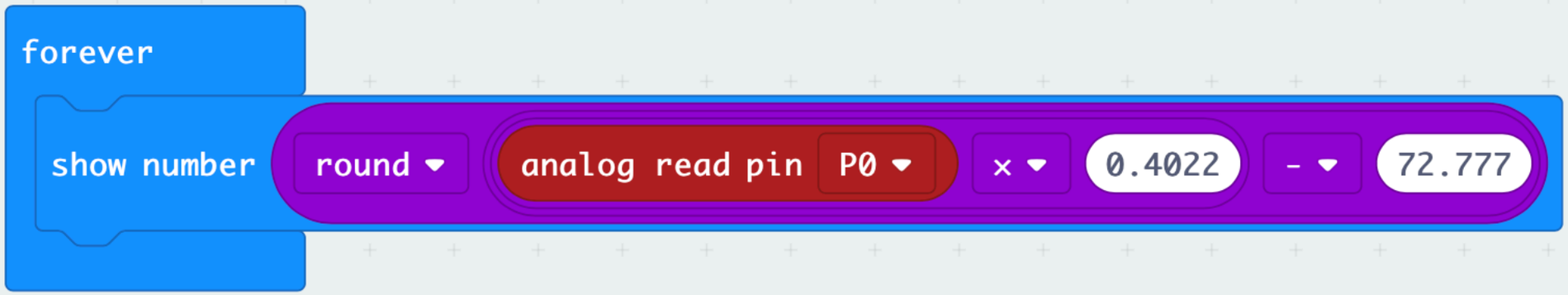
Codes for Temperature Sensor (TMP 36)

Step 5: The following codes output the reading of temperature senso[illegible] microbit



Codes for Temperature Sensor (TMP 36)

Step 6: Calibrate the temperature sensor, and convert the readings of the sensor to temperature values in Celsius



Relay

- High voltage devices could be controlled by Microbits using relays

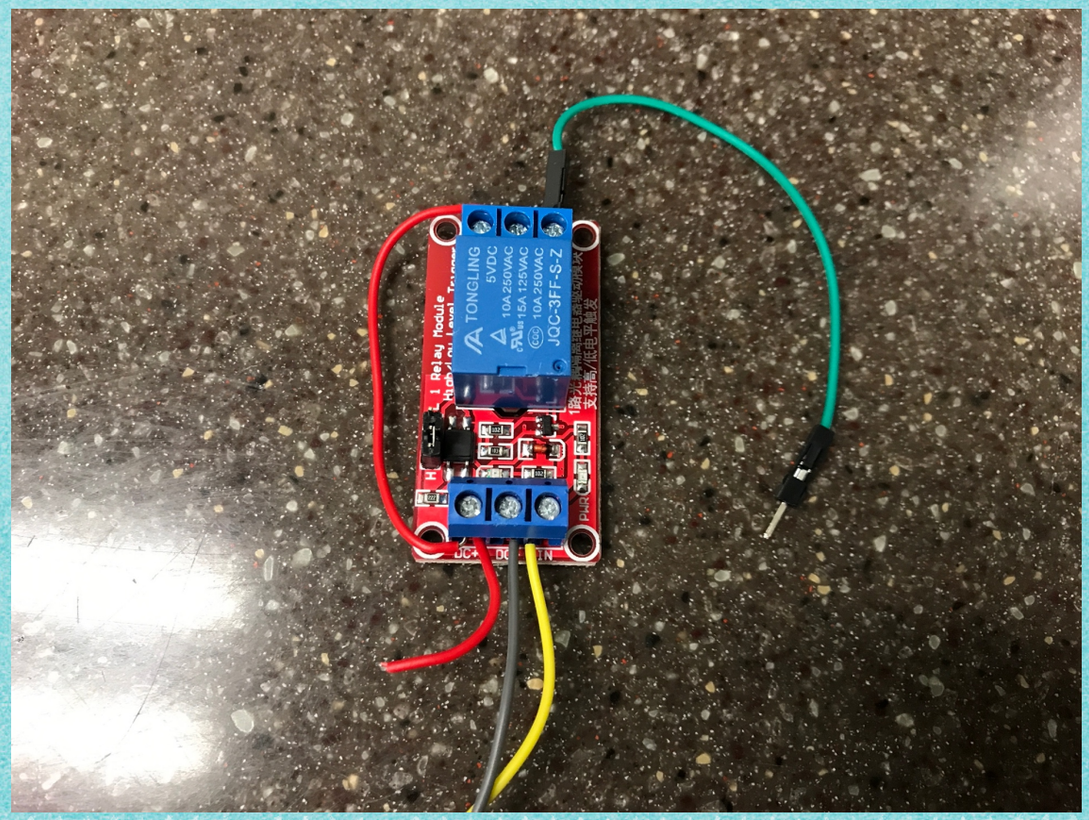
Step 1: Connect wires to relay as shown

DC+ -> COM, **red** wire

DC- -> **grey** wire

IN -> **yellow** wire

NO -> **green** wire



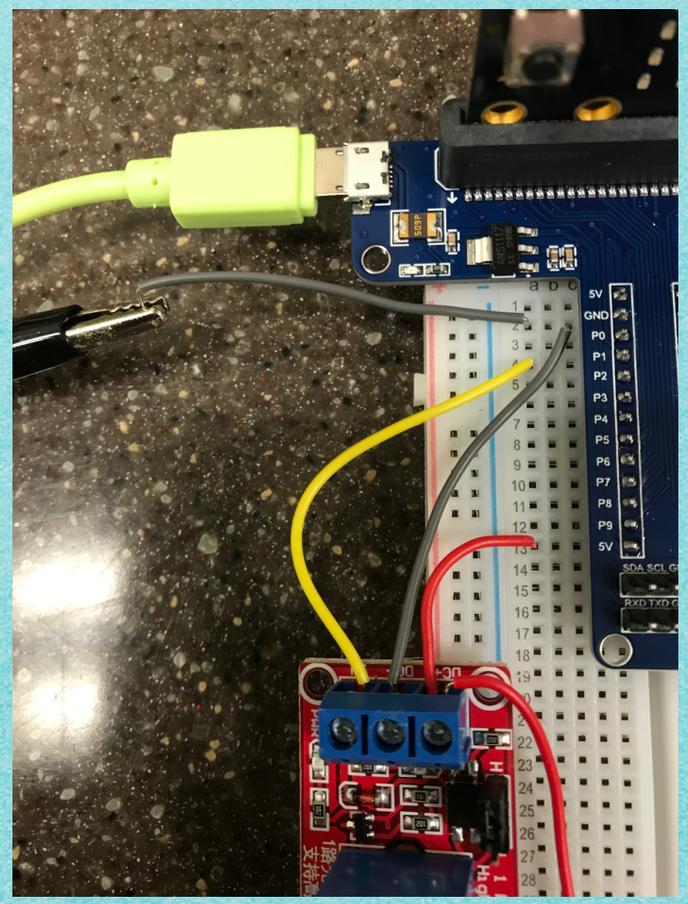
Control Fan with Relay

Step 2: Connect **relay** to **breadboard** as shown:

Red -> 5V

Yellow -> pin 1

Grey -> GND

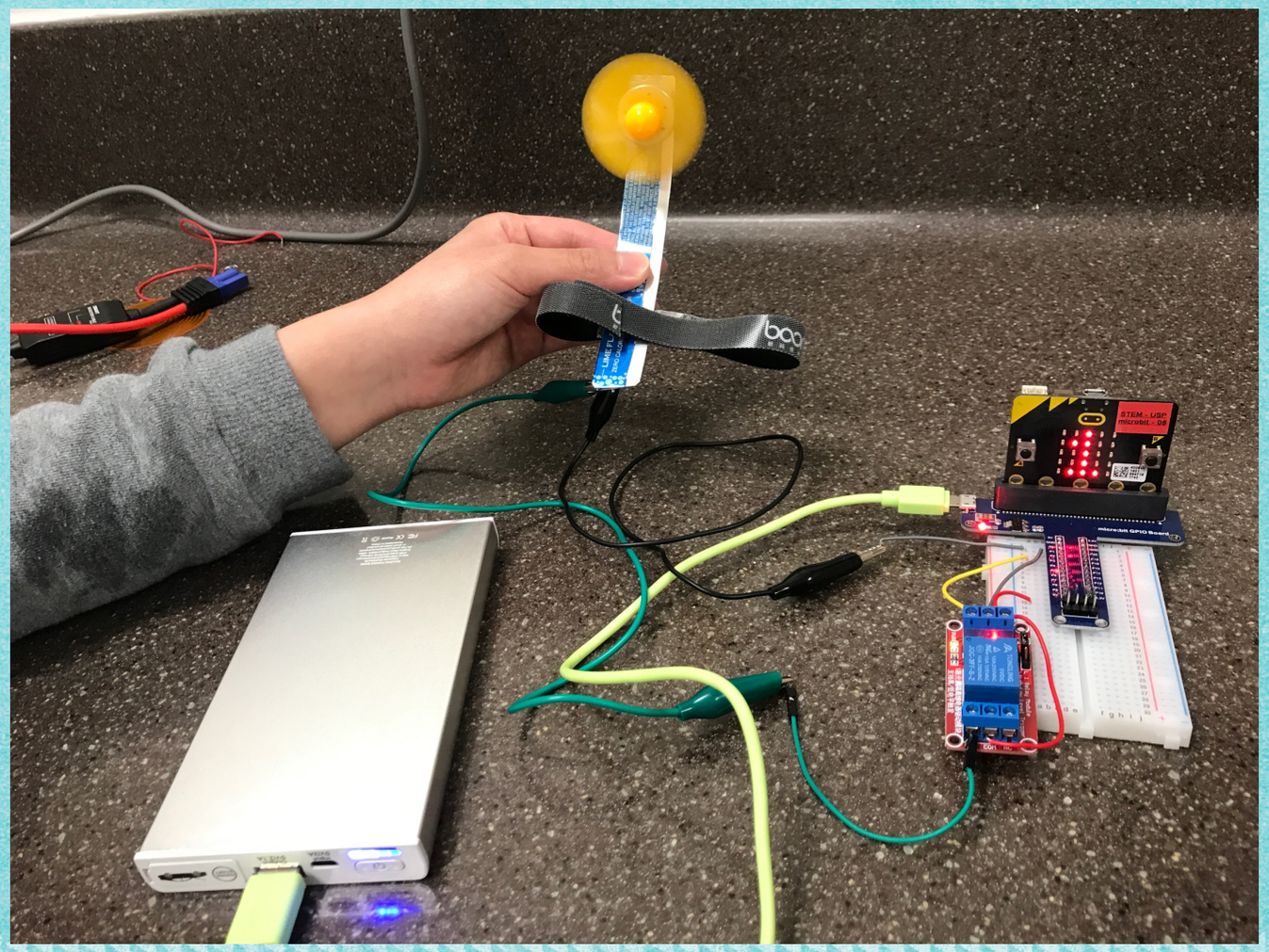


Control Fan with Relay

Step 3: Connect **relay** to **fan** as shown:

Green -> Fan

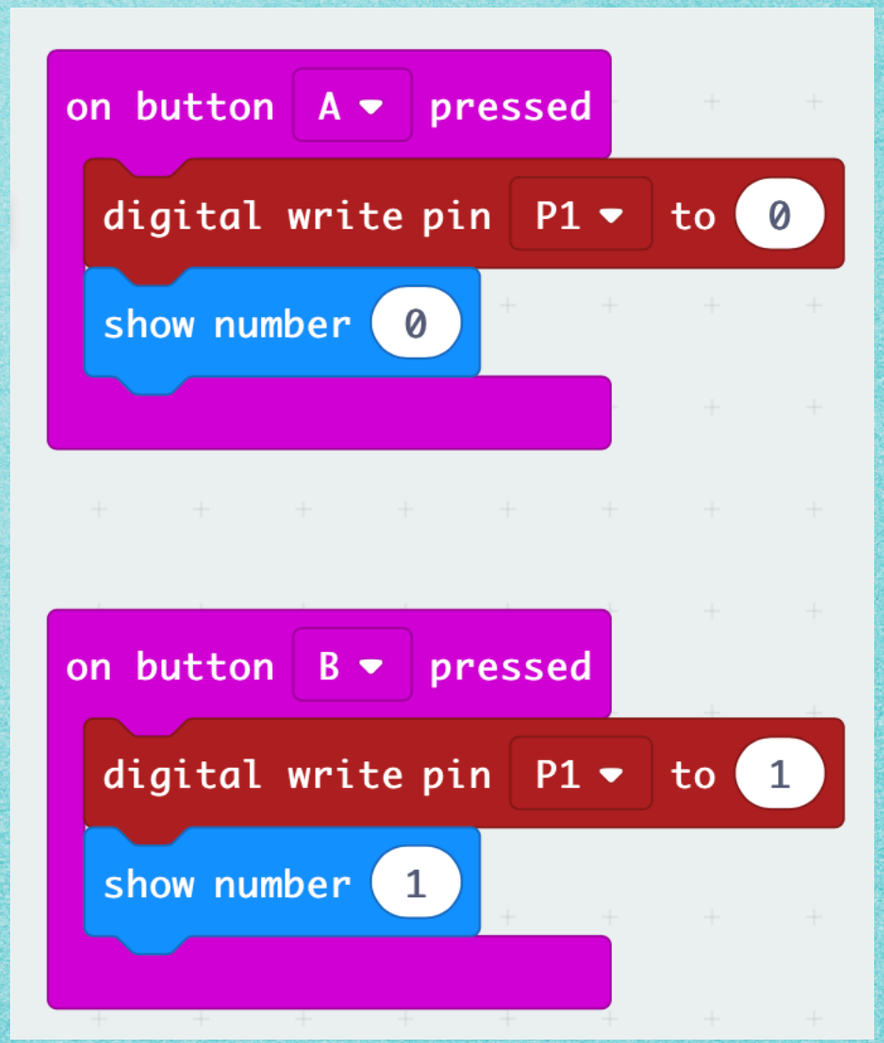
GND -> Fan



Control Fan with Relay

Step 4: The following codes control the relay by pin 1

Check whether the fan works

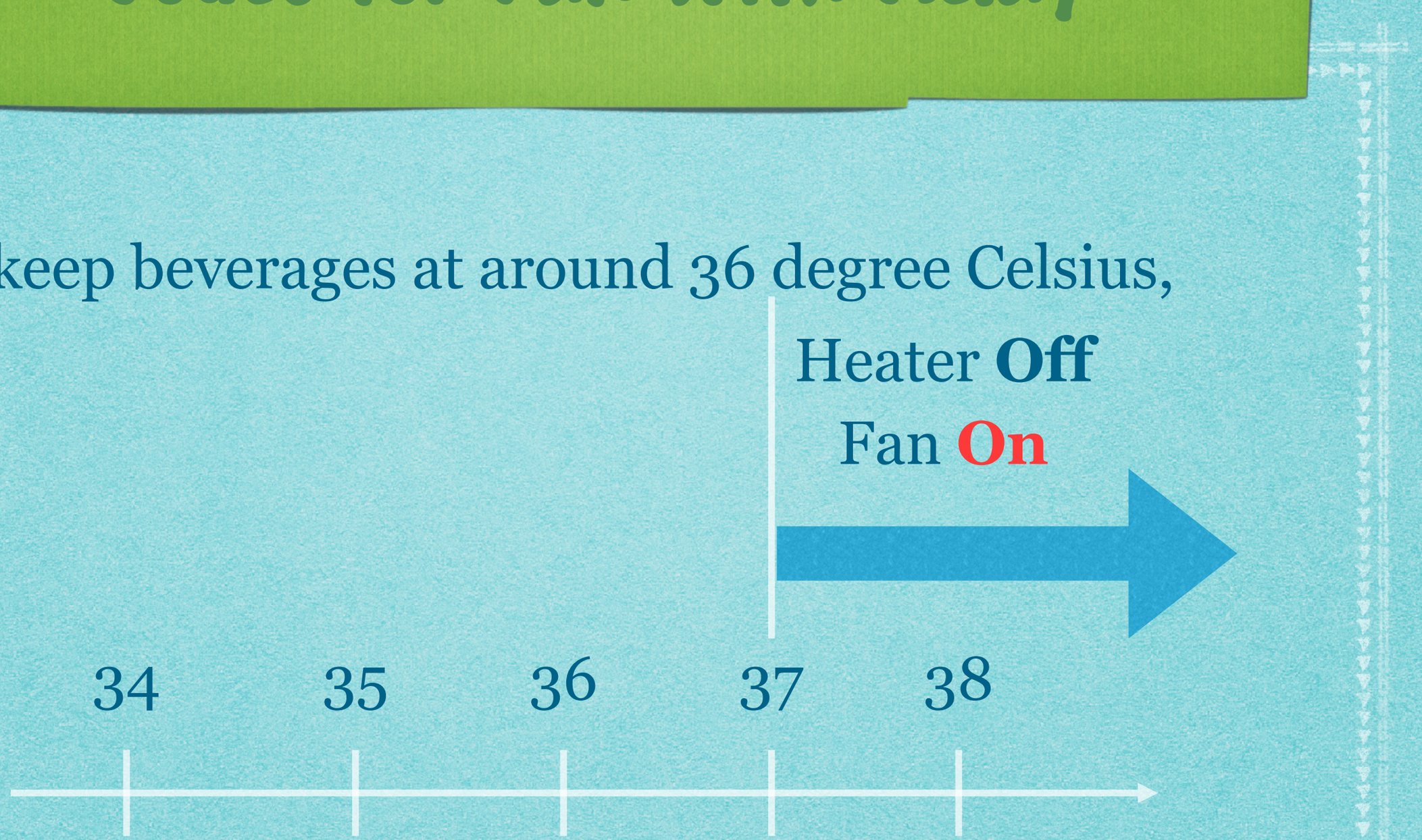


Codes for Fan with Relay

To keep beverages at around 36 degree Celsius,

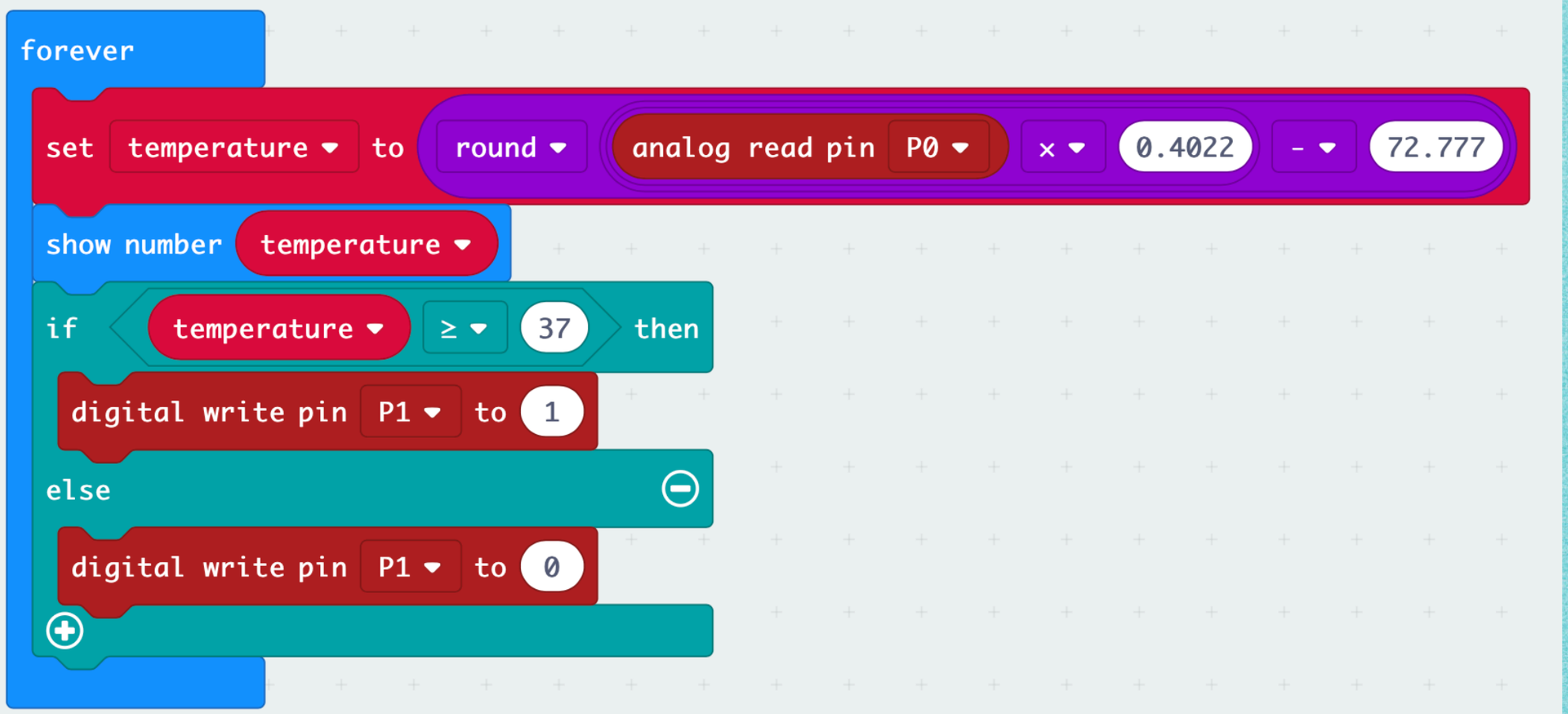
Heater **Off**

Fan **On**



Codes for Fan with Relay

Step 5: The following codes switch on fan if temperature ≥37 degrees at pin 1

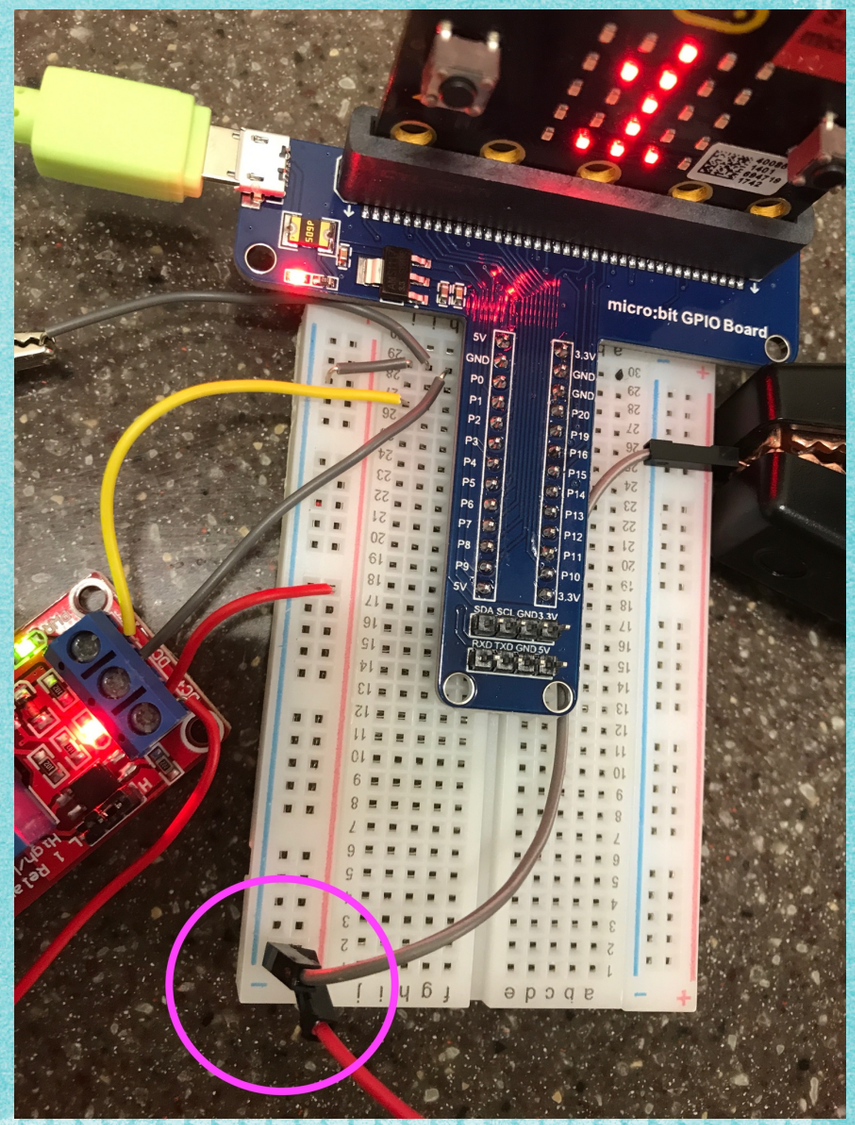


Control Heater with Relay

Step 1: Connect **12V Portable Car Battery Charger** to **breadboard** as shown

Red line on breadboard -> (+) of battery

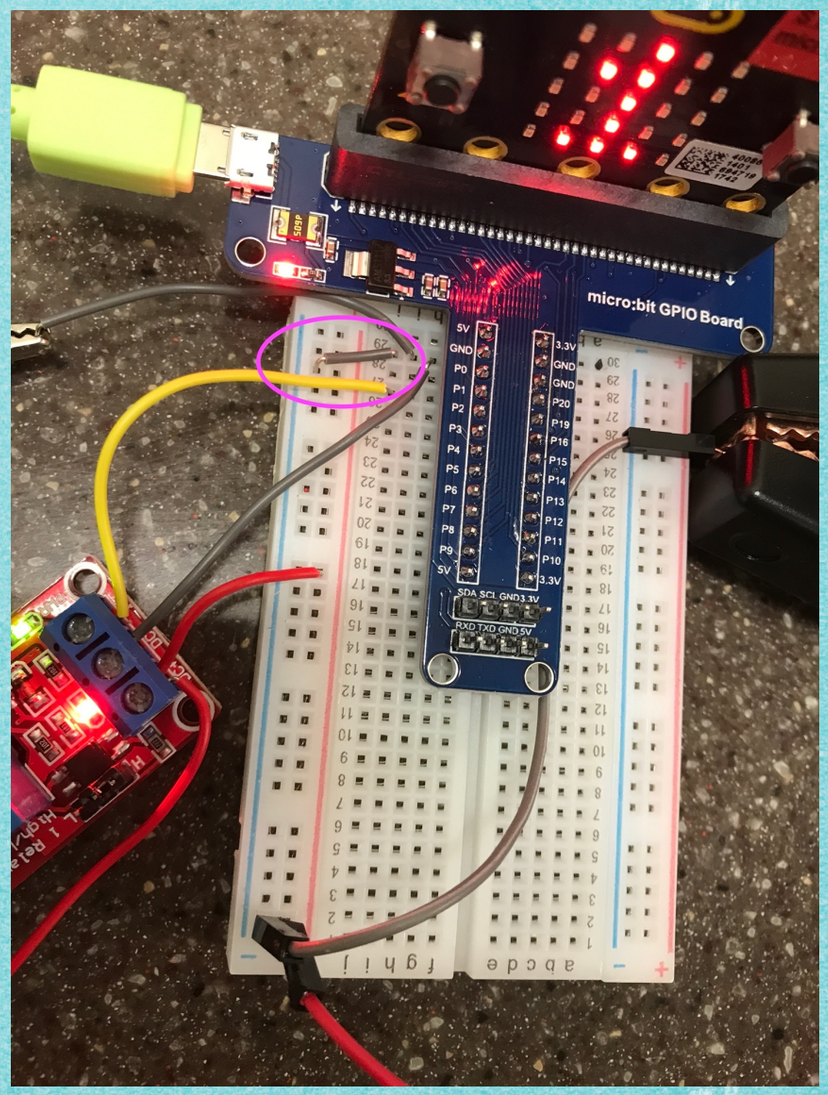
Blue line on breadboard -> (-) of battery



Control Heater with Relay

Step 2: Connect **common ground** as shown

GND (edge connector) -> GND (blue line on breadboard)



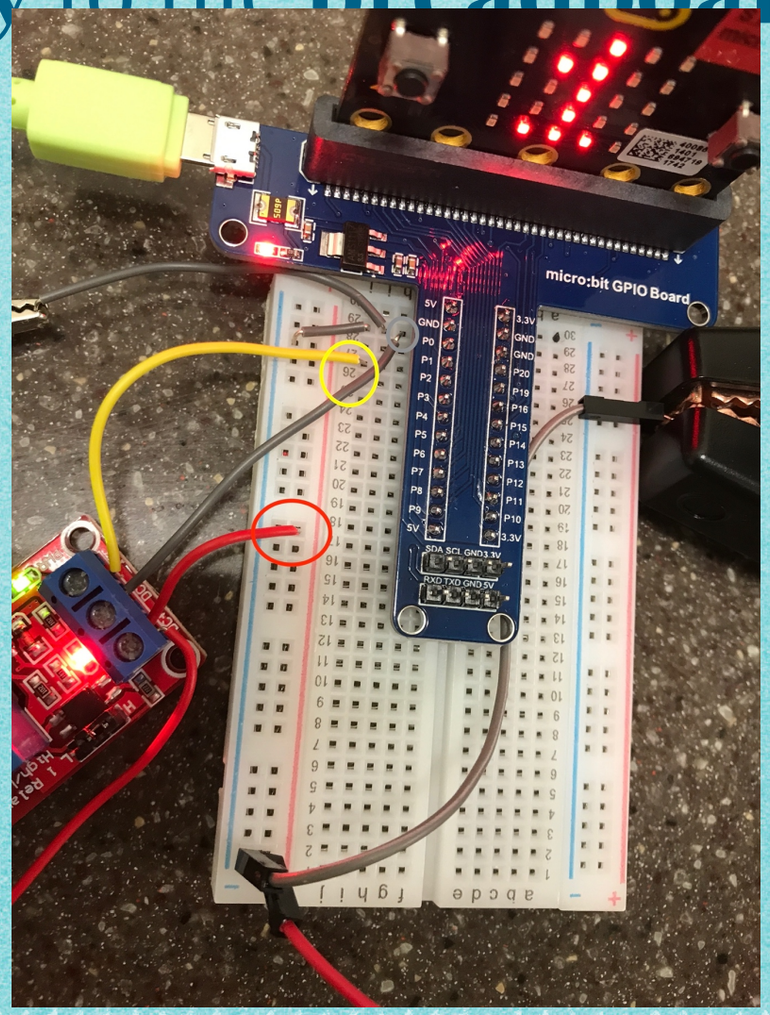
Control Heater with Relay

Step 3: Connect **relay** to the **breadboard**

Red -> 12V

Yellow -> pin 2

Grey -> GND

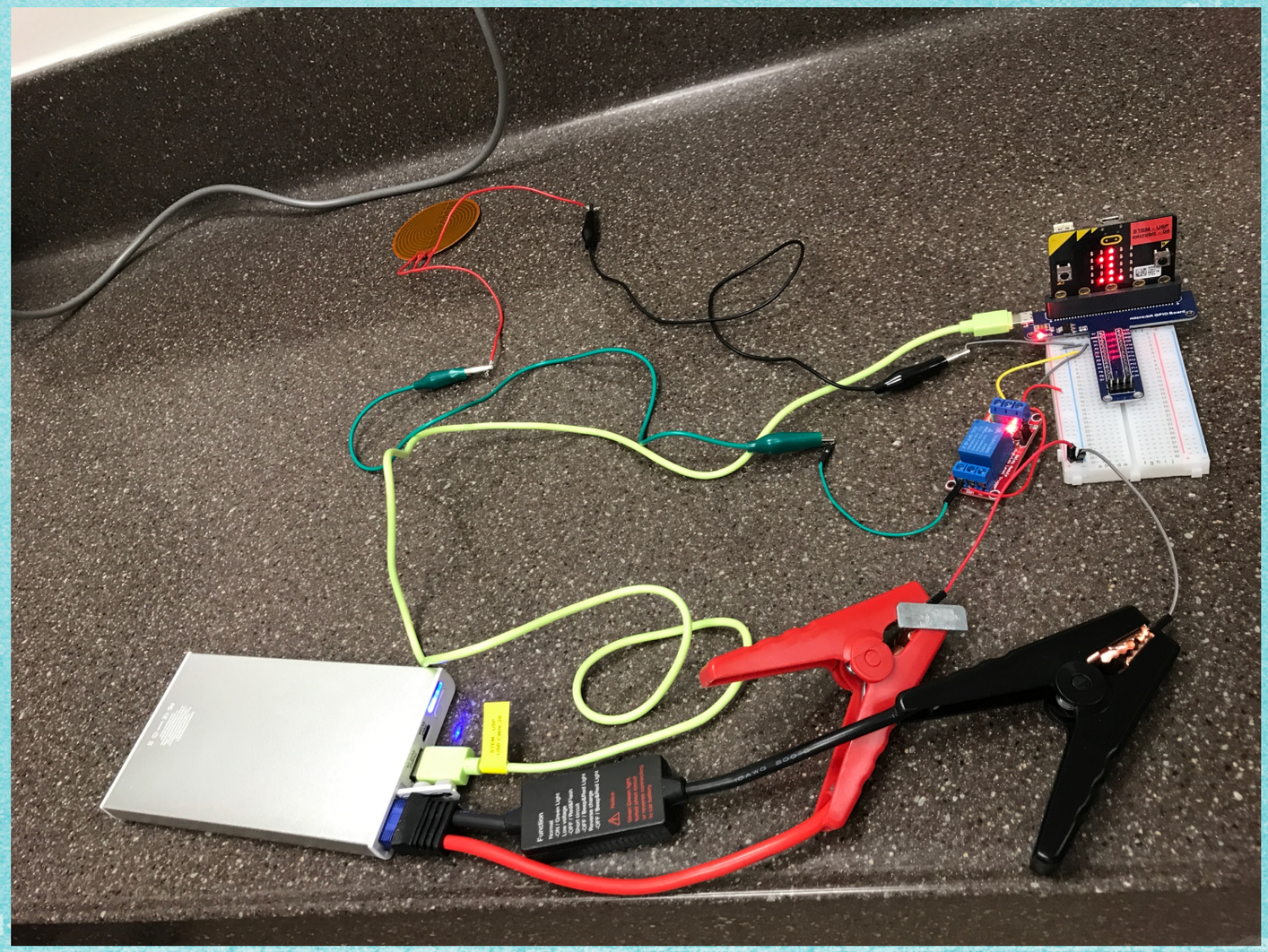


Control Heater with Relay

Step 3: Connect relay to **heater** as shown:

Green -> Heater

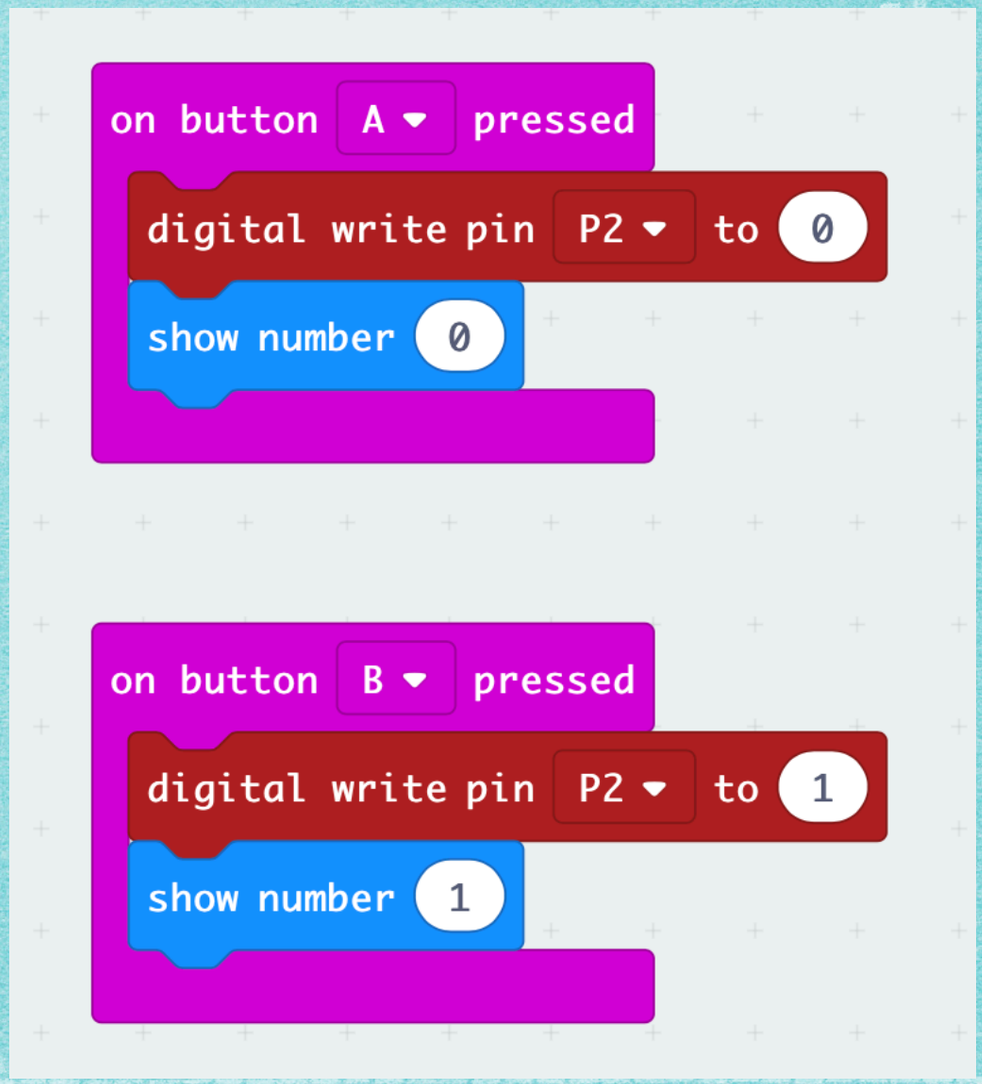
GND -> Fan



Control Heater with Relay

Step 4: The following codes control the relay by pin 2

Check whether the heater works

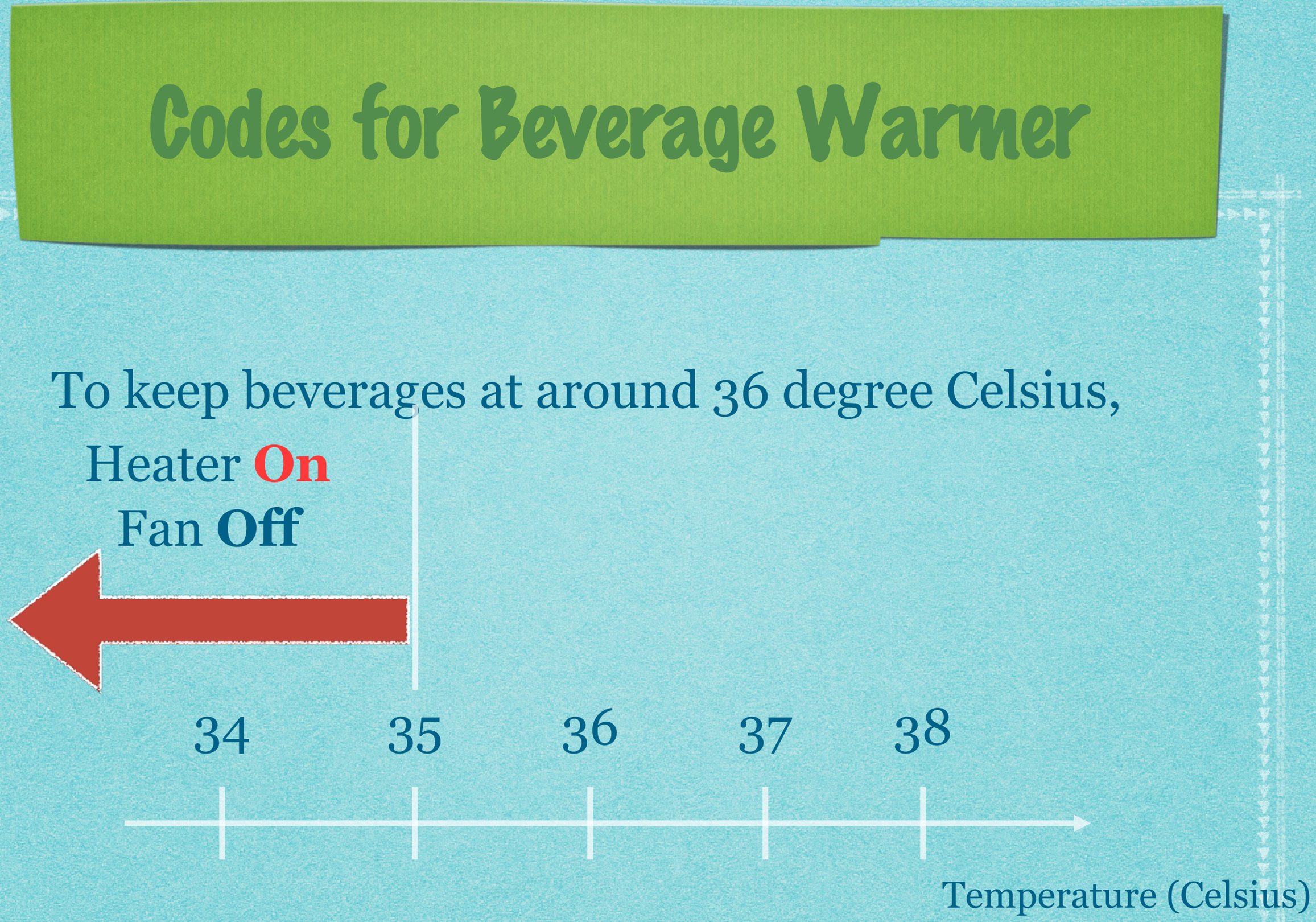


Codes for Beverage Warmer

To keep beverages at around 36 degree Celsius,

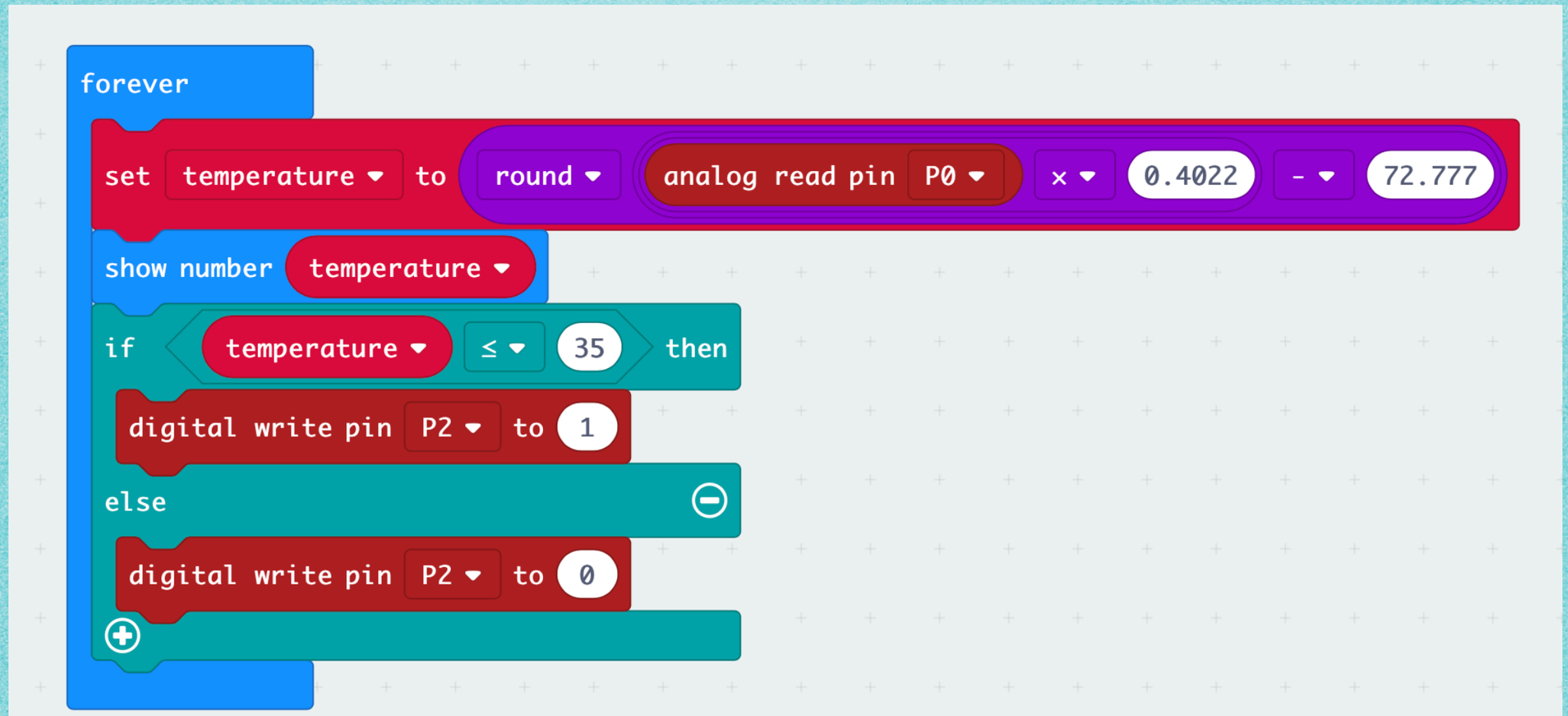
Heater **On**

Fan **Off**



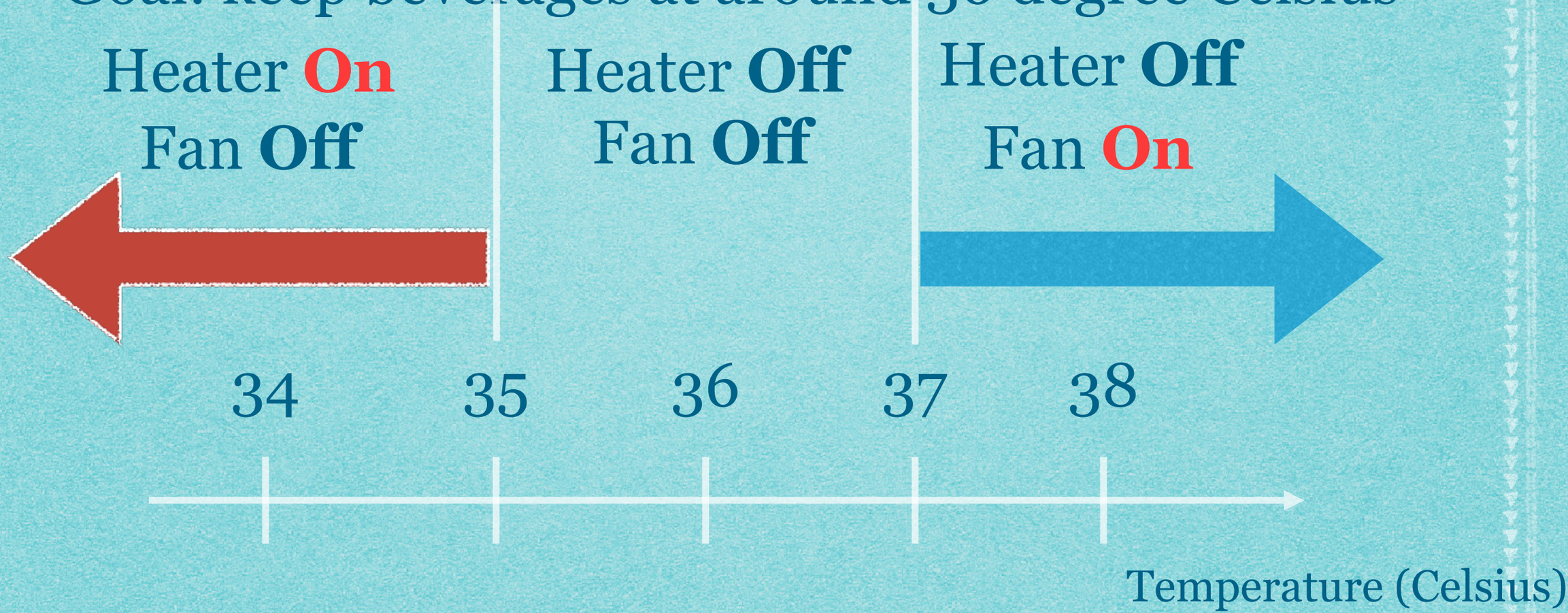
Codes for Heater with Relay

Step 5: The following codes switch on heater if temperature ≤ 35 degrees at pin 2



Codes for Beverage Warmer

Goal: keep beverages at around 36 degree Celsius



Codes for Beverage Warmer

```
forever
  set temperature to round analog read pin P0 × 0.4022 - 72.777
  show number temperature
  if temperature ≤ 35 then
    digital write pin P2 to 1
  else
    digital write pin P2 to 0
  if temperature ≥ 37 then
    digital write pin P1 to 1
  else
    digital write pin P1 to 0
```

Here is our Beverage Warmer