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Analog and digital temperature sensors

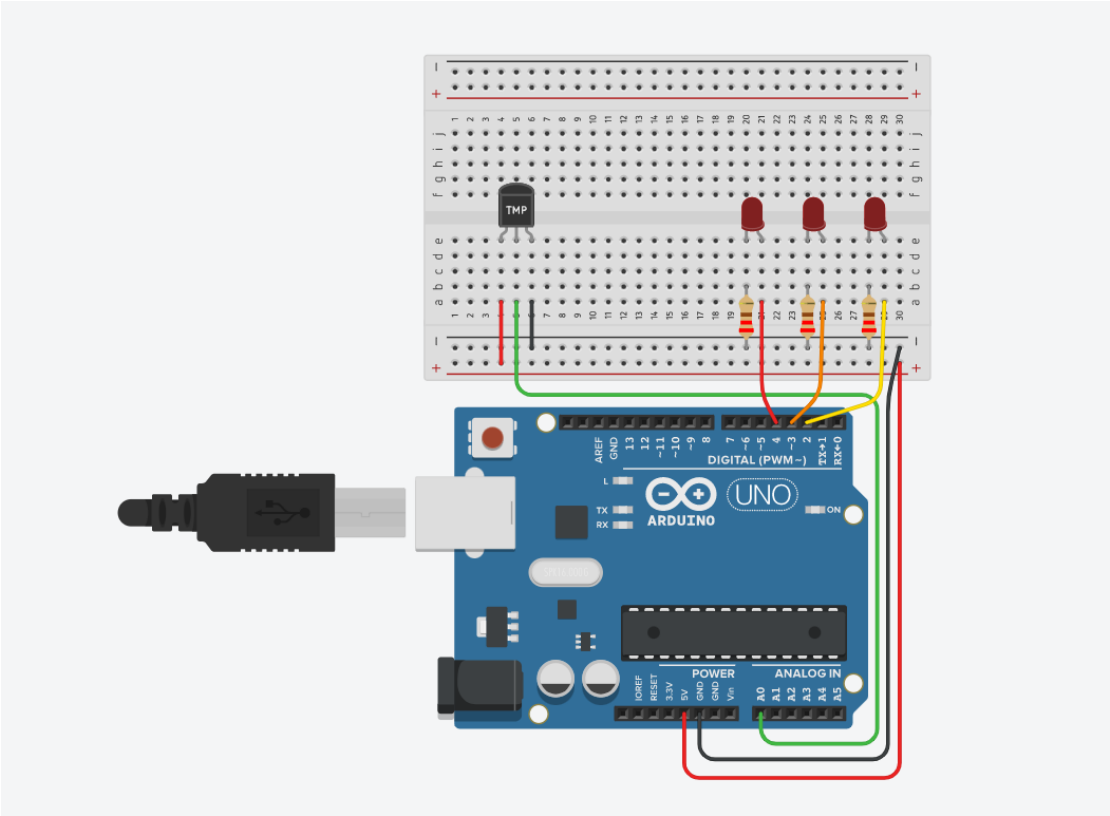
About temperature sensors

What is a temperature sensor? A temperature sensor is a device used to measure temperature. This can be air temperature, liquid temperature or the temperature of solid matter.

There are different types of temperature sensors available and they each use different technologies and principles to take the temperature measurement.

Analog temperature sensor

Circuit diagram



Components:

Quantity	Component
1	Arduino Uno R3
1	Temperature Sensor [TMP36]
3	Red LED
3	220 Ω Resistor

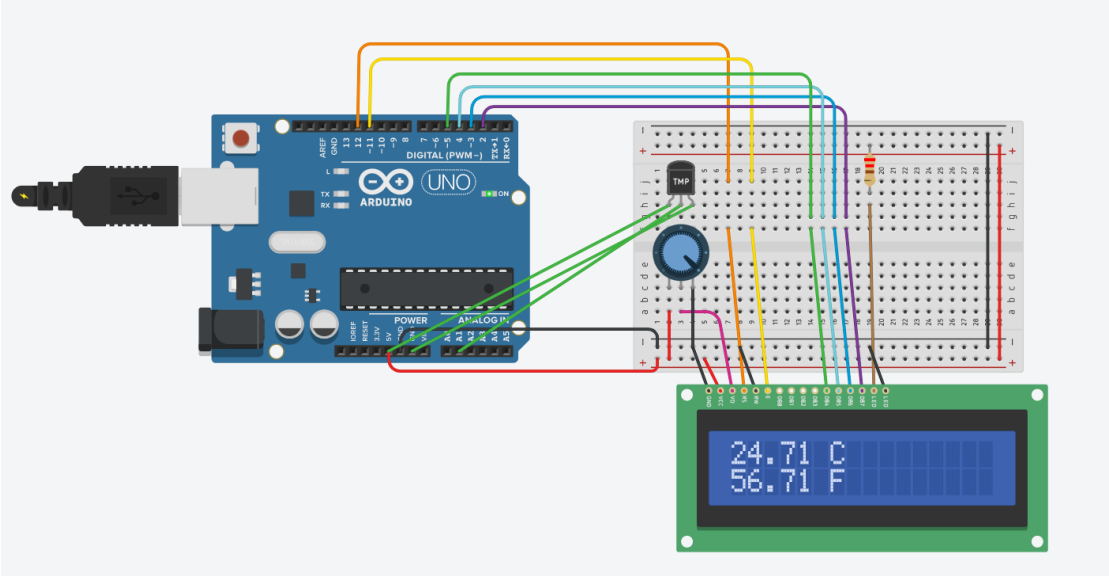
The code:

```
int baselineTemp = 0;


int celsius = 0;


int fahrenheit = 0;


void setup()
{
  pinMode(A0, INPUT);
  Serial.begin(9600);


  pinMode(2, OUTPUT);
  pinMode(3, OUTPUT);
  pinMode(4, OUTPUT);
}


void loop()
{
  // set threshold temperature to activate LEDs
  baselineTemp = 40;
  // measure temperature in Celsius
  celsius = map(((analogRead(A0) - 20) * 3.04), 0, 1023, -40, 125);
  // convert to Fahrenheit
  fahrenheit = ((celsius * 9) / 5 + 32);
  Serial.print(celsius);
  Serial.print(" C, ");
  Serial.print(fahrenheit);
```

```
  Serial.println(" F");
  if (celsius < baselineTemp) {
    digitalWrite(2, LOW);
    digitalWrite(3, LOW);
    digitalWrite(4, LOW);
  }
  if (celsius >= baselineTemp && celsius < baselineTemp + 10) {
    digitalWrite(2, HIGH);
    digitalWrite(3, LOW);
    digitalWrite(4, LOW);
  }
  if (celsius >= baselineTemp + 10 && celsius < baselineTemp + 20) {
    digitalWrite(2, HIGH);
    digitalWrite(3, HIGH);
    digitalWrite(4, LOW);
  }
  if (celsius >= baselineTemp + 20 && celsius < baselineTemp + 30) {
    digitalWrite(2, HIGH);
    digitalWrite(3, HIGH);
    digitalWrite(4, HIGH);
  }
  if (celsius >= baselineTemp + 30) {
    digitalWrite(2, HIGH);
    digitalWrite(3, HIGH);
    digitalWrite(4, HIGH);
  }
  delay(1000); // Wait for 1000 millisecond(s)
}
```

Digital temperature sensor

Circuit diagram



Components:

Quantity	Component
1	Temperature Sensor [TMP36]
1	Arduino Uno R3
1	LCD 16 x 2
1	220 Ω Resistor
1	250 kΩ Potentiometer

The code:

```
/*
 LiquidCrystal Library - Hello World

Demonstrates the use a 16x2 LCD display.  The LiquidCrystal
library works with all LCD displays that are compatible with the
Hitachi HD44780 driver. There are many of them out there, and you
can usually tell them by the 16-pin interface.

This sketch prints "Hello World!" to the LCD
and shows the time.

 The circuit:
* LCD RS pin to digital pin 12
* LCD Enable pin to digital pin 11
* LCD D4 pin to digital pin 5
* LCD D5 pin to digital pin 4
* LCD D6 pin to digital pin 3
* LCD D7 pin to digital pin 2
* LCD R/W pin to ground
* LCD VSS pin to ground
* LCD VCC pin to 5V
* 10K resistor:
* ends to +5V and ground
* wiper to LCD VO pin (pin 3)

Library originally added 18 Apr 2008
by David A. Mellis
library modified 5 Jul 2009
by Limor Fried (http://www.ladyada.net)
example added 9 Jul 2009
```

```
 by Tom Igoe
 modified 22 Nov 2010
 by Tom Igoe

 This example code is in the public domain.

 http://www.arduino.cc/en/Tutorial/LiquidCrystal
 */

// include the library code:
#include <LiquidCrystal.h>
int sensorPin = 1;

// initialize the library with the numbers of the interface pins
LiquidCrystal lcd(12, 11, 5, 4, 3, 2);

void setup() {
  // set up the LCD's number of columns and rows:
  lcd.begin(16, 2);
  lcd.setCursor(0,0);
  Serial.begin(9600);
  // Print a message to the LCD.
}

void loop() {
  // set the cursor to column 0, line 1
  // (note: line 1 is the second row, since counting begins with 0):
  lcd.setCursor(0, 1);
  int reading = analogRead(sensorPin);
  float voltage = reading * 5.0;
 voltage /= 1024.0;
  // print the number of seconds since reset:

  // now print out the temperature
  float temp = (voltage - 0.5) * 100 ;  //converting from 10 mv per degree wit 500 mV offset
```

```
                                    //to degrees ((voltage - 500mV) times 100)
  float far;
  far = temp * (9/5) +32;
  lcd.setCursor(0,0);
  lcd.print(temp);
  lcd.print(" C");
  lcd.setCursor(0,1);
  lcd.print(far);
  lcd.print(" F");
  delay(1000);
  lcd.clear();
}
;
```