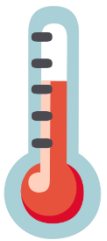# Let's build a Weather Station!

First, let's look at what we are going to measure in our weather station:
Temperature and Humidity

TEMPERATURE:
Temperature is the measure of heat expressed in terms of several scales, including Fahrenheit and Celsius.

HUMIDITY:
Humidity is the concentration of water vapour present in the air. Humidity can indicate the likelihood for precipitation.
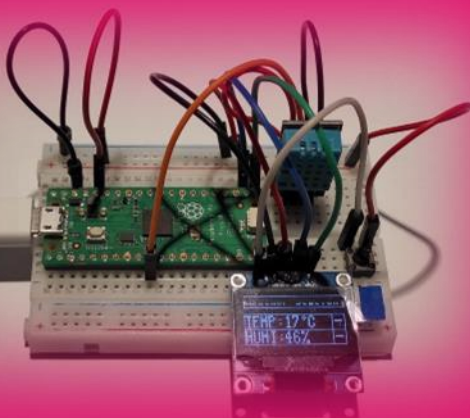

What is a weather station?

A weather station is a facility, either on land or sea, with instruments and equipment for measuring atmospheric conditions to provide information for weather forecasts and to study the weather and climate.

The measurements taken include temperature, atmospheric pressure, humidity, wind speed, wind direction, and precipitation amount.

Wind measurements are taken with as few other obstructions as possible, while temperature and humidity measurements are kept free from direct solar radiation.
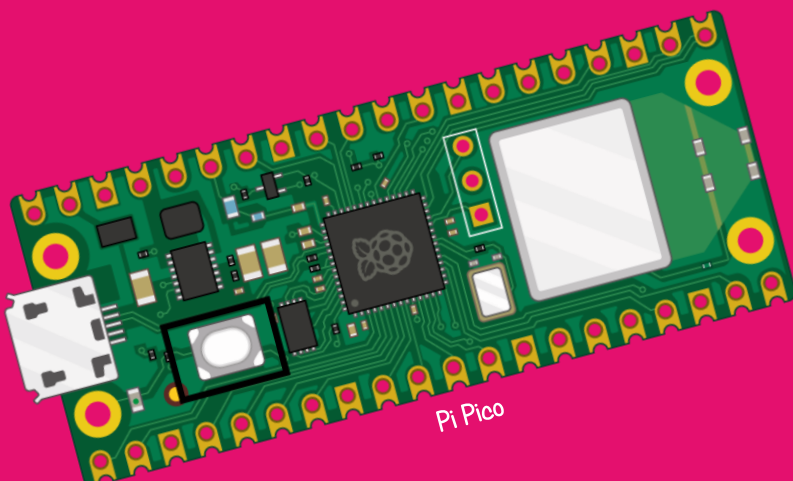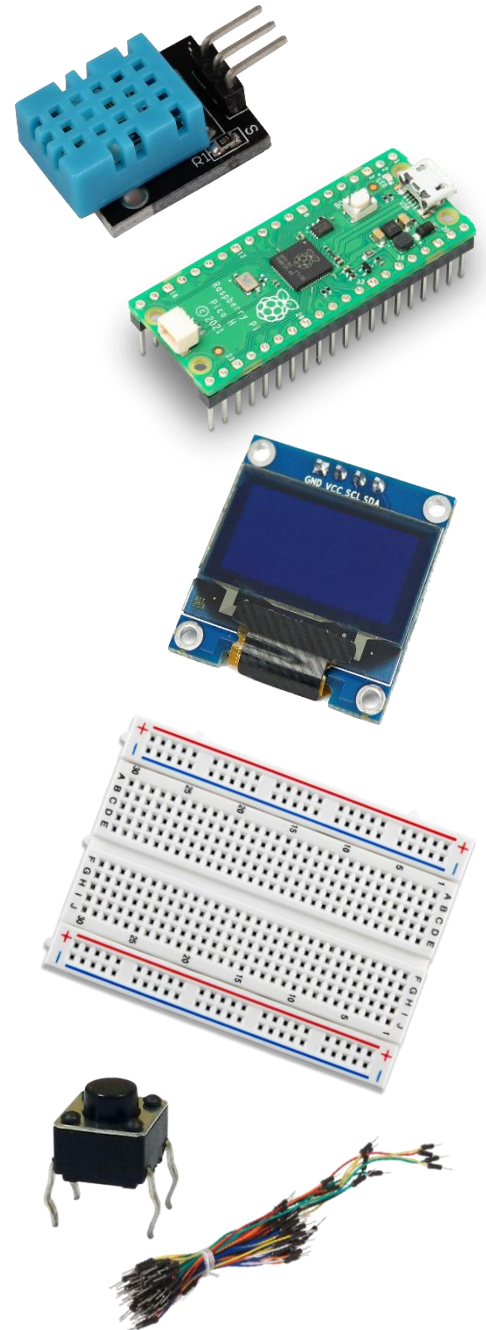

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Let's build a Weather Station!

What are we going to need to build our weather station?

KIT LIST

1 * DHT11 Sensor

1 * Pi Pico

1 * Button switch

1 * oled 1306 Display

1 * Breadboard

11 * Jumper wires

1 * USB Cable

Kit

Pi Pico

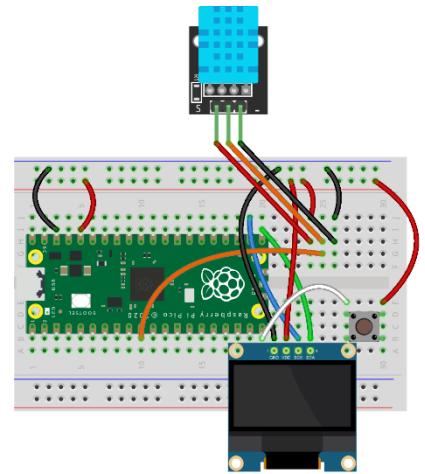**University of Sunderland**

Let's build a Weather Station!

From design to build what will our weather station end up looking like?
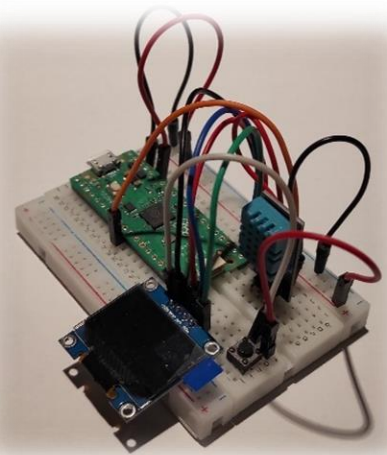
KIT LIST

1 * DHT11 Sensor

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1 * oled 1306 Display

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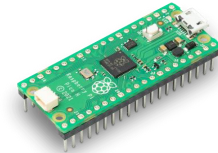1 * USB Cable

Design

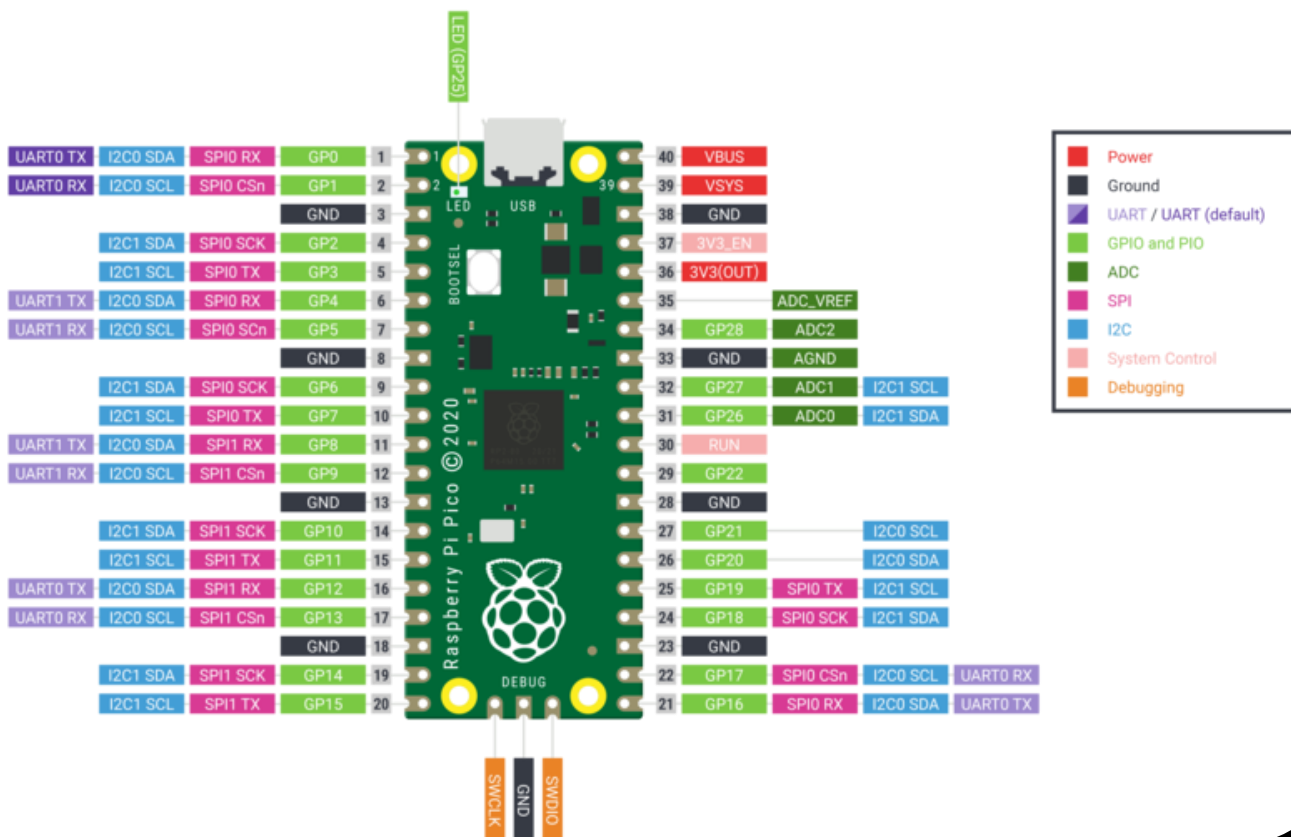## Build

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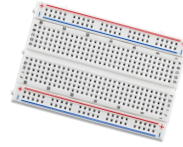
Let's build a Weather Station!

We're using a Raspberry Pi Pico as our microprocessor. So, what exactly is it?

Raspberry Pi Pico is Raspberry Pi's first microcontroller board, designed especially for physical computing. Microcontrollers are a different type of device than Single Board Computers (like the Raspberry Pi 4 and previous generations of Pi). They don't run an operating system and they are typically programmed to do just one task – though that task can be pretty intricate and exciting! They're perfect for experimenting with hardware and using as the brains of custom devices, machines, and inventions.

Let's build a Weather Station!

We're building our weather station
as a prototype
using a breadboard.
So, what exactly is a breadboard?

A breadboard is used as a platform to prototype your circuits on. They provide a reusable environment that allows different ideas to be tested.
Breadboards come in different sizes. but they all have a pattern of holes for jumper wires. The main area has holes connected vertically and the edges (power rails) have the holes connected horizontally.
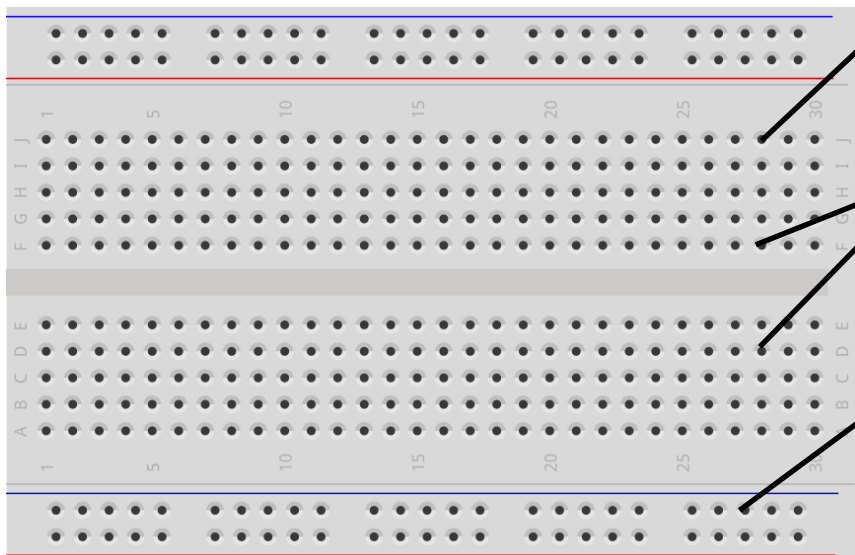
Vertically connected holes to allow patching to other vertical areas..
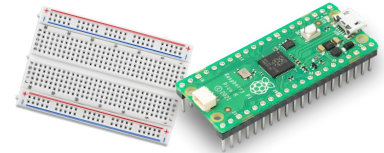
The two areas are separate to allow more devices to be included.

Horizontally connected rows to distribute power to devices. RED for positive (+). BLUE for negative (-).
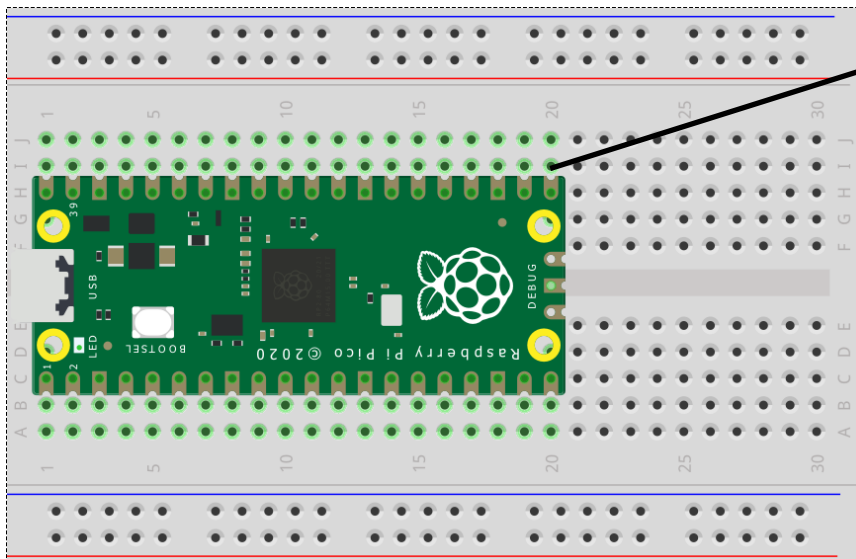
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Let's build a Weather Station!

It's time to put the microprocessor onto the breadboard which is where we are going to build our weather station.
So how do we line them up and fix them together?

The breadboard has 30/60 columns in two blocks in the centre. The Pico must be located at the very left-hand side with the microprocessor pins in the middle of the two blocks and let left most pins lined up to the very left-hand edge. as shown in the diagram below.

Be very careful pressing the Pico down. don't force it or it may break. Press gently at the edges so it sits flush to the breadboard with the Pico pins all the way in so you cannot see them.
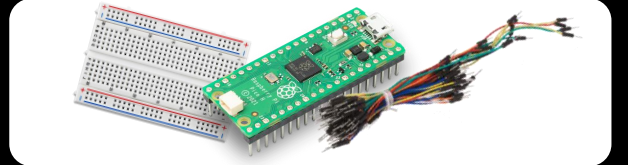
Make sure there are 2 rows above and below the Pico.

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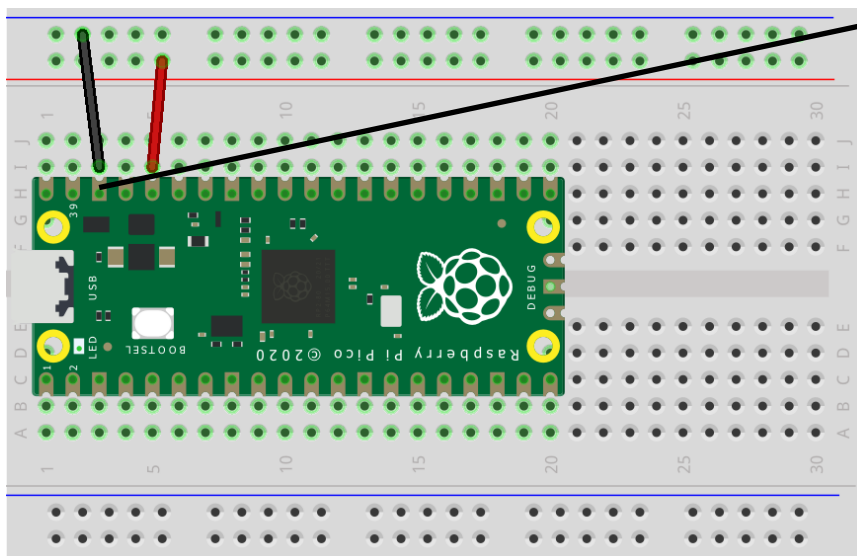
Let's build a Weather Station!

That's the Pico on the breadboard and we can start adding all the components and wires.
Let's start by adding power to the power rails (rows) at the top of the board.

The top row of the breadboard needs to have a 3.3v (+) and ground (GND) added to them.
We can do this by adding a wire from the 3.3v power out on Pico to the RED rail with a wire and a GND to the BLUE rail using a wire. See the diagram on page 4 for the Pins.
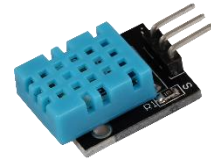Pin 38 – BLUE rail. Pin 36—RED Rail

You can tell the GND pin as it has square edges. (There's a few!)
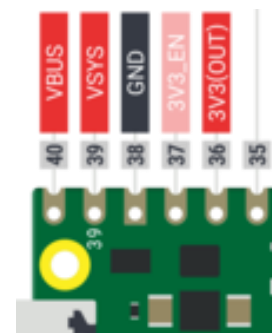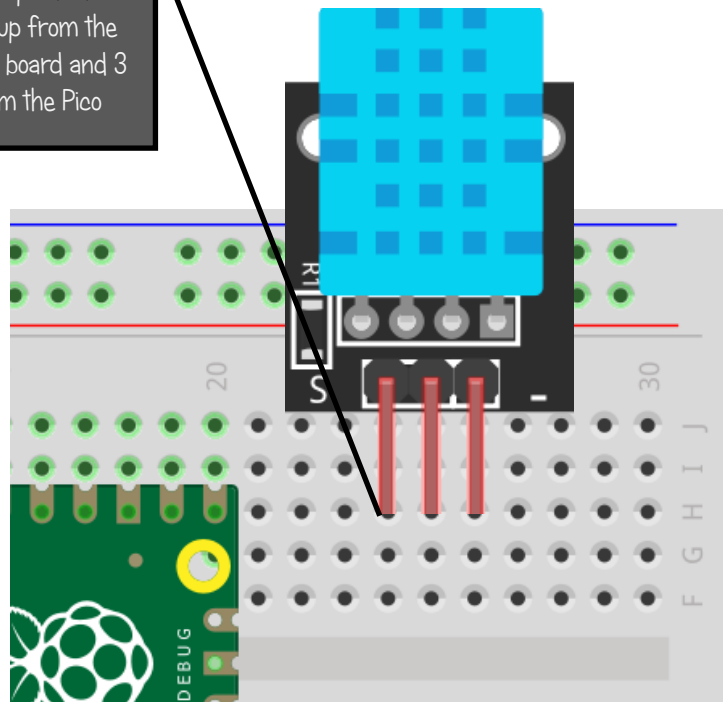
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Let's build a Weather Station!

Now we have the basic prototype setup.
We have the Pi Pico on the breadboard
and the power distribution is ready.
Now we can site the rest of the components.

The first component we can add is the DHT11 sensor.
It has 3 connectors that need to be lined up on the breadboard
The three connectors are 3.3v power.
GND and a signal pin (in the middle) which send the readings to the Pico.

Locate the 3.3v pin (+) on the third row up from the middle of the board and 3 holes way from the Pico
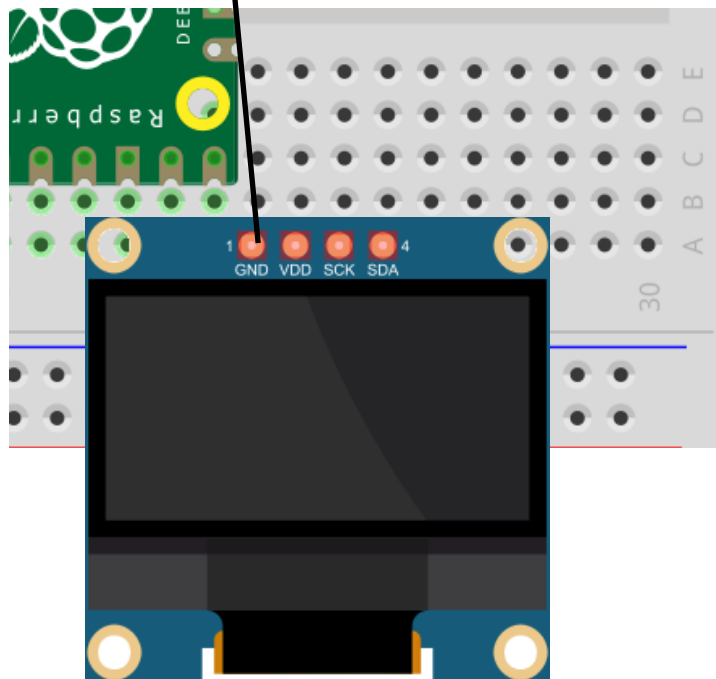
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Let's build a Weather Station!

Now we have the basic prototype setup.
We have the Pi Pico on the breadboard
and the power distribution is ready.
Now we can site the rest of the components.

The next component we can add is the OLED screen.
It has 4 connectors that need to be lined up on the breadboard
The four connectors are 3.3v power (VCC), GND,
and the clock (SCL/SCK) and data signal (SDA) pins which send the readings to the Pico.

Locate the end pin on the bottom row 1 hole way from the Pico

1 GND VDD SCK SDA 4

BE AWARE!

Check the connections carefully some OLED have a different layout!

1 GND VDD SCK SDA 4

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Let's build a Weather Station!

Now we have the basic prototype setup.
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The four connectors are 3.3v power (VCC), GND,
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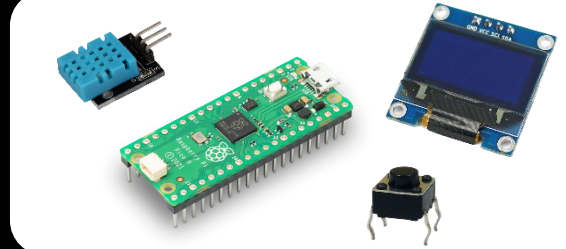There isn't a VCC pin (+) or a GND (-) pin on a basic button.
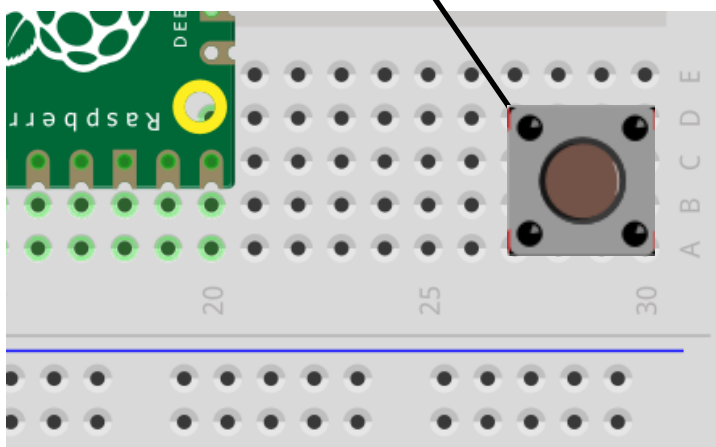
NOTE!

The connections work in either direction. If the button has 2 pins they need to be on the left and right side. If it has 4 pins they need to be on the left and right side too.
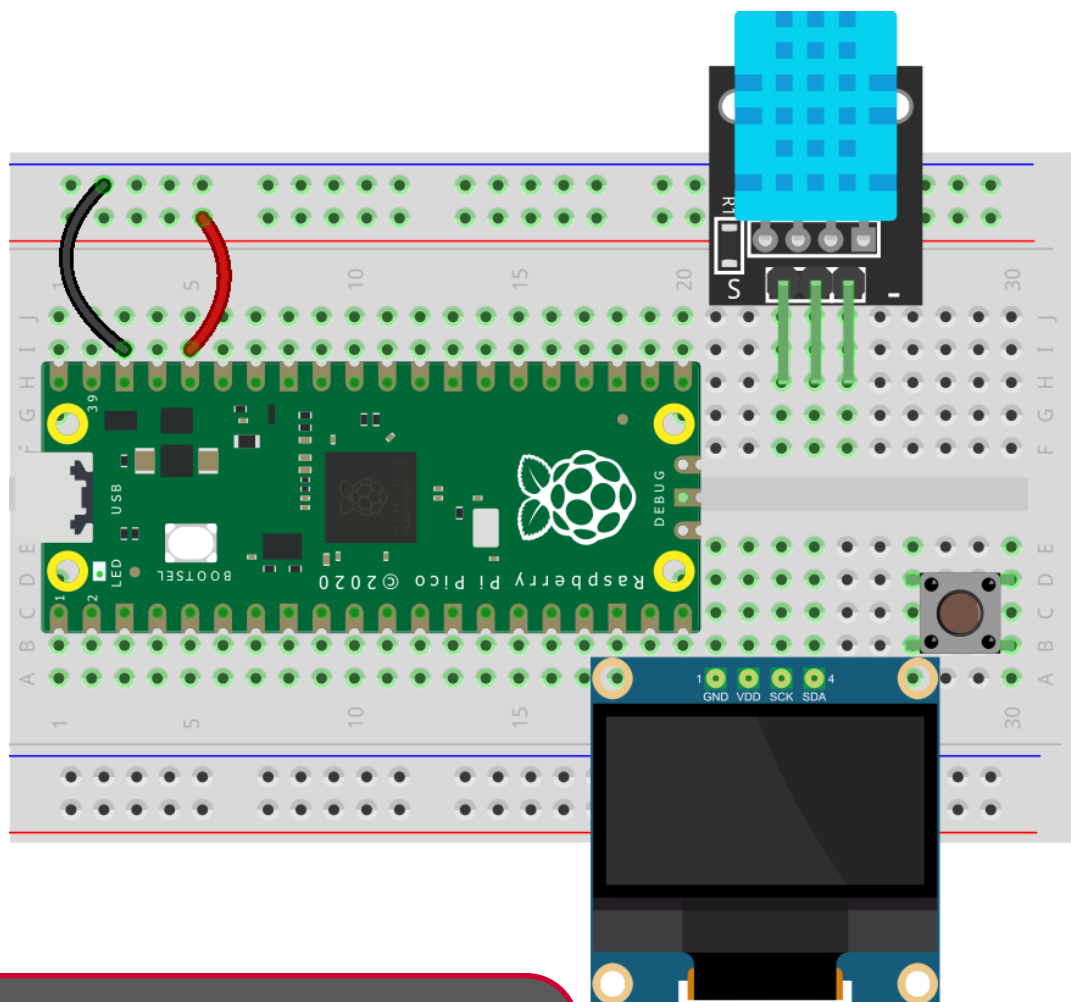
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Let's build a Weather Station!

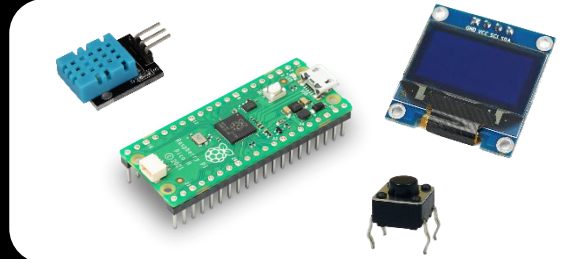Now we have all the components on the board we can start to wire them together!

NOTE!

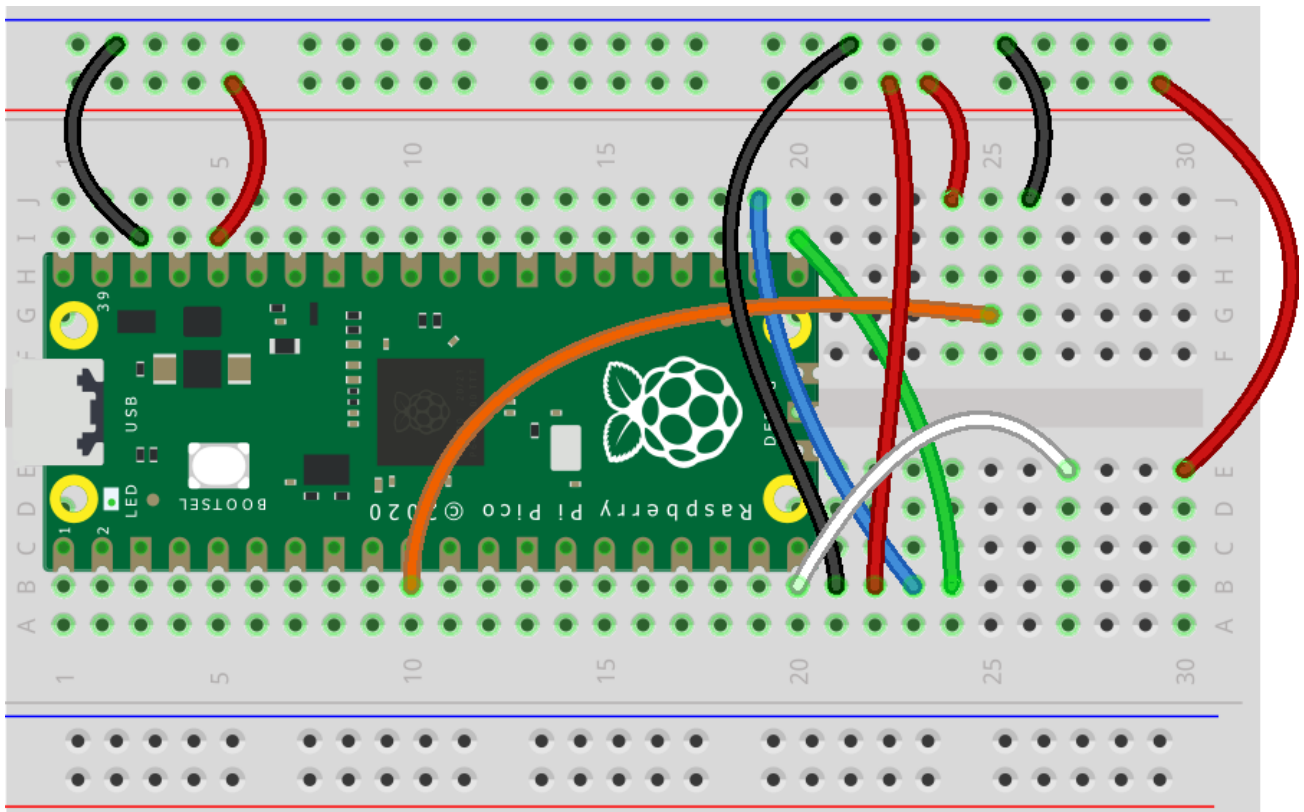Wire colours are used so you can see the start and end points. You can use any colour wire you like.

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Let's build a Weather Station!

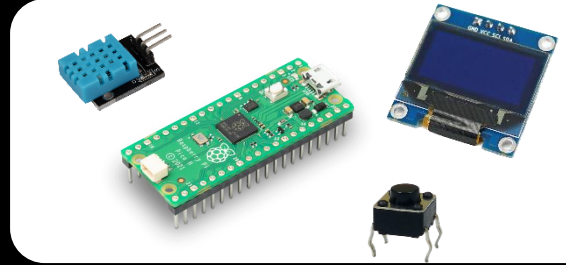Now we have all the components on the board we can start to wire them together!

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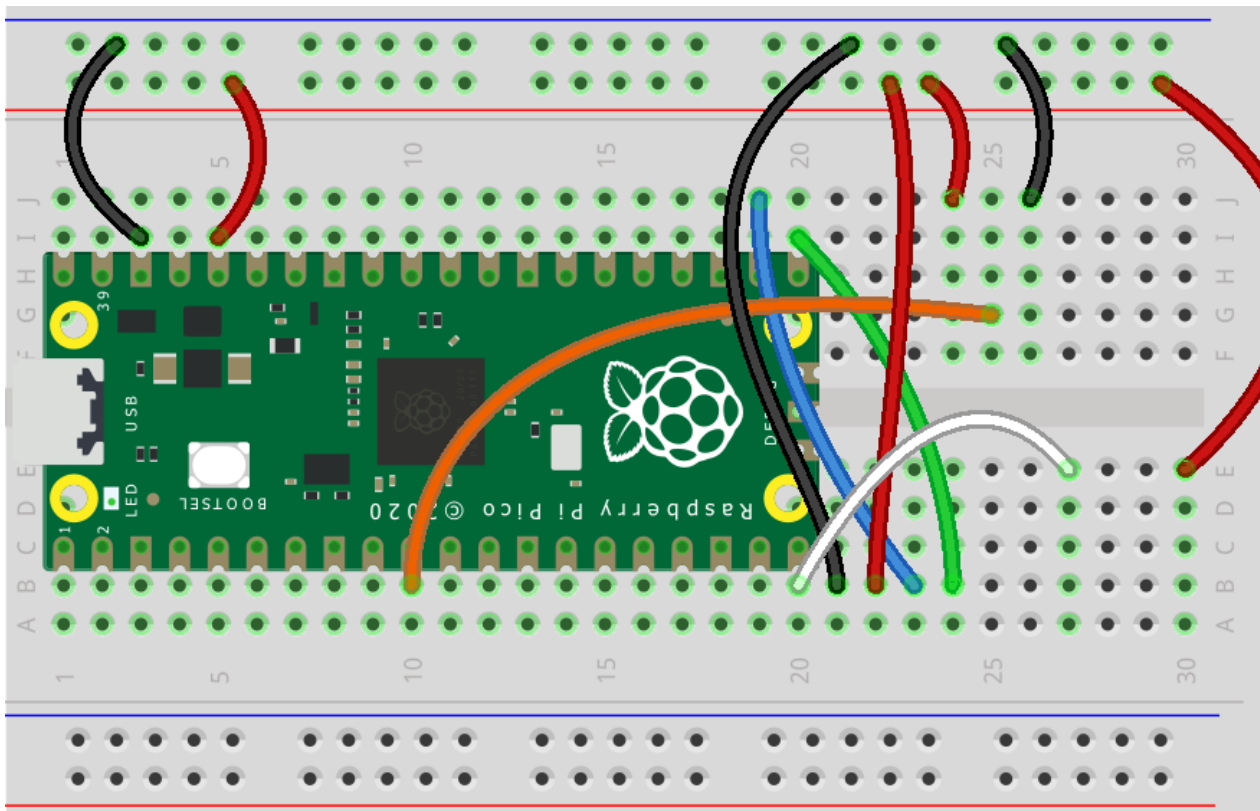Wire colours are used so you can see the start and end points. You can use any colour wire you like.

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Let's build a Weather Station!

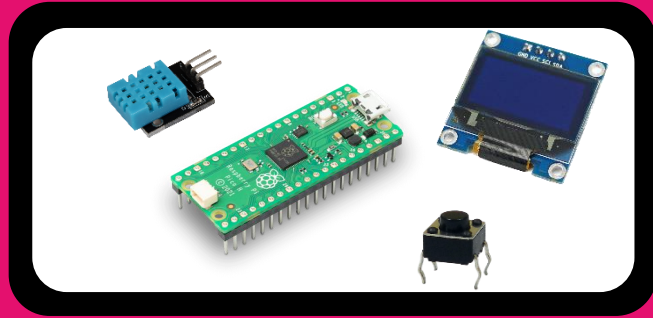Now we have all the components on the board we can start to wire them together!

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Let's build a Weather Station!

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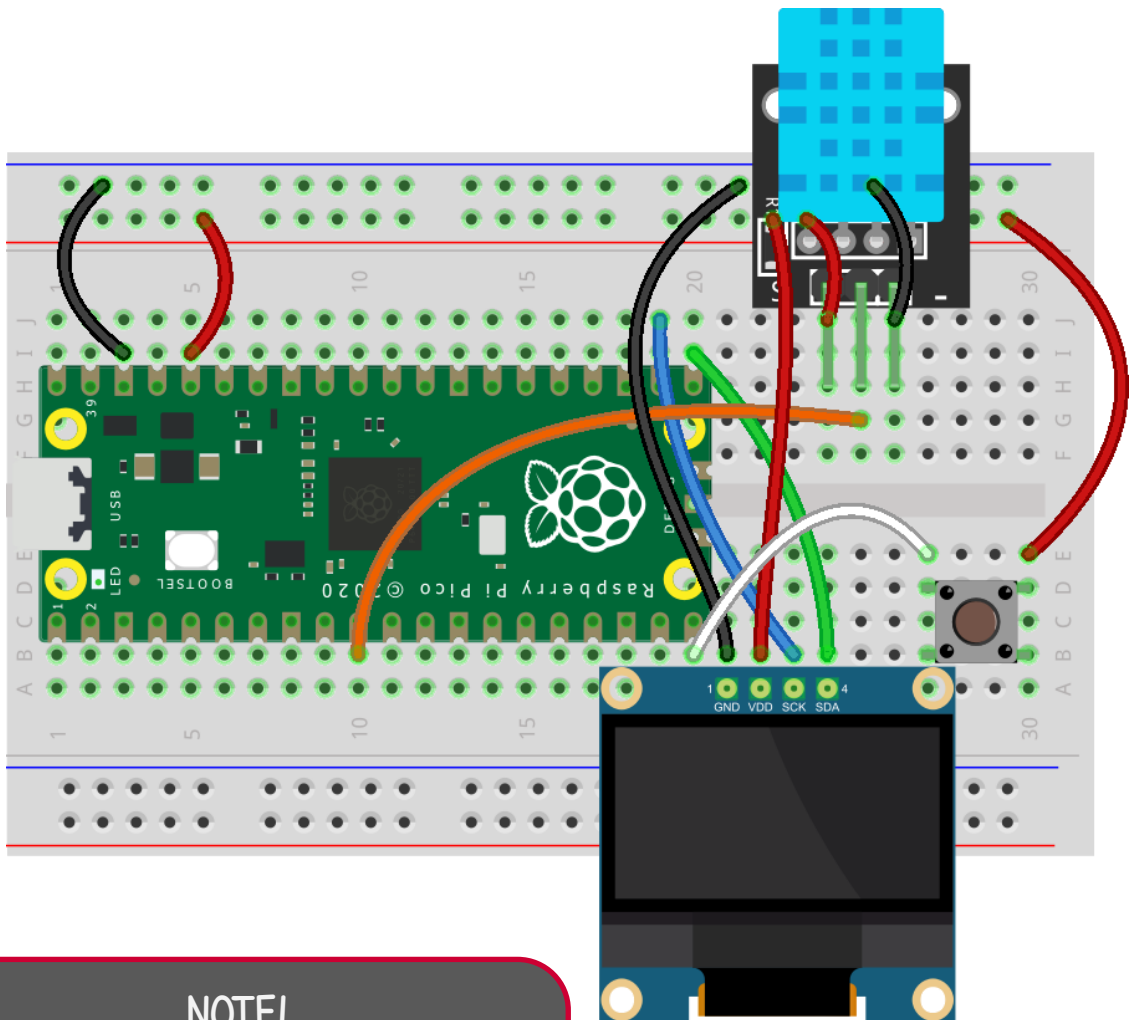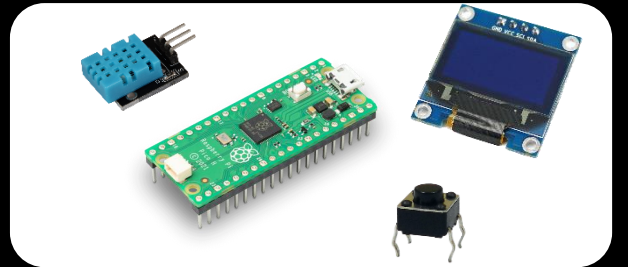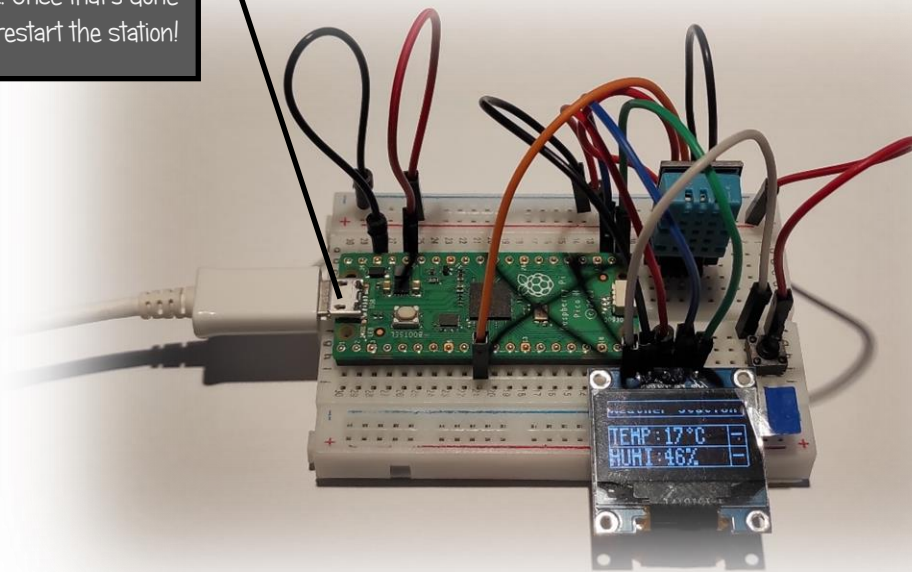
Let's build a Weather Station!

Your weather station should now look something like this! All you need now is the code to load it onto the Pico with Thonny.

Now you need to use Thonny to install the software. Once that's done you can restart the station!

Once the software is installed you can try placing it in different locations and see what happens!

REMEMBER: You can use a USB power bank!

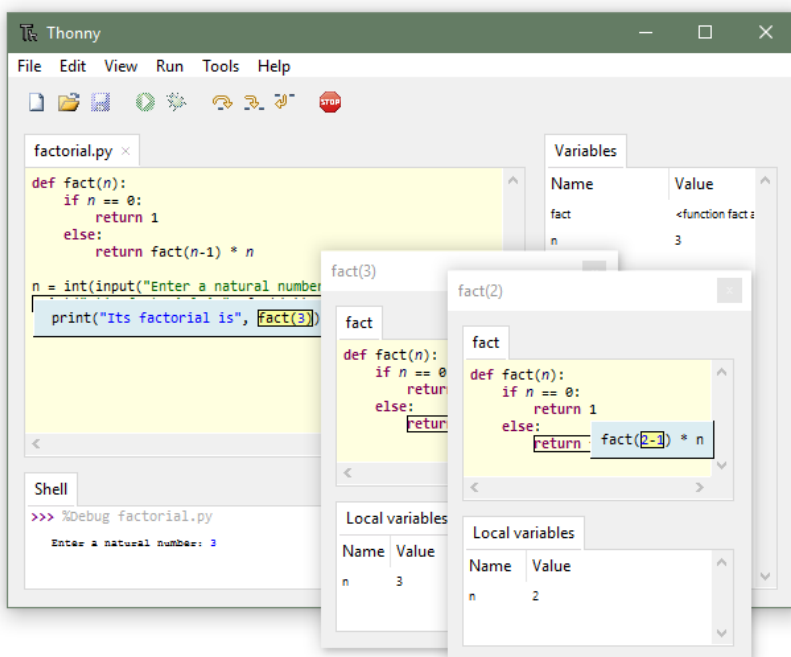**University of Sunderland**

Let's build a
Weather Station!

Follow the links below for the weather station code,
how to download, and to get help on how to use Thonny.

Click HERE to get the code from GitHub!
Click HERE for the Thonny download.

Click HERE for how to install Micropython as a file.
Click HERE for how to install Micropython from Thonny.
Click HERE for help with using Thonny.

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