Real Time Data Logging with BBC micro:bit and Data Streamer Excel Add-In

The BBC micro:bit is a very capable microcontroller. It can be used to record live data from various sensors.

Items Needed:
- BBC micro:bit microcontroller
- Microsoft Data Streamer Add-in for Excel
- micro:bit Developer USB driver
- Some kind of sensor package for the data you wish to collect.

The micro:bit makeCode

You need to write a micro:bit program that can collect sensor data and then write it out through the serial port to an application, in this case, Microsoft Excel with Data Streamer.

The following example uses the SparkFun weather:bit weather station to collect temperature and relative humidity readings and then send them to Tera Term via the serial port. It samples the sensors every one minute, but you can change the sampling rate to suit your needs.

Go to makecode.org and create a new micro:bit project.

You need to add the 'Hacking-stem' Extension to get access to the DataStream extension.
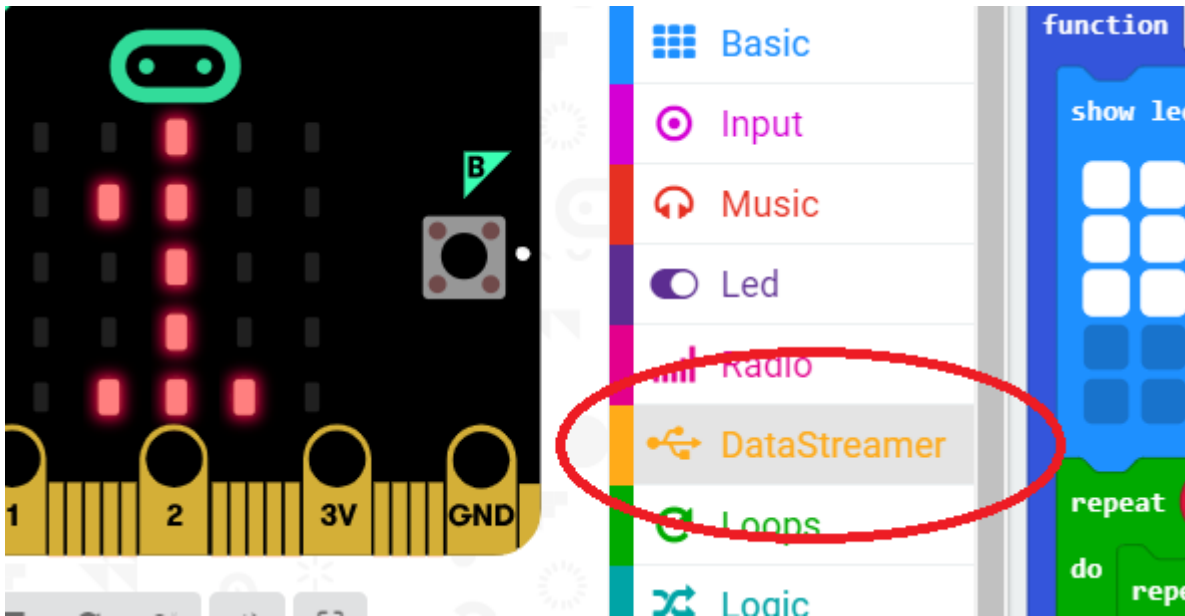
Scroll down through the makeCode tools list. Click on Advanced and then click on Extensions.
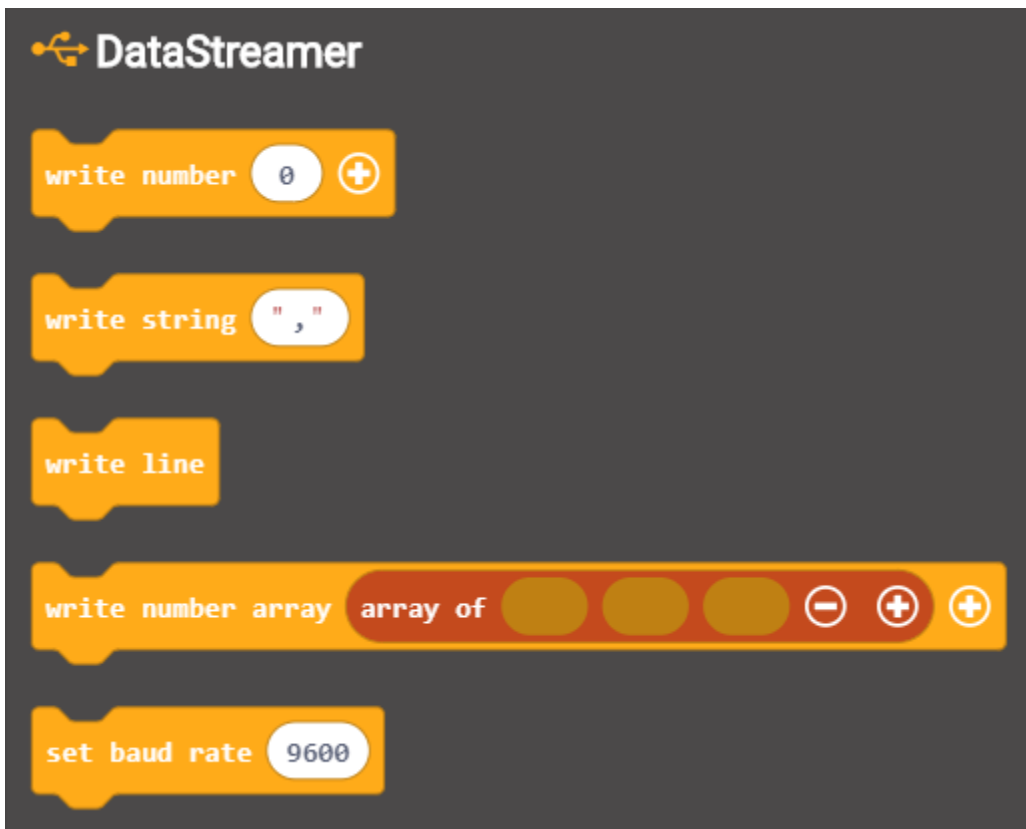
Type in 'Stem Hack' and press Enter.
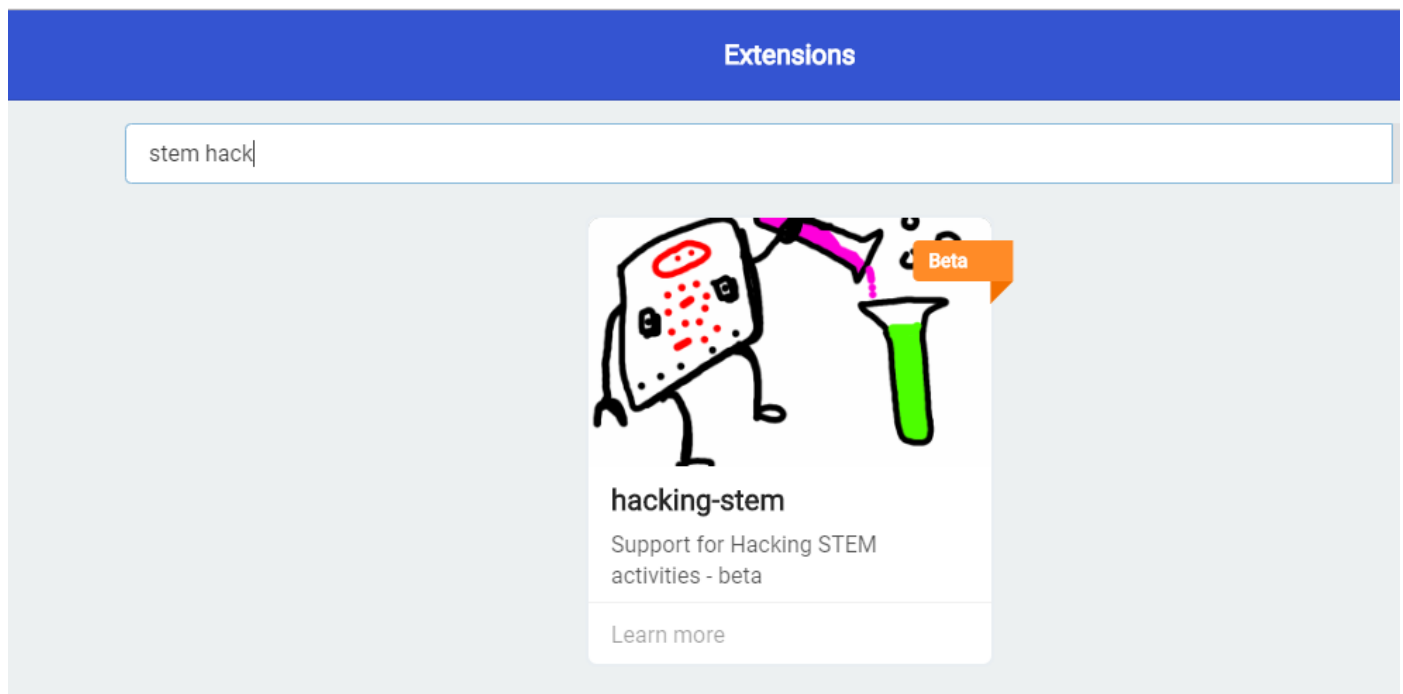
Click on the hacking-stem choice and it will load into your makeCode screen.

You now have a 'DataStreamer' tool option.

In this tool you'll see,

We'll be using the 'Write number array' block in this project.

Start coding your project.

This block lets user adjust the sampling interval

```
on button [A ▼] pressed
    set [waitIntervalMinutes ▼] to ([waitIntervalMinutes ▼] [+ ▼] (1))
    show number ([waitIntervalMinutes ▼])
```

This block initiates data logging.

```
on button [B ▼] pressed
    set [samplingOn ▼] to (1)
```

```
on start
    set   samplingOn ▼  to  0       Variable to control when sampling starts

    set   waitIntervalMinutes ▼  to  1

    set   xCol ▼  to  0              These variables control the turning
                                     off of pixels in the countdown grid.
    set   numCols ▼  to  5

    set   numRows ▼  to  3

    set   yRow ▼  to  0

    start weather monitoring        This activates the sensors that are sampled.

    show string  "Minutes="

    show number  waitIntervalMinutes ▼

    serial redirect to USB          Set the serial output to the USB port.
```

Grid for visual indicator of time remaining before next sample

wait for 4 seconds.

update grid to show a reduction in time remaining before next sample

move along 1 column

reset to first column

move down one row

reset to top row

forever

while samplingOn = 1 — while sampling is enabled

do

call function TimeDelay — wait until the next sampling interval

set temperatureInt to temperature(C) ÷ 100 — format your sensor data as desired

set relHumidity to humidity ÷ 1024

write number array array of temperatureInt relHumidity ⊖ ⊕ ⊕ — Data Streamer command to write the values out through the serial port

show leds — visual indicator that write is complete
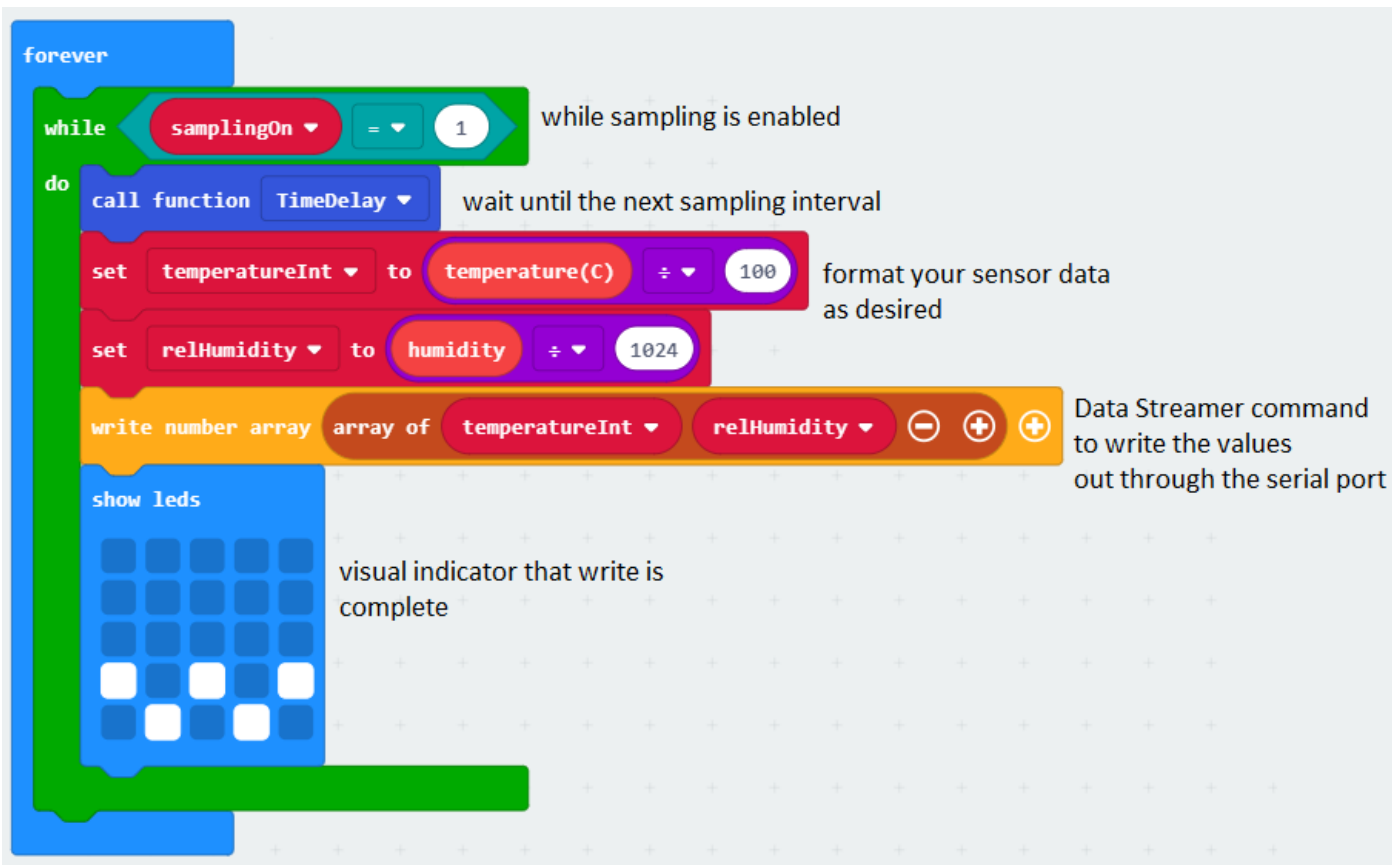
Upload this program to your micro:bit.

With the micro:bit running, use Button A to select your sampling interval (in increments of 1 minute).

When you're ready, press Button B and the data streaming will start.

The LED array changes as it counts down to the next sampling interval. After sending you'll see a 'w' in the display to indicate that a data 'write' has occurred. The countdown to the next sampling will not restart.

Click the reset button on the back of the micro:bit to start over anytime.

micro:bit Developer USB Driver

The Developer USB driver is required to communicate with Data Streamer.

The link is: https://os.mbed.com/docs/latest/tutorials/windows-serial-driver.html

Download this driver and install it on your computer.

Microsoft Data Streamer Add-In for Excel

Download Microsoft Data Streamer.

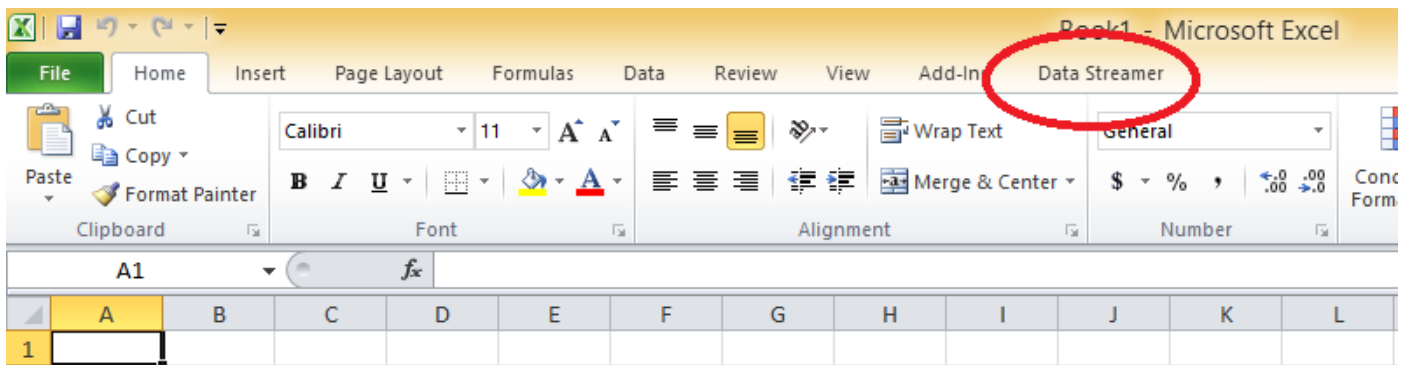The link is: https://www.microsoft.com/en-us/download/details.aspx?id=56976

Install the program on your computer.
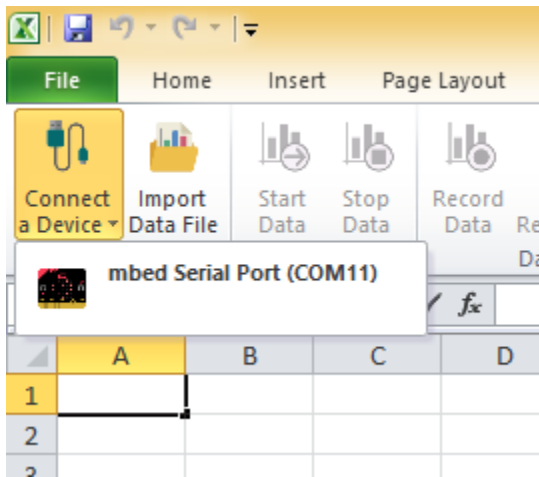
Receiving micro:bit Data in Microsoft Excel

Launch Microsoft Excel.

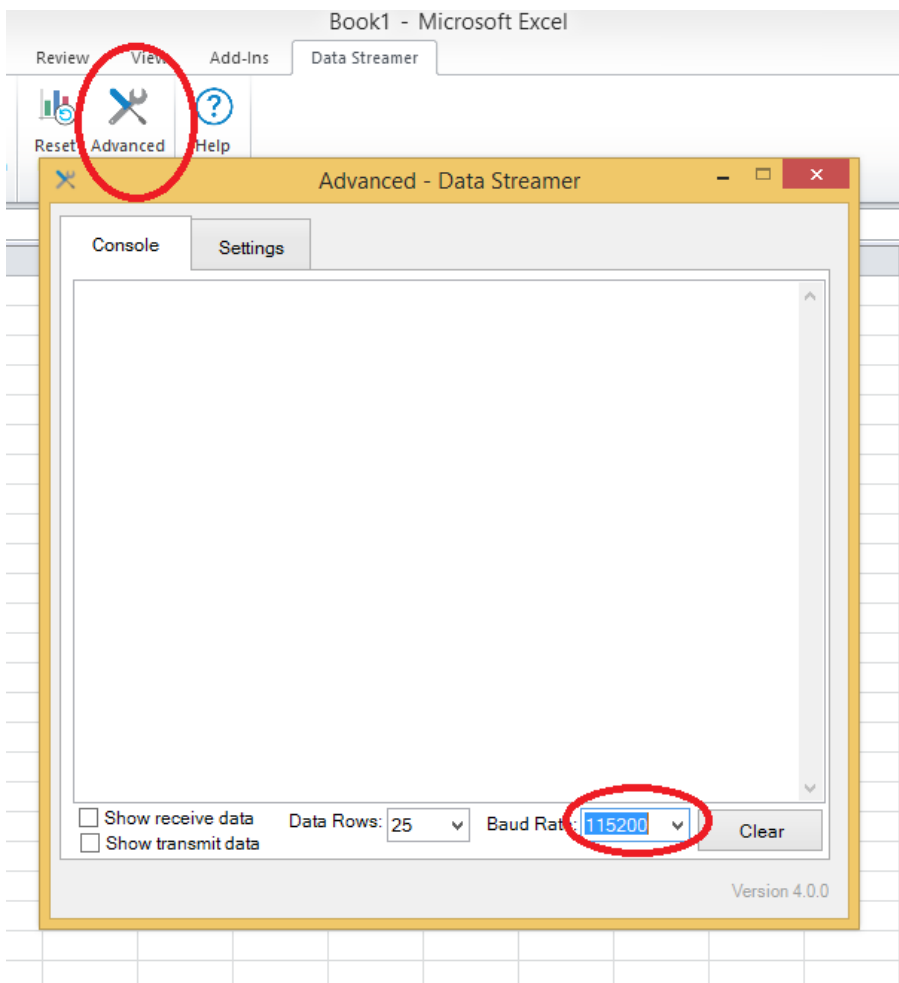You will now see a Data Streamer tab at the top of the screen.

Click on the Data Streamer tab.

With your micro:bit connected, click on 'Connect a Device' button and then pick the micro:bit.


Now click on the 'Advanced' button. The dialog box will open.

Set your baud rate to 115200. If you'd like to see the data coming in raw on this console, just check the 'Show receive data' box. You should have clicked the 'Start Data' button before opening this dialog if you want to see the data coming in on this console.

Click the red 'Close' box in the top right corner of the dialog.

Now click the 'Start Data' button. This will start the reception of data streamed from your micro:bit.
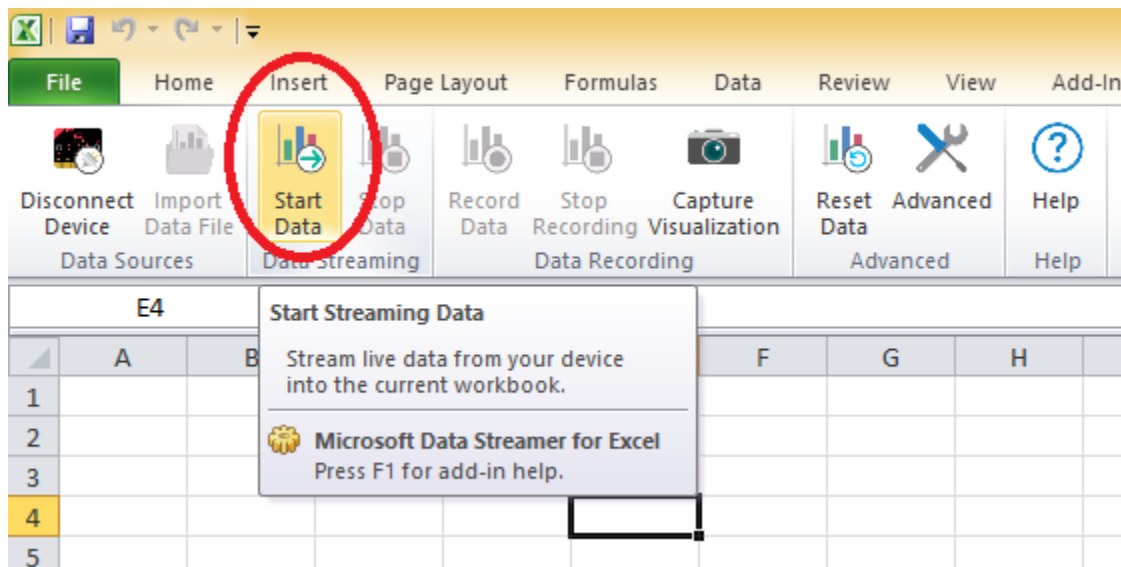

Click the 'Record Data' Button. Data Streamer will create a new sheet with some formatted cells where the data will populate.
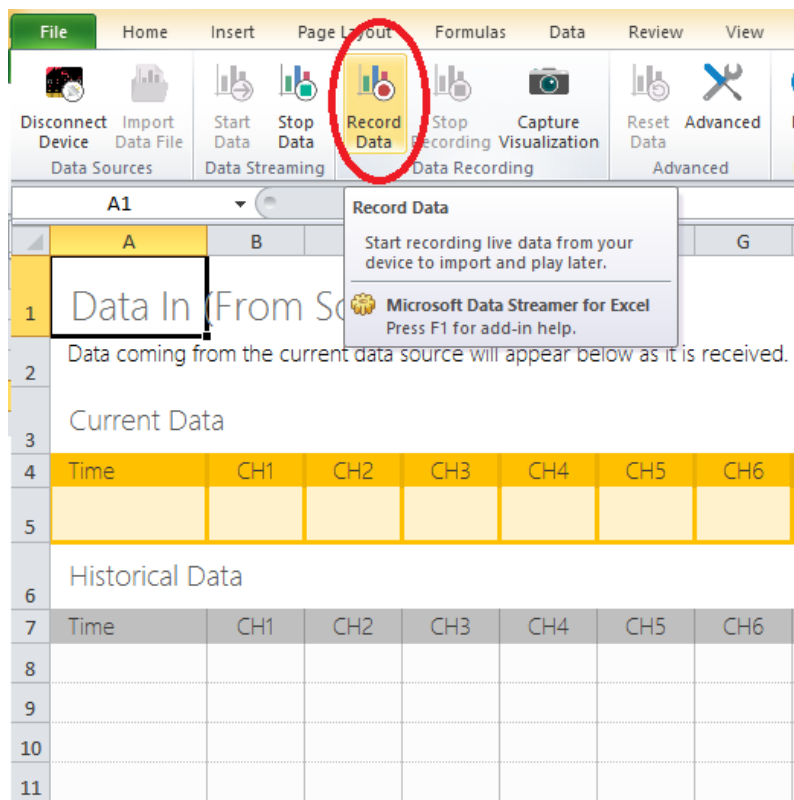
Note: By default, the data populates from the bottom of the grey 'Historical Data' table upwards. So if you don't see data loading, scroll down a bit and look at the bottom of the table. As each sample comes in, it will push earlier samples up from the bottom.

You may now graph and/or manipulate this data as you wish using the spreadsheet's graphing and other features.
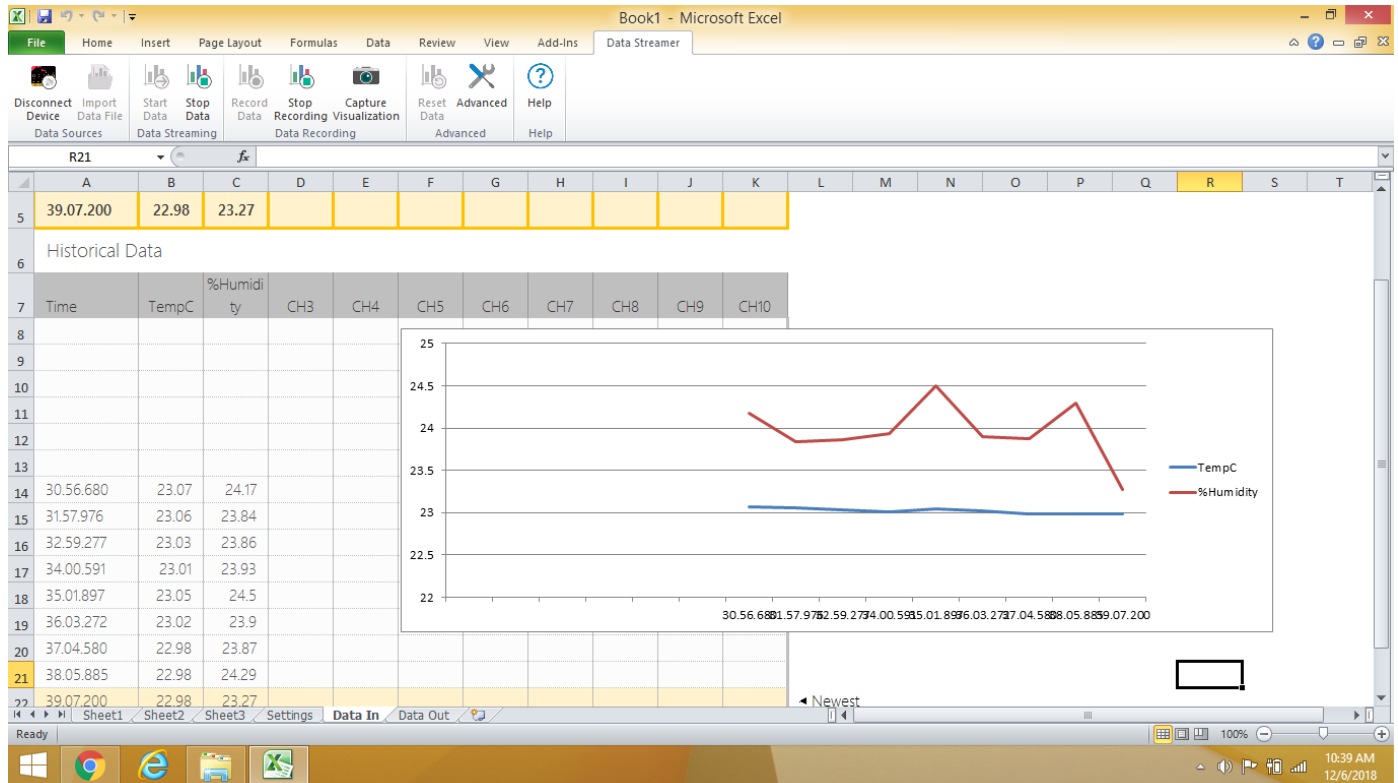
Notice that Data Streamer adds a time stamp for each sampling.

If you'd like to see a live graph, just highlight a larger row selection, generate the graph, and the graph will grow as time passes.

Notice that the table headings for CH1 and CH2 were edited to contain the names of the data in those columns so the names appear in the graph.

Some other options:
In the Excel workbook there is a 'Settings' tab that gives you options for:
      Data Interval (milliseconds)
      Data Rows (how many rows do you want to record? You should make sure you have enough)
      Data Channels (by default it's 10)
      Data Orientation (fill from top down or bottom up)

So you can set more rows if you want to gather data over a long time period. You could also write your micro:bit blocks so that it just broadcasts data at a fixed rate and then just let Excel grab the data at your desired Data Interval.

Good luck with your micro:bit data logging!

(Gord Payne, Newmarket High School, YRDSB TLLP Robotics Project, December 2018)

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