

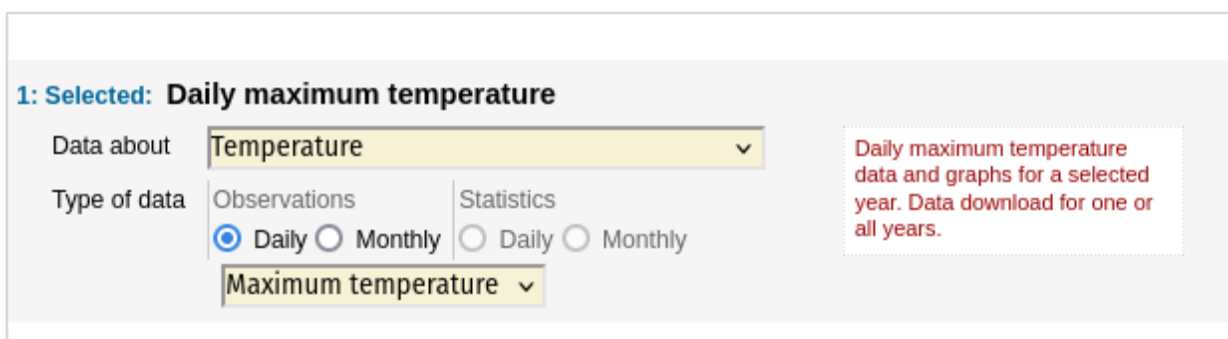
# Creating scatter plots of bivariate data in Google Sheets using annual temperature data

This tutorial provides clear step-by-step instructions describing how to:

- A. Export annual temperature data from the Bureau of Meteorology for use in Google Sheets
- B. Cleanup and prepare the data.
- C. Create a scatter plot using temperature data and plot the line of best fit (or trendline).

## A. Export temperature data for use in Google Sheets

1. Go to <http://www.bom.gov.au/climate/data/>
2. Select Daily Maximum Temperature by selecting the following options:



The screenshot shows the 'Data about' section of the Bureau of Meteorology website. It features a dropdown menu for 'Data about' set to 'Temperature'. Below this, there are two tabs: 'Observations' and 'Statistics'. Under the 'Observations' tab, there are radio buttons for 'Daily' (selected) and 'Monthly'. Under the 'Statistics' tab, there are also radio buttons for 'Daily' and 'Monthly'. A second dropdown menu is set to 'Maximum temperature'. To the right of these options, a red text box states: 'Daily maximum temperature data and graphs for a selected year. Data download for one or all years.'

3. Select a weather station of interest, for this example, we will use Moorabbin Airport. Check the data availability for the station you are going to use, we are aiming for 90-100% availability back to the 1970s. If there is less availability or the timespan is shorter, the analysis won't work as well.

**2: Select a weather station in the area of interest**

melbourne  OR - search by

**Matching towns** (click one to select it)

Port Melbourne, VIC, 37.83°S, 144.91°E
South Melbourne, VIC, 37.83°S, 144.95°E
South Melbourne, VIC, 37.83°S, 144.96°E
West Melbourne, VIC, 37.81°S, 144.93°E

**More information:**  
[Geoscience Australia](#)  
(opens new window)

**Nearest Bureau stations** (click one to select it)

Only show open stations (may no longer report all data types)

086338 Melbourne (Olympic Park) VIC (1.6km away)
086038 Essendon Airport VIC (14.0km away)
086068 Viewbank VIC (15.0km away)
086077 Moorabbin Airport VIC (18.5km away)
087031 Laverton RAAF VIC (19.6km away)

**More information:**  
[for the selected station](#)  
(opens new window)

**Data available for the selected station**

**Select year**

2025 ▾

4. After selecting a station, the station number will be automatically filled in in the final box. You can now click the get data button.

**3: Get the data**

Station number   (Opens in new window)

[Don't clear this number](#) Note, most stations do not collect all data types. Searching will ensure relevant stations.

5. This will lead you to a new page, where there is a button in the top right corner labeled 'All years of data'. Click on this and download the file.

## Daily maximum temperature

### Moorabbin Airport

The Daily maximum air temperature is nominally recorded at 9 am local clock time. It is the highest temperature for the 24 hours leading up to the observation, and is recorded as the maximum temperature for the previous day. [About temperature data](#)

- Unzip the file, and then upload the file with the '.csv' extension to Google Sheets. Follow this tutorial for instructions on how: <https://www.youtube.com/watch?v=C3ic0jqAWJY>

## B. Clean up and prepare the data

- After opening the imported CSV, you will see something that looks like this:

	A	B	C	D	E	F	G	H	I
1	Product code	Bureau of Meteo	Year	Month	Day	Maximum tempe	Days of accumul	Quality	
2	IDCJAC0010	86077	1971	1	1				
3	IDCJAC0010	86077	1971	1	2				
4	IDCJAC0010	86077	1971	1	3				
5	IDCJAC0010	86077	1971	1	4				
6	IDCJAC0010	86077	1971	1	5				
7	IDCJAC0010	86077	1971	1	6				
8	IDCJAC0010	86077	1971	1	7				
9	IDCJAC0010	86077	1971	1	8				
10	IDCJAC0010	86077	1971	1	9				
11	IDCJAC0010	86077	1971	1	10				
12	IDCJAC0010	86077	1971	1	11				
13	IDCJAC0010	86077	1971	1	12				
14	IDCJAC0010	86077	1971	1	13				
15	IDCJAC0010	86077	1971	1	14				
16	IDCJAC0010	86077	1971	1	15				
17	IDCJAC0010	86077	1971	1	16				
18	IDCJAC0010	86077	1971	1	17				
19	IDCJAC0010	86077	1971	1	18				
20	IDCJAC0010	86077	1971	1	19				
21	IDCJAC0010	86077	1971	1	20				
22	IDCJAC0010	86077	1971	1	21				
23	IDCJAC0010	86077	1971	1	22				
24	IDCJAC0010	86077	1971	1	23				
25	IDCJAC0010	86077	1971	1	24				
26	IDCJAC0010	86077	1971	1	25				
27	IDCJAC0010	86077	1971	1	26				
28	IDCJAC0010	86077	1971	1	27				
29	IDCJAC0010	86077	1971	1	28				
30	IDCJAC0010	86077	1971	1	29				
31	IDCJAC0010	86077	1971	1	30				
32	IDCJAC0010	86077	1971	1	31				
33	IDCJAC0010	86077	1971	2	1				
34	IDCJAC0010	86077	1971	2	2				
35	IDCJAC0010	86077	1971	2	3				
36	IDCJAC0010	86077	1971	2	4				
37	IDCJAC0010	86077	1971	2	5				
38	IDCJAC0010	86077	1971	2	6				
39	IDCJAC0010	86077	1971	2	7				
40	IDCJAC0010	86077	1971	2	8				
41	IDCJAC0010	86077	1971	2	9				
42	IDCJAC0010	86077	1971	2	10				
43	IDCJAC0010	86077	1971	2	11				
44	IDCJAC0010	86077	1971	2	12				

- First, you need to delete the empty rows at the top of the table. Select the rows that have the same year as the first year of data, and then click 'delete rows'.
- Next, scroll down to the bottom of the sheet, and then select the rows for the last year of data. Delete these rows as well.
- Next, we will need to make a 'Date' column, combining the year, month and day columns into one. This can be done by selecting cell H2 and writing in '=DATE(C2,D2,E2)'. Make sure to write in the header 'Date' in H1. Fill the whole column with the date value.

5. After this, the data should look like this:

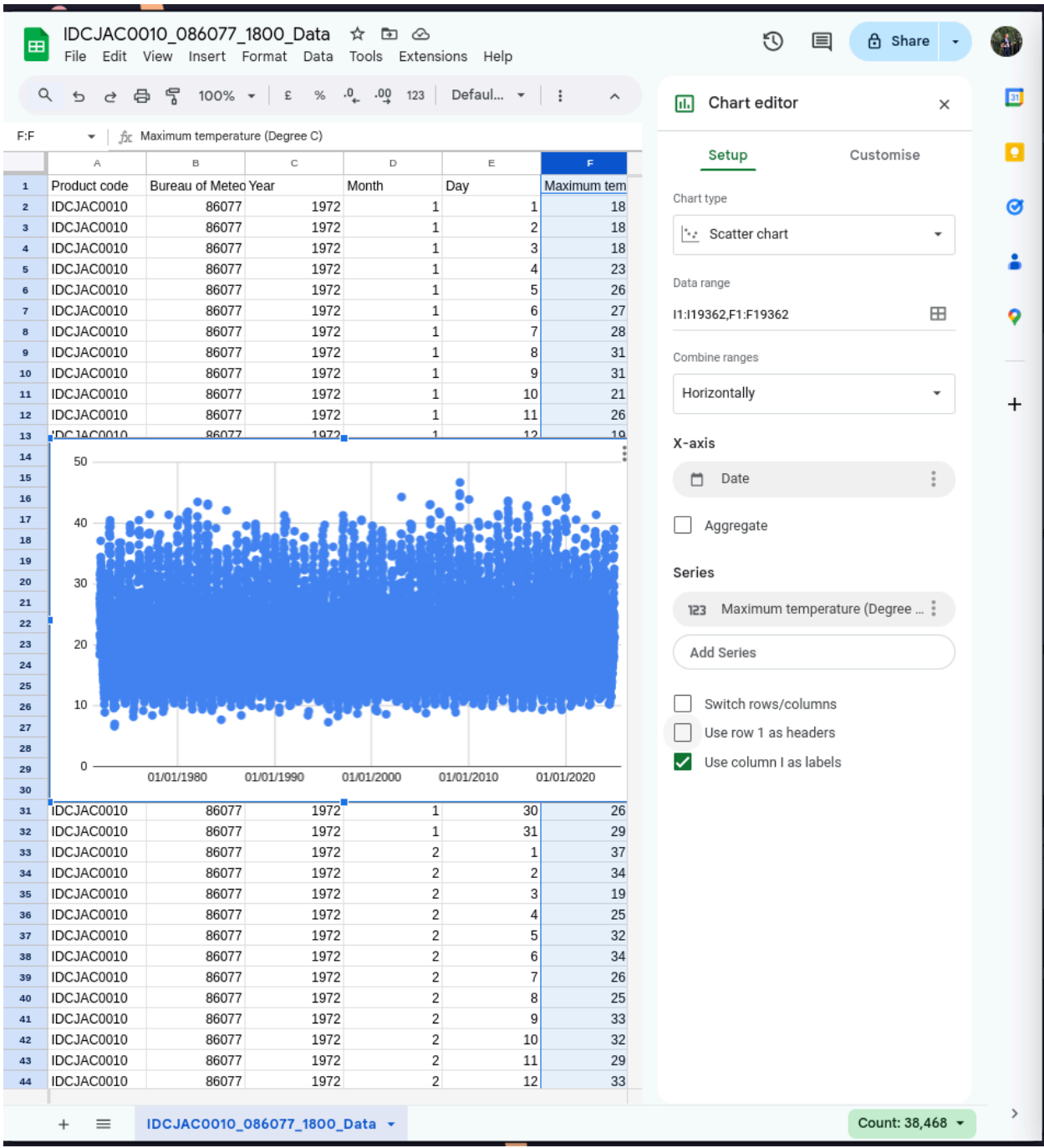
	A	B	C	D	E	F	G	H	I
1	Product code	Bureau of Meteorology	Year	Month	Day	Maximum temperature	Days of accumulation	Quality	Date
2	IDCJAC0010	86077	1971	8	5	16.7		Y	05/08/1971
3	IDCJAC0010	86077	1971	8	6	17.7	1	Y	06/08/1971
4	IDCJAC0010	86077	1971	8	7	15.6	1	Y	07/08/1971
5	IDCJAC0010	86077	1971	8	8	10.7	1	Y	08/08/1971
6	IDCJAC0010	86077	1971	8	9	14.8	1	Y	09/08/1971
7	IDCJAC0010	86077	1971	8	10	13.8	1	Y	10/08/1971
8	IDCJAC0010	86077	1971	8	11	13.2	1	Y	11/08/1971
9	IDCJAC0010	86077	1971	8	12	12.7	1	Y	12/08/1971
10	IDCJAC0010	86077	1971	8	13	13.1	1	Y	13/08/1971
11	IDCJAC0010	86077	1971	8	14	12.3	1	Y	14/08/1971
12	IDCJAC0010	86077	1971	8	15	12.2	1	Y	15/08/1971
13	IDCJAC0010	86077	1971	8	16	12	1	Y	16/08/1971
14	IDCJAC0010	86077	1971	8	17	15.4	1	Y	17/08/1971
15	IDCJAC0010	86077	1971	8	18	14.4	1	Y	18/08/1971
16	IDCJAC0010	86077	1971	8	19	15.8	1	Y	19/08/1971
17	IDCJAC0010	86077	1971	8	20	17.7	1	Y	20/08/1971
18	IDCJAC0010	86077	1971	8	21	14.7	1	Y	21/08/1971
19	IDCJAC0010	86077	1971	8	22	15.2	1	Y	22/08/1971
20	IDCJAC0010	86077	1971	8	23	18.7	1	Y	23/08/1971
21	IDCJAC0010	86077	1971	8	24	14.1	1	Y	24/08/1971
22	IDCJAC0010	86077	1971	8	25	12.2	1	Y	25/08/1971
23	IDCJAC0010	86077	1971	8	26	10.7	1	Y	26/08/1971
24	IDCJAC0010	86077	1971	8	27	14	1	Y	27/08/1971
25	IDCJAC0010	86077	1971	8	28	12.9	1	Y	28/08/1971
26	IDCJAC0010	86077	1971	8	29	15.2	1	Y	29/08/1971
27	IDCJAC0010	86077	1971	8	30	12.8	1	Y	30/08/1971
28	IDCJAC0010	86077	1971	8	31	13.4	1	Y	31/08/1971
29	IDCJAC0010	86077	1971	9	1	12.3	1	Y	01/09/1971
30	IDCJAC0010	86077	1971	9	2	11.3	1	Y	02/09/1971
31	IDCJAC0010	86077	1971	9	3	12.7	1	Y	03/09/1971
32	IDCJAC0010	86077	1971	9	4	13.5	1	Y	04/09/1971
33	IDCJAC0010	86077	1971	9	5	14.9	1	Y	05/09/1971
34	IDCJAC0010	86077	1971	9	6	17.1	1	Y	06/09/1971
35	IDCJAC0010	86077	1971	9	7	15.9	1	Y	07/09/1971
36	IDCJAC0010	86077	1971	9	8	18.1	1	Y	08/09/1971
37	IDCJAC0010	86077	1971	9	9	18.3	1	Y	09/09/1971
38	IDCJAC0010	86077	1971	9	10	11.9	1	Y	10/09/1971
39	IDCJAC0010	86077	1971	9	11	13.6	1	Y	11/09/1971
40	IDCJAC0010	86077	1971	9	12	13.9	1	Y	12/09/1971
41	IDCJAC0010	86077	1971	9	13	17.3	1	Y	13/09/1971
42	IDCJAC0010	86077	1971	9	14	17.9	1	Y	14/09/1971
43	IDCJAC0010	86077	1971	9	15	14.4	1	Y	15/09/1971
44	IDCJAC0010	86077	1971	9	16	15.6	1	Y	16/09/1971

## C. Making an initial chart

1. Now that the data is in a good format, an initial chart can be made.
2. Select both the Date column and the maximum temperature column (You can hold CTRL while clicking to have the columns selected at the same time).

	A	B	C	D	E	F	G	H	I
1	Product code	Bureau of Meteo	Year	Month	Day	Maximum tempe	Days of accumul	Quality	Date
2	IDCJAC0010	86077	1972	1	1	18.5	1	Y	01/01/1972
3	IDCJAC0010	86077	1972	1	2	18.4	1	Y	02/01/1972
4	IDCJAC0010	86077	1972	1	3	18.4	1	Y	03/01/1972
5	IDCJAC0010	86077	1972	1	4	23.8	1	Y	04/01/1972
6	IDCJAC0010	86077	1972	1	5	26.8	1	Y	05/01/1972
7	IDCJAC0010	86077	1972	1	6	27.6	1	Y	06/01/1972
8	IDCJAC0010	86077	1972	1	7	28.3	1	Y	07/01/1972
9	IDCJAC0010	86077	1972	1	8	31.7	1	Y	08/01/1972
10	IDCJAC0010	86077	1972	1	9	31.5	1	Y	09/01/1972
11	IDCJAC0010	86077	1972	1	10	21.6	1	Y	10/01/1972
12	IDCJAC0010	86077	1972	1	11	26.2	1	Y	11/01/1972
13	IDCJAC0010	86077	1972	1	12	19.4	1	Y	12/01/1972
14	IDCJAC0010	86077	1972	1	13	21.7	1	Y	13/01/1972
15	IDCJAC0010	86077	1972	1	14	23.9	1	Y	14/01/1972
16	IDCJAC0010	86077	1972	1	15	27.6	1	Y	15/01/1972
17	IDCJAC0010	86077	1972	1	16	27.6	1	Y	16/01/1972
18	IDCJAC0010	86077	1972	1	17	30.9	1	Y	17/01/1972
19	IDCJAC0010	86077	1972	1	18	19.7	1	Y	18/01/1972
20	IDCJAC0010	86077	1972	1	19	23.3	1	Y	19/01/1972
21	IDCJAC0010	86077	1972	1	20	25.7	1	Y	20/01/1972
22	IDCJAC0010	86077	1972	1	21	23.9	1	Y	21/01/1972
23	IDCJAC0010	86077	1972	1	22	21.8	1	Y	22/01/1972
24	IDCJAC0010	86077	1972	1	23	21.1	1	Y	23/01/1972
25	IDCJAC0010	86077	1972	1	24	21.5	1	Y	24/01/1972
26	IDCJAC0010	86077	1972	1	25	26.8	1	Y	25/01/1972
27	IDCJAC0010	86077	1972	1	26	30.7	1	Y	26/01/1972
28	IDCJAC0010	86077	1972	1	27	24.3	1	Y	27/01/1972
29	IDCJAC0010	86077	1972	1	28	21.1	1	Y	28/01/1972
30	IDCJAC0010	86077	1972	1	29	28.2	1	Y	29/01/1972
31	IDCJAC0010	86077	1972	1	30	26.1	1	Y	30/01/1972
32	IDCJAC0010	86077	1972	1	31	29.6	1	Y	31/01/1972
33	IDCJAC0010	86077	1972	2	1	37.1	1	Y	01/02/1972
34	IDCJAC0010	86077	1972	2	2	34.4	1	Y	02/02/1972
35	IDCJAC0010	86077	1972	2	3	19.9	1	Y	03/02/1972
36	IDCJAC0010	86077	1972	2	4	25.1	1	Y	04/02/1972
37	IDCJAC0010	86077	1972	2	5	32.2	1	Y	05/02/1972
38	IDCJAC0010	86077	1972	2	6	34.4	1	Y	06/02/1972
39	IDCJAC0010	86077	1972	2	7	26.5	1	Y	07/02/1972
40	IDCJAC0010	86077	1972	2	8	25.7	1	Y	08/02/1972
41	IDCJAC0010	86077	1972	2	9	33.7	1	Y	09/02/1972
42	IDCJAC0010	86077	1972	2	10	32.4	1	Y	10/02/1972
43	IDCJAC0010	86077	1972	2	11	29.1	1	Y	11/02/1972
44	IDCJAC0010	86077	1972	2	12	33.3	1	Y	12/02/1972

3. Next, go to the 'Insert' menu and click 'Chart'. This will open up the chart menu. Select the scatter chart and it should look like the image below.



4. The data should seem like there are no clear trends

## D. Making a pivot table and a clearer chart

1. Because of seasonal influence, looking at the raw temperatures doesn't give us a very good idea of the trend. Instead, we will look at the averages.
2. Select all the data by typing 'CTRL-A'. Go to the 'Insert' menu and select 'Pivot Table'. This will bring up the pivot table menu. Click on the create button and go to the new sheet.

The screenshot shows a Google Sheets interface with a data table and a 'Create pivot table' dialog box. The data table has the following columns: Product code, Bureau of Metro, Year, Month, Day, Maximum temperature, Days of accumul, Quality, and Date. The dialog box shows the data range as IDCJAC0010\_086077\_1800\_Data!A1:19360 and the option to insert into a new sheet.

	A	B	C	D	E	F	G	H	I
1	Product code	Bureau of Metro	Year	Month	Day	Maximum tempe	Days of accumul	Quality	Date
2	IDCJAC0010	86077	1972	1	1	18.5	1	Y	01/01/1972
3	IDCJAC0010	86077	1972	1	2	18.4	1	Y	02/01/1972
4	IDCJAC0010	86077	1972	1	3	18.4	1	Y	03/01/1972
5	IDCJAC0010	86077	1972	1	4	23.8	1	Y	04/01/1972
6	IDCJAC0010	86077	1972	1	5	26.8	1	Y	05/01/1972
7	IDCJAC0010	86077	1972	1	6	27.6	1	Y	06/01/1972
8	IDCJAC0010	86077	1972	1	7	28.3	1	Y	07/01/1972
9	IDCJAC0010	86077	1972	1	8	31.7	1	Y	08/01/1972
10	IDCJAC0010	86077	1972	1	9	31.5	1	Y	09/01/1972
11	IDCJAC0010	86077	1972	1	10	21.6	1	Y	10/01/1972
12	IDCJAC0010	86077	1972	1			1	Y	11/01/1972
13	IDCJAC0010	86077	1972	1			1	Y	12/01/1972
14							1	Y	13/01/1972
15							1	Y	14/01/1972
16							1	Y	15/01/1972
17							1	Y	16/01/1972
18							1	Y	17/01/1972
19							1	Y	18/01/1972
20							1	Y	19/01/1972
21							1	Y	20/01/1972
22							1	Y	21/01/1972
23							1	Y	22/01/1972
24							1	Y	23/01/1972
25							1	Y	24/01/1972
26							1	Y	25/01/1972
27							1	Y	26/01/1972
28							1	Y	27/01/1972
29							1	Y	28/01/1972
30							1	Y	29/01/1972
31	IDCJAC0010	86077	1972	1	30	26.1	1	Y	30/01/1972
32	IDCJAC0010	86077	1972	1	31	29.6	1	Y	31/01/1972
33	IDCJAC0010	86077	1972	2	1	37.1	1	Y	01/02/1972
34	IDCJAC0010	86077	1972	2	2	34.4	1	Y	02/02/1972
35	IDCJAC0010	86077	1972	2	3	19.9	1	Y	03/02/1972
36	IDCJAC0010	86077	1972	2	4	25.1	1	Y	04/02/1972
37	IDCJAC0010	86077	1972	2	5	32.2	1	Y	05/02/1972
38	IDCJAC0010	86077	1972	2	6	34.4	1	Y	06/02/1972
39	IDCJAC0010	86077	1972	2	7	26.5	1	Y	07/02/1972
40	IDCJAC0010	86077	1972	2	8	25.7	1	Y	08/02/1972
41	IDCJAC0010	86077	1972	2	9	33.7	1	Y	09/02/1972
42	IDCJAC0010	86077	1972	2	10	32.4	1	Y	10/02/1972
43	IDCJAC0010	86077	1972	2	11	29.1	1	Y	11/02/1972
44	IDCJAC0010	86077	1972	2	12	33.3	1	Y	12/02/1972

- Now, click on the Rows button and select 'Year' as the row. Next, go to the values and select the 'maximum temperature'. Change the summarise by value to 'AVERAGE'.

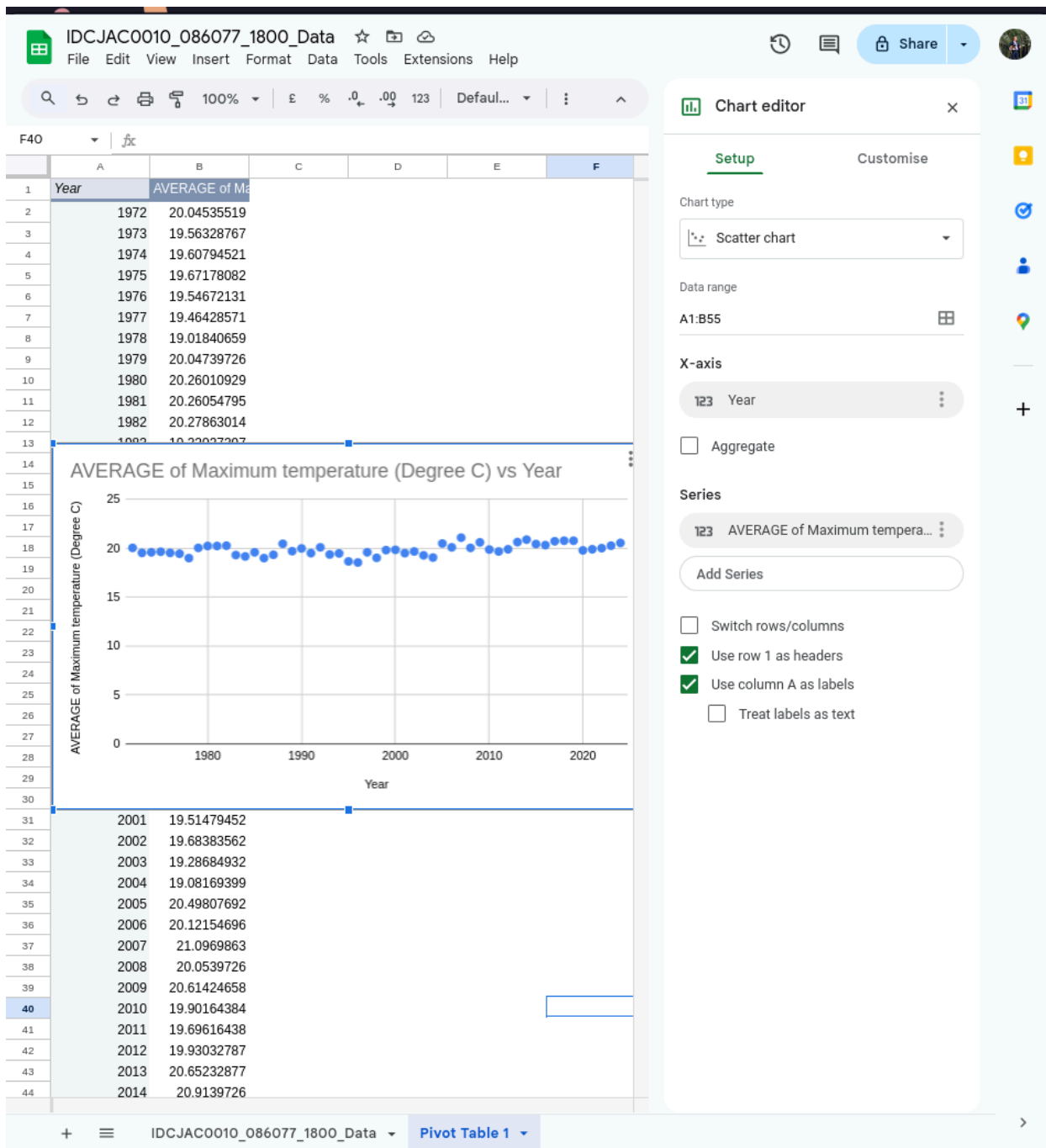
The screenshot shows a Google Sheet with a pivot table and the Pivot table editor. The pivot table is structured as follows:

Year	AVERAGE of Maximum temperature
1972	20.04535519
1973	19.56328767
1974	19.60794521
1975	19.67178082
1976	19.54672131
1977	19.46428571
1978	19.01840659
1979	20.04739726
1980	20.26010929
1981	20.26054795
1982	20.27863014
1983	19.32027397
1984	19.18114754
1985	19.61013699
1986	19.01342466
1987	19.34821918
1988	20.47076503
1989	19.71593407
1990	19.99013699
1991	19.52273973
1992	20.11642857
1993	19.37426901
1994	19.48425656
1995	18.68369231
1996	18.55685714
1997	19.61484594
1998	19.05706371
1999	19.83203343
2000	19.86935933
2001	19.51479452
2002	19.68383562
2003	19.28684932
2004	19.08169399
2005	20.49807692
2006	20.12154696
2007	21.0969863
2008	20.0539726
2009	20.61424658
2010	19.90164384
2011	19.69616438
2012	19.93032787
2013	20.65232877
2014	20.9139726

The Pivot table editor shows the following configuration:

- Rows:** Year
- Values:** Maximum temperature (Summarise by: AVERAGE)
- Filters:** (None)

- Select all of the data again by hitting 'CTRL-A', and then go to the Insert menu and select 'chart'. Make sure to select 'scatter chart' as the chart type.



- Next go to the customise menu in the chart popup, and select the 'Series' Customisations. Select the 'Trend Line' Checkbox, then set the Label to 'Use Equation' and select the 'Show R2' checkbox.

Google Sheets interface showing a pivot table and a scatter plot with a trend line.

**Pivot Table Data:**

Year	AVERAGE of Maximum temperature (Degree C)
1972	20.04535519
1973	19.56328767
1974	19.60794521
1975	19.67178082
1976	19.54672131
1977	19.46428571
1978	19.01840659
1979	20.04739726
1980	20.26010929
1981	20.26054795
1982	20.27863014
1983	19.32027397
2001	19.51479452
2002	19.68383562
2003	19.28684932
2004	19.08169399
2005	20.49807692
2006	20.12154696
2007	21.0969863
2008	20.0539726
2009	20.61424658
2010	19.90164384
2011	19.69616438
2012	19.93032787
2013	20.65232877
2014	20.9139726
2015	20.46225895
2016	20.34180328
2017	20.74230769
2018	20.78351648
2019	20.80576923
2020	19.79338843

**Chart: AVERAGE of Maximum temperature (Degree C) vs Year**

Series: AVERAGE of Maximum temperature (Degree C)

Trend line equation:  $0.0174x + -14.9$   $R^2 = 0.214$

Chart Editor Settings:

- Series: AVERAGE of Maximum temperature
- Format:
  - Colour: Blue
  - Fill colour: Auto
  - Fill opacity: 100%
  - Point size: 7px
  - Point shape: Circle
  - Axis: Left axis
- Format data point: Add
- Options:
  - Error bars:
  - Data labels:
  - Trend line:
  - Type: Linear
  - Line colour: Blue
  - Line opacity: 40%
  - Line thickness: 2px
  - Label: Use equation
  - Show R<sup>2</sup>:
- Legend: >

END OF TUTORIAL