# Data Analysis Worksheet

**Night-Sky Brightness Investigation**

Name: _____
Group: _____
Observation location: _____
Date(s) of observation: _____

## Part 1 – Importing Data from ThingSpeak

1. Open your **ThingSpeak channel**.
2. Download the dataset using **Export → CSV**.
3. Open the file in **Excel, Google Sheets, or LibreOffice Calc**.
4. If all data appear in one column, separate them:
    - Select the column.
    - Go to **Data → Text to Columns**.
    - Choose **Delimited**.
    - Select **Comma** as the separator.

After separating the data, keep only the necessary columns:

**Date & Time Sky Brightness**

## Part 2 – Preparing the Dataset

Clean and organise the data:

☐ Remove empty rows
☐ Remove incorrect measurements (e.g. when a flashlight or nearby light affected the detector)
☐ Sort the data chronologically

If necessary, split **Date and Time** into two columns.

Final dataset structure:

**Date Time Sky Brightness**

Number of measurements collected: _____

Measurement interval (approx.): _____ minutes



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## Part 3 – Creating a Brightness Graph

Create a **line graph of Sky Brightness vs Time**.

Steps:

1. Select the **Time** and **Sky Brightness** columns.
2. Insert a **line chart**.
3. Label the axes:

X-axis → Time
Y-axis → Sky Brightness

## Part 4 – Identifying Twilight Phases

Examine the brightness curve.

Mark the approximate positions of:

Civil twilight (Sun altitude ≈ –6°)
Nautical twilight (Sun altitude ≈ –12°)
Astronomical twilight (Sun altitude ≈ –18°)

Estimated times:

Civil twilight ends at: _____

Nautical twilight ends at: _____

Astronomical twilight ends at: _____

## Part 5 – Identifying Patterns in the Data

Look for unusual changes in brightness.

Possible causes include:

☐ clouds reflecting artificial light
☐ Moon rise
☐ nearby artificial lights
☐ airglow
☐ sensor disturbance



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Describe at least one pattern you see in the graph.

Time of this event: _____

Possible explanation:

## Part 6 – Comparing with Solar Activity

Find the **daily Sunspot Number** for your observation dates
(source: SILSO database).

Add the values to your spreadsheet.

Create a **scatter plot**:

X-axis → Sunspot Number
Y-axis → Sky Brightness

Then calculate the correlation using:

```
=CORREL(range_brightness , range_sunspots)
```

Correlation coefficient (r):

Add a **trendline** to the graph and display **$R^2$**.

$R^2$ value:



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What does this value suggest?

☐ no correlation
☐ weak correlation
☐ moderate correlation
☐ strong correlation

Explain your interpretation:

## Part 7 – Interpreting Sky Quality

Based on your brightness values and previous lessons about the **Bortle Scale**, estimate the sky quality at your observation site.

Estimated Bortle class:

Explain your reasoning.

## Part 8 – Reflection

1. Which factor most influenced your brightness measurements?



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2. What uncertainties might affect your results?

3. Why are long-term observations important in astronomy and environmental monitoring?



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