

Week 5

Data Description – Part 1

- Describe three phenomena
 1. Daylength
 2. Phases of the moon
 3. Covid 19 pandemic
- Objective:
 - Naturally motivate mathematical concepts
 - Introduce many mathematical terminologies
 - Learn the art of problem description mathematically
- Mathematics and astronomy

First two topics – Day length and phases of the moon are from astronomy

Data Description – Part 2

- **Daytime**
 - Daytime: Time of the day between sunrise and sunset
 - Daytime varies across seasons, it is maximum during summer and minimum during winter.
- **Seasons and Daytime**

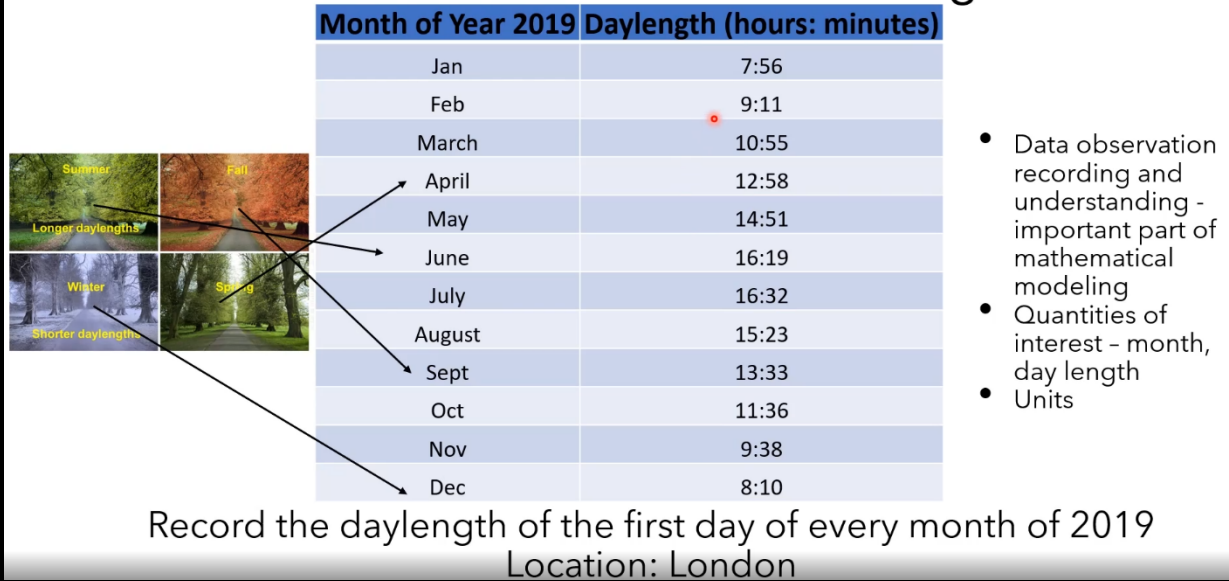
Different between daytime and nighttime duration for a given season is dependent on the location of the place.

Problem 1: Observe and record the daytime of first day of every month of 2019.

Location: London

- **Obtaining the data**
 - <https://www.timeanddate.com/>
 - **Observation and data recording**
 - Record the daylength of the first day of every month of 2019
- Location: London

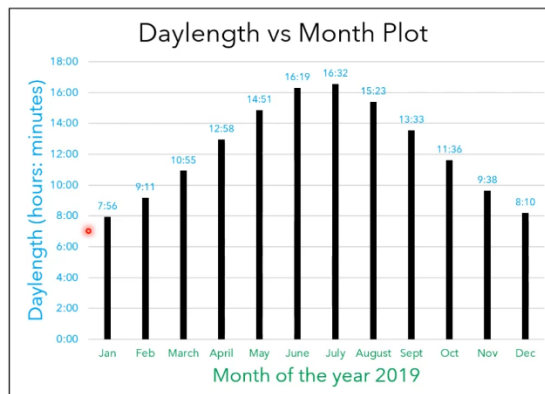
Observation and data recording



Data Description – Part 3

- **Data Visualization**
 - Representation of data or information in a graph, chart, or other visual format.
 - Important to develop visualization skills.
 - Makes big and small data easier for the human brain to understand
 - Easier to detect patterns and trends in groups of data
- **Data Visualization (Plotting)**

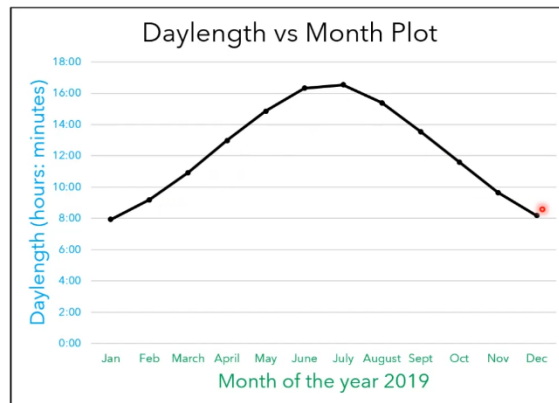
Data visualization (plotting)



Month of Year 2019	Daylength (hours: minutes)
Jan	7:56
Feb	9:11
March	10:55
April	12:58
May	14:51
June	16:19
July	16:32
August	15:23
Sept	13:33
Oct	11:36
Nov	9:38
Dec	8:10

Height of the bar represents the magnitude of daylength

Data visualization (plotting)



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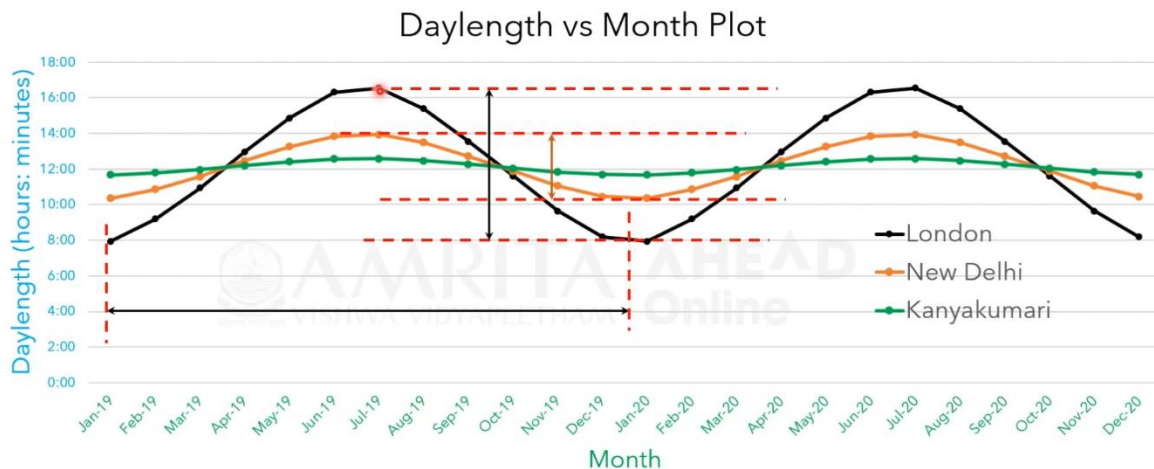
Height of the bar represents the magnitude of daylength

Extending the scope of the problem

- Record data for period of two years for three cities
 - London
 - New Delhi
 - Kanyakumari
- Carefully selected cities – Reason (distance from equator)

5.4 Data Description 4

- Record data for period of two years for three cities
- Visualize the data



- Dependence
- Variation, Maximum(maxima) and Minimum(minima)
- Periodicity, Amplitude

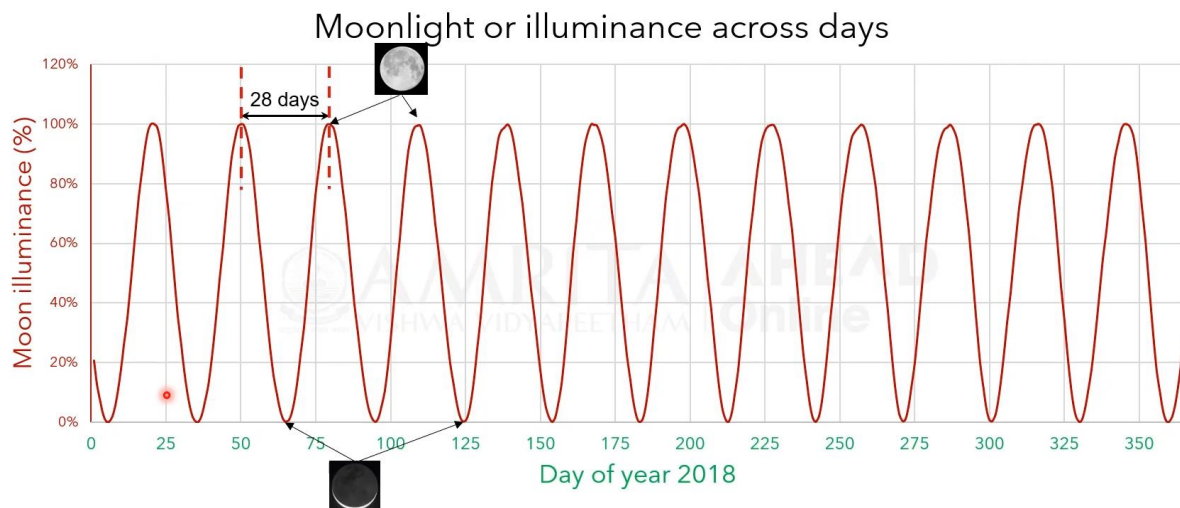
Data Description – Part 5

- **Problem 2 – Phases of the moon.**
- Problem: Record and visualize moonlight (moon illuminance) across days for the year 2018 in London

- **Obtaining the data** - <https://www.timeanddate.com/>
- **Tabulated data**

Note that we introduced another column representing the day of the year.

- **Recording and plotting moonlight**
 - Recording illuminances for all days of the year 2018 in London
 - Observe how moon phases and periodicity are captured in the plot.



- **Superimpose two problems**

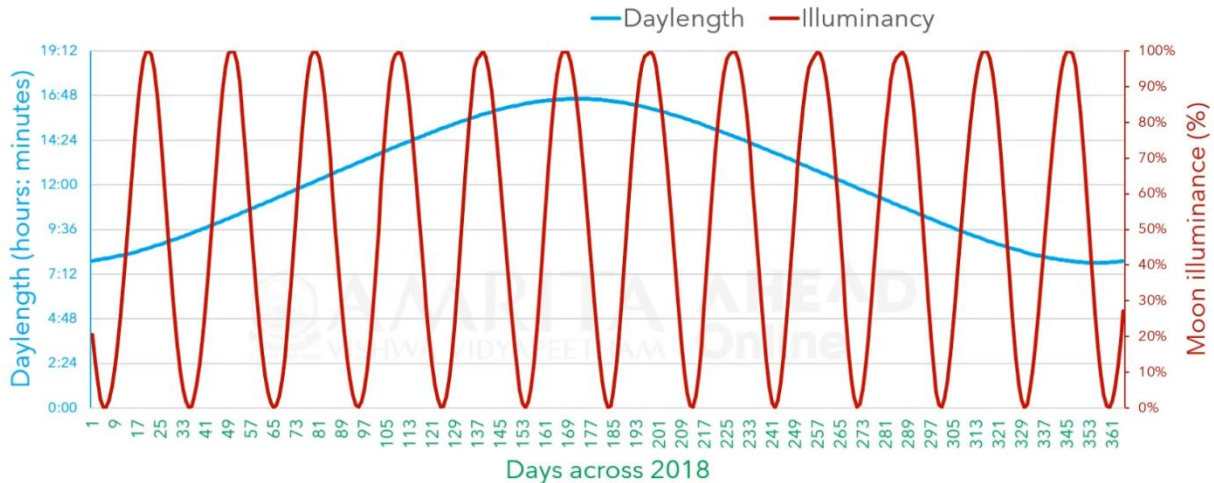
- Problem 1: collect and visualize data for the daylength of first day of every month for a year.

- Independent variable
 - First day of each month for the entire year
 - Location
- Dependent variable
 - Daylength

- Problem 2: Record and visualize the moon illuminance for all the days of the year

- Independent variable
 - Day of the year
- Dependent variable
 - Illuminance

- Let's superimpose the two problems in our visual charts



- Bring independent variables of both problems together
- Introduced additional y axis to accommodate two distinct dependent variables