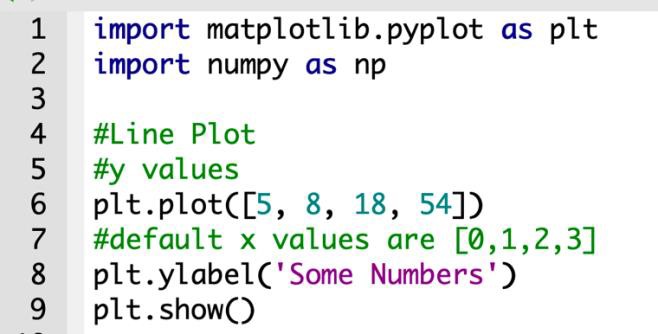
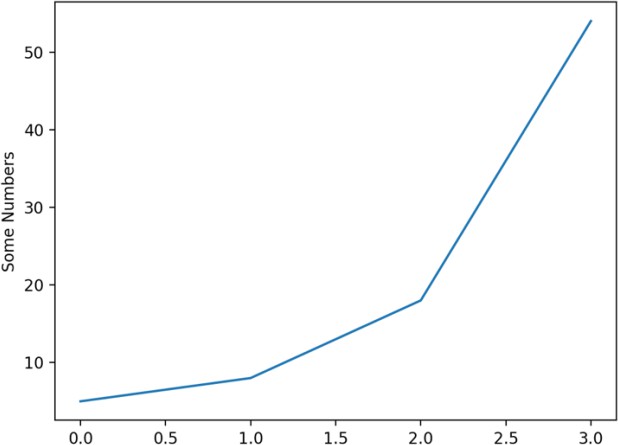
Lesson 3c worksheets – Plotting with Matplotlib

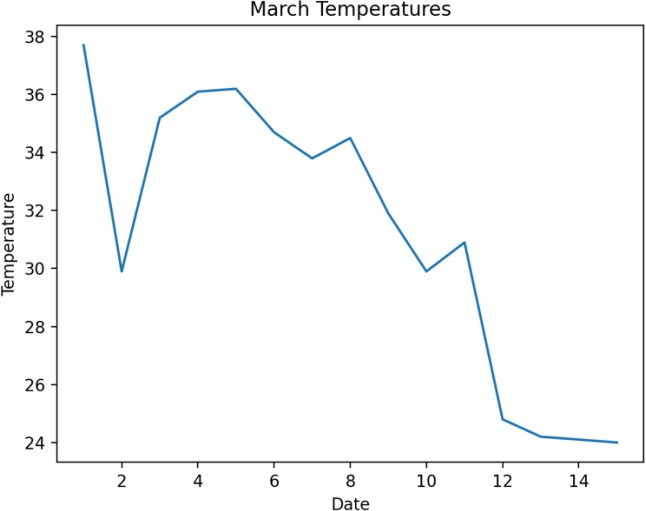
1. matplotlib.pyplot

* Each pyplot function makes some change to a figure, e.g. create a figure, create a plotting area, plot lines.
* matplotlib.pyplot keeps track of the figure you are working on.
* functions calls are directed to the current figure.

1. Line Plot

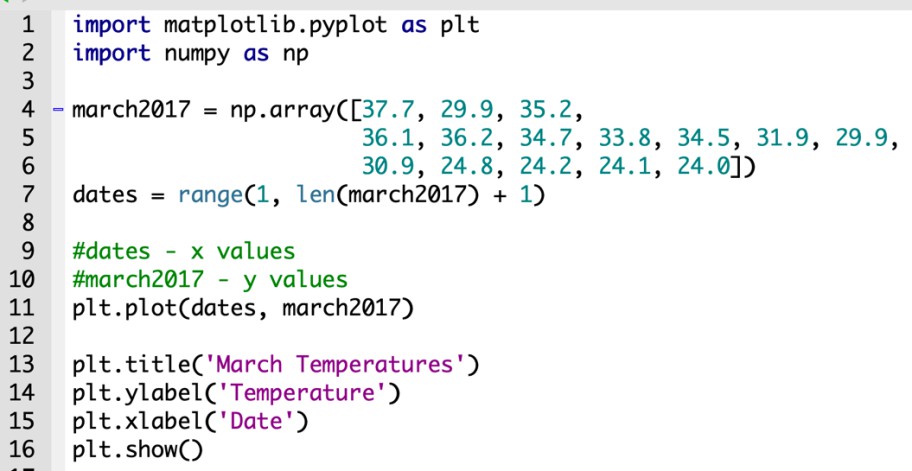
* Assumes supplied values are y-values
* Uses default values for x-values

1. March temperature example using line plot:



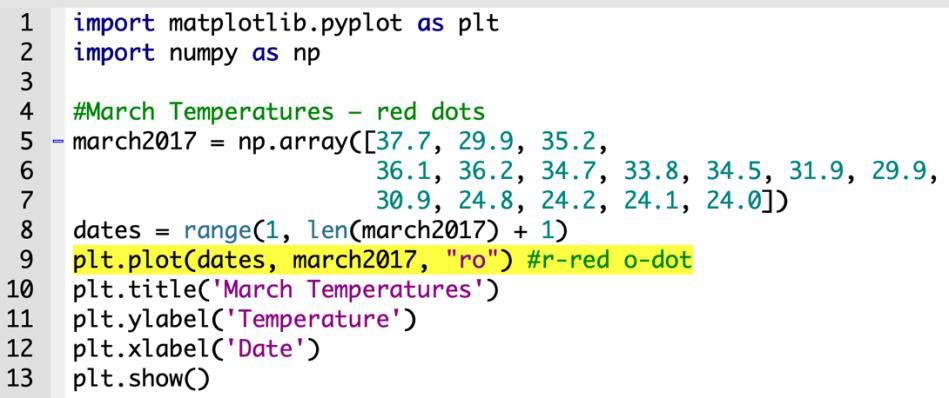
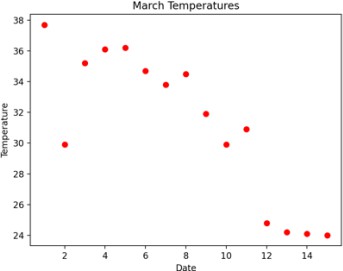
ylabel

Title

* Both x and y values are supplied to plt.plot() function.
* Copy and paste the data below: march2017 = np.array([37.7, 29.9, 35.2, 36.1, 36.2, 34.7, 33.8, 34.5, 31.9, 29.9,30.9, 24.8, 24.2, 24.1, 24.0])

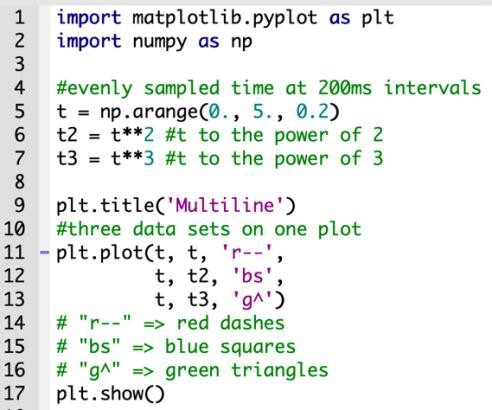
xlabel

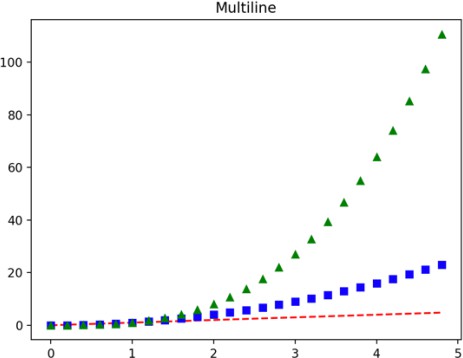
1. March Temperatures – red dots

* The line patterns “ro” is supplied to plt.plot() function.

1. Multiple plots on an axis

* Put a few arrays on the same plot.





* For details of line style, marker and colours, refer to the following links:
* Line style

[https://matplotlib.org/stable/api/\_as\_gen/matplotlib.lines.Line2D.html#](https://matplotlib.org/stable/api/_as_gen/matplotlib.lines.Line2D.html#matplotlib.lines.Line2D.set_linestyle) [matplotlib.lines.Line2D.set\_linestyle](https://matplotlib.org/stable/api/_as_gen/matplotlib.lines.Line2D.html#matplotlib.lines.Line2D.set_linestyle)

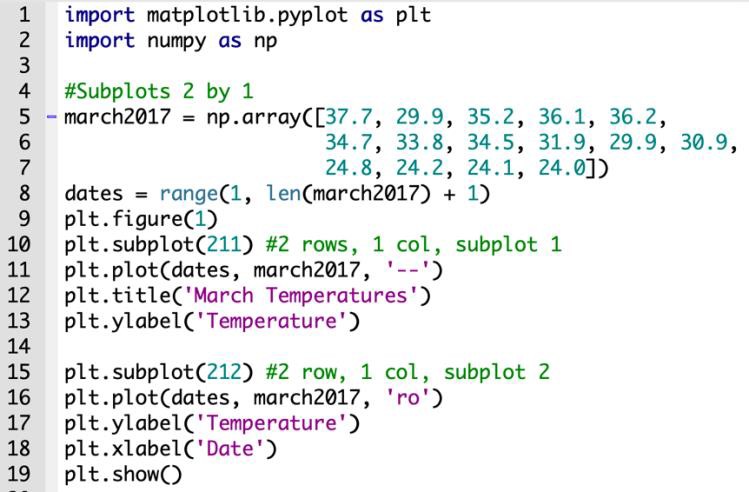
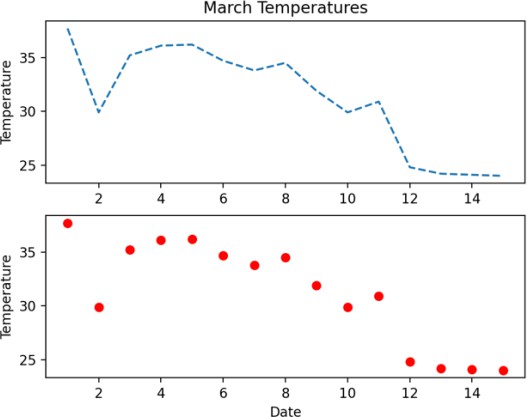
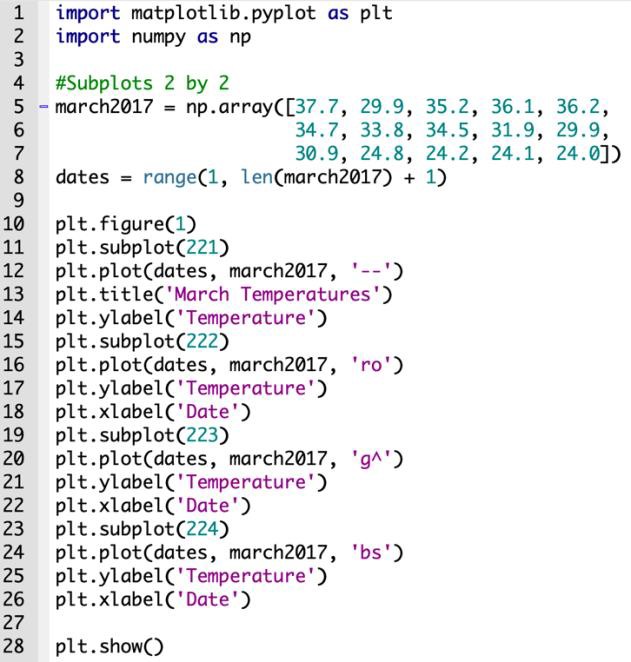
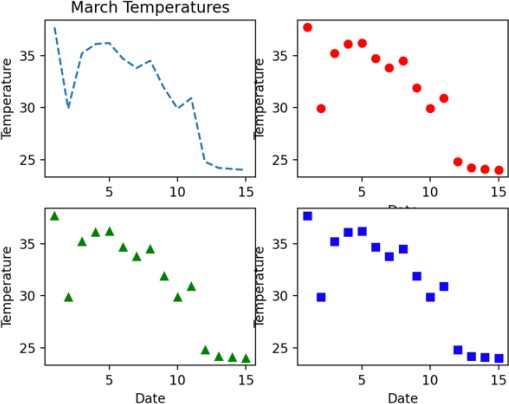
* Marker

<https://matplotlib.org/stable/api/markers_api.html>

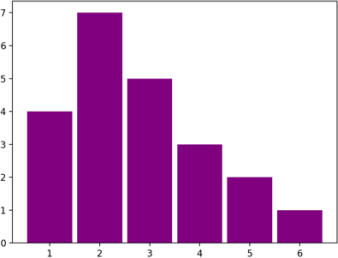
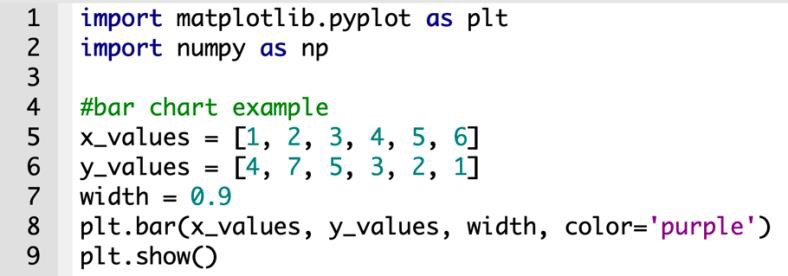
* Colours

https://matplotlib.org/2.0.2/users/colors.html

1. Subplots

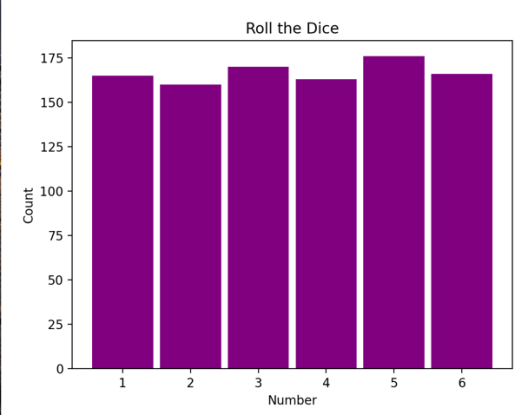
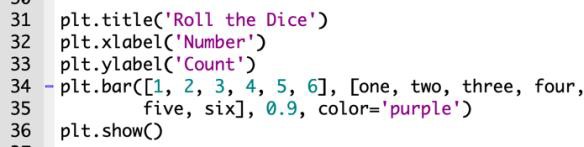
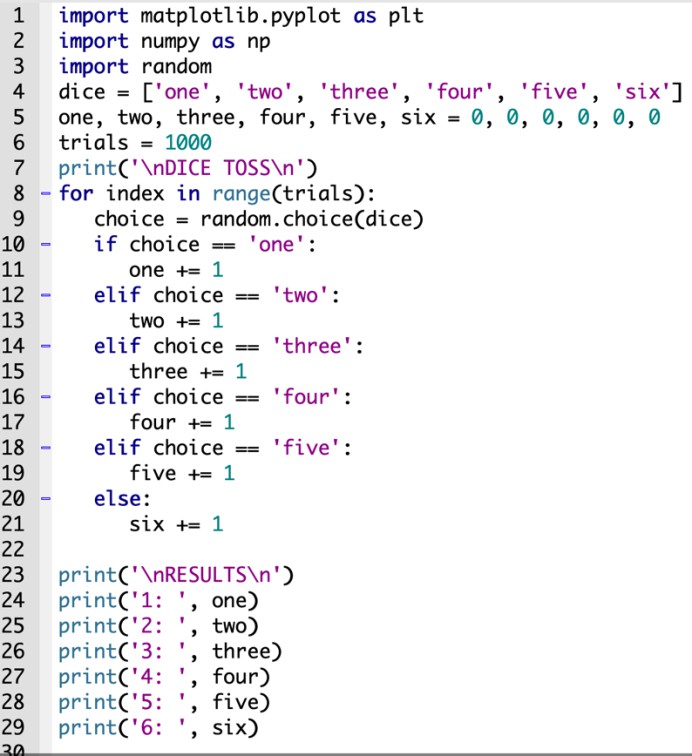
* Put a few subplots in one plot.
* Put 2 subplots in one plot example.
* Put 4 subplots in one plot example.

1. Bar chart

* Use the bar() function.

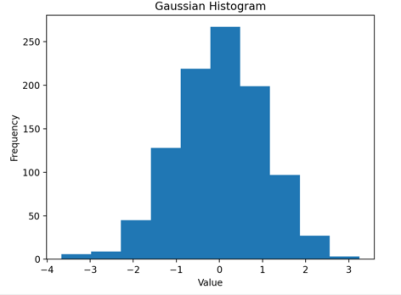
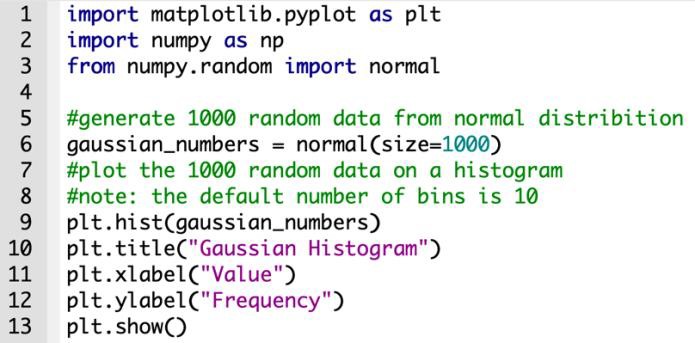
1. Roll the Dice example.

* Roll a dice for 1000 times and record down how many times each sides (1-6) appears.
* Use random.choice() to roll a dice randomly.
* Use bar chart to display the frequency of appearance of each side.



1. Histogram

* Histogram give us a plot of the frequency of a value or event across a range of possible values.
* Do not confuse a Histogram to a bar chart. They are different things.
* If you have no idea of what a Histogram is, please revise at
* https://[www.mathsisfun.com/data/histograms.html](http://www.mathsisfun.com/data/histograms.html)
* To draw a Histogram, large amount of data is needed, so we use random() function to help us to generate those large amount of data (instead of typing 1000 data values).
* The code below generates 1000 random data from a normal distribution.
* If you have no idea of what a normal distribution is, please revise at
* https://[www.mathsisfun.com/data/standard-normal-distribution.html](http://www.mathsisfun.com/data/standard-normal-distribution.html)



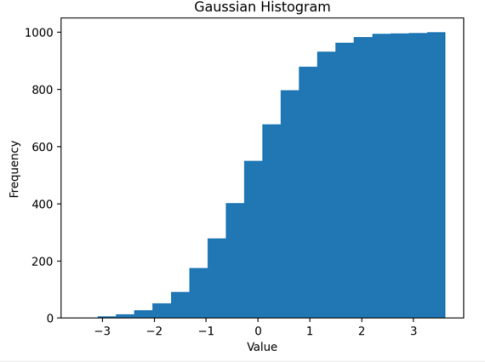
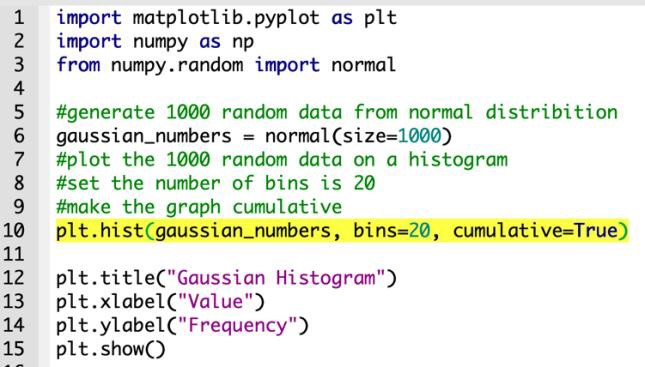
1. Histogram - normalize to convert to probabilities.

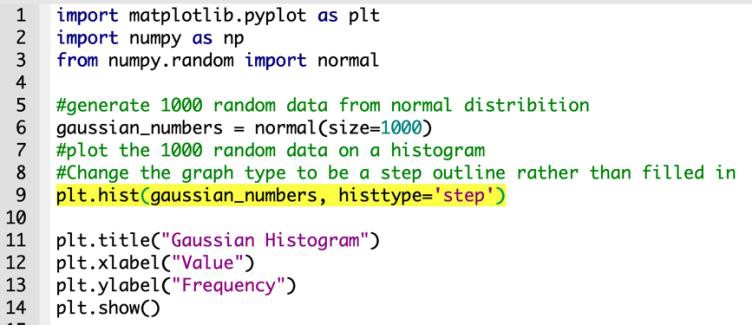
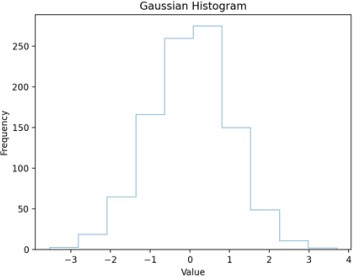
* A screenshot of a computer

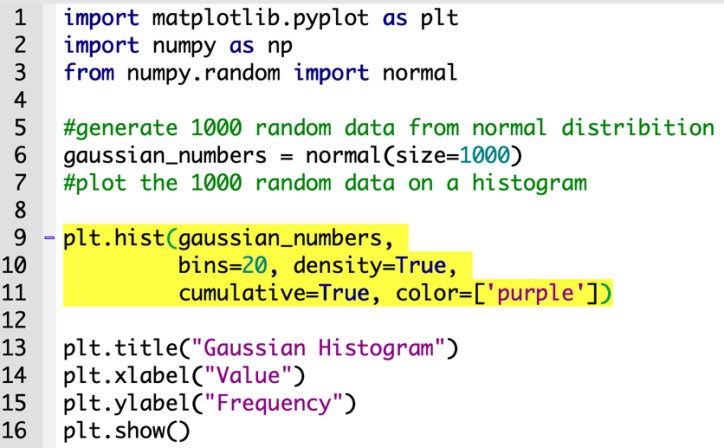
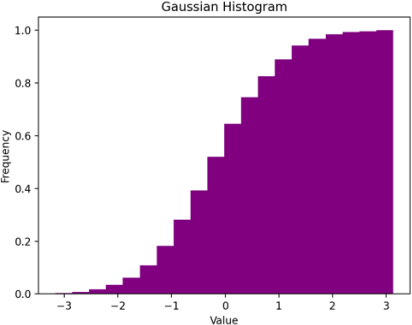
  AI-generated content may be incorrect.Note the range value of y axis is 0.00 to 0.40 (probabilities)

1. Histogram - Cumulative Frequency

* The cumulative frequency is the running total of the frequencies.



1. Histogram - Step outline
2. Histogram – with configuration

* Combine a few parameters

1. Simulation of unconstrained growth example

