Learn By Example: Plotly

Overview

Plotly offers suite of analytics and visualization tools

Spans business intelligence, open-source libraries and platforms

Emphasis on online collaboration

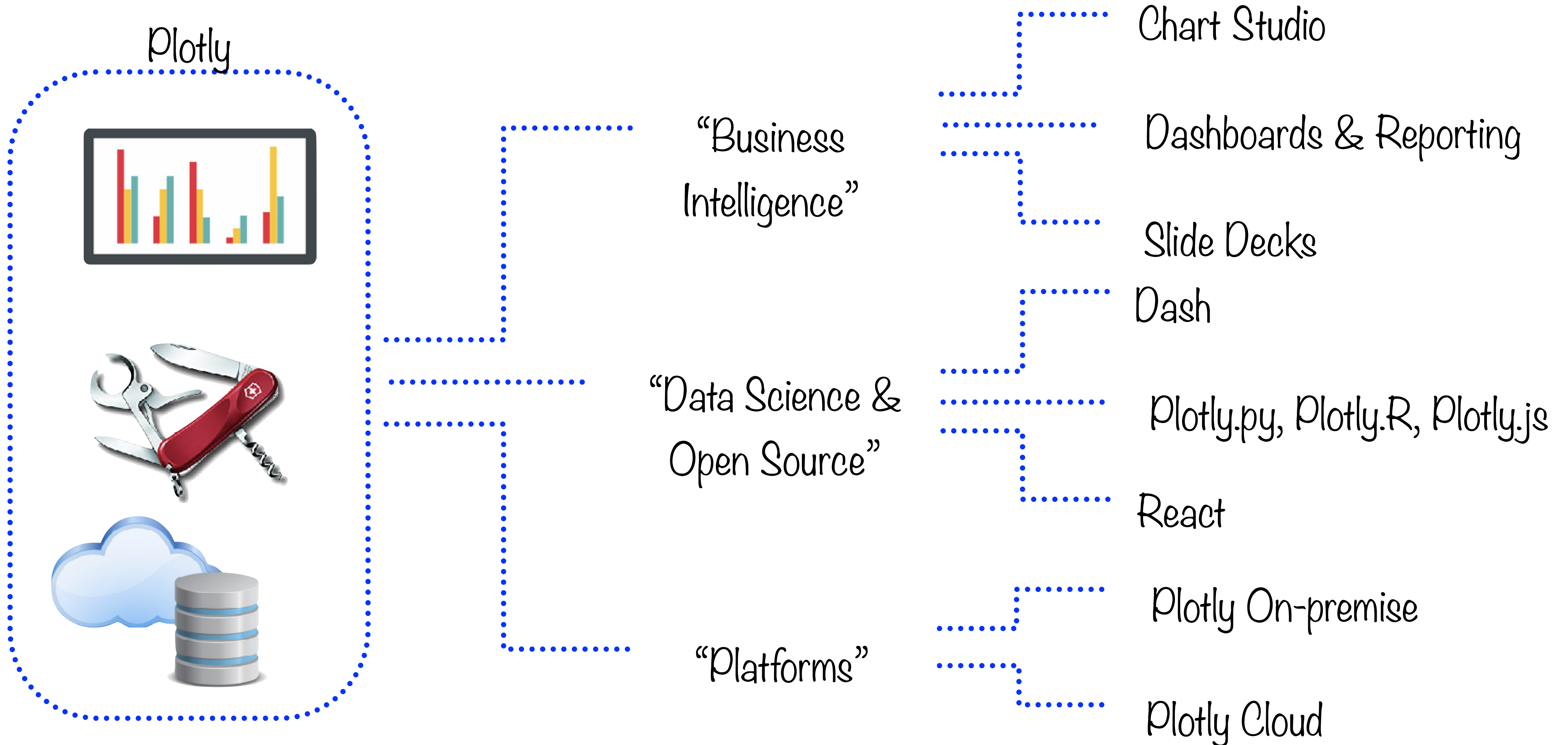This course focuses on plotly.py

High-quality online visualizations

Introducing Plotly

Plotly

Plotly, also known by its URL, Plot.ly, is a technical computing company headquartered in Montreal, Quebec, that develops online data analytics and visualization tools.

Wikipedia

Plotly

Plotly

"Business Intelligence"
- Chart Studio
- Dashboards & Reporting
- Slide Decks

"Data Science & Open Source"
- Dash
- Plotly.py, Plotly.R, Plotly.js
- React

"Platforms"
- Plotly On-premise
- Plotly Cloud

Plotly

Plotly

"Business Intelligence"

"Data Science & Open Source"

"Platforms"

Chart Studio

Dashboards & Reporting

Slide Decks

Dash

Plotly.py, Plotly.R, Plotly.js

React

Plotly On-premise

Plotly Cloud

Plotly

Data visualization toolbox

Create interactive plots

Online collaboration and sharing

Export to variety of formats

Plotly APIs

Scala

Python

R

JavaScript

MATLAB

Node.js

Visualization Libraries in Python

Matplotlib

Powerful, complex library for plotting within Python notebooks

Seaborn

High-level library based on Matplotlib - build polished charts easily

Bokeh

Not built on Matplotilb; focused on browser-based visualizations

Plotly.py

Not built on Matplotlib either; online collaboration on visualizations

Plotly.py

Plotly's Python graphing library makes interactive, publication-quality graphs online.

plot.ly/python

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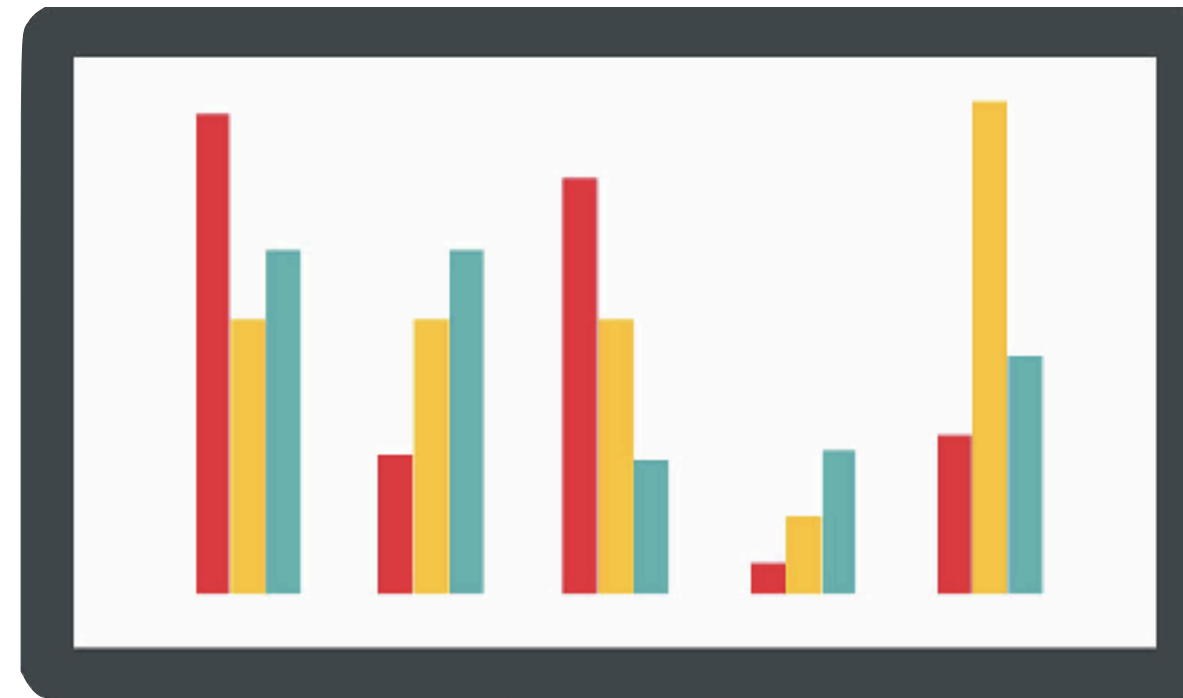
Plotly

JSON

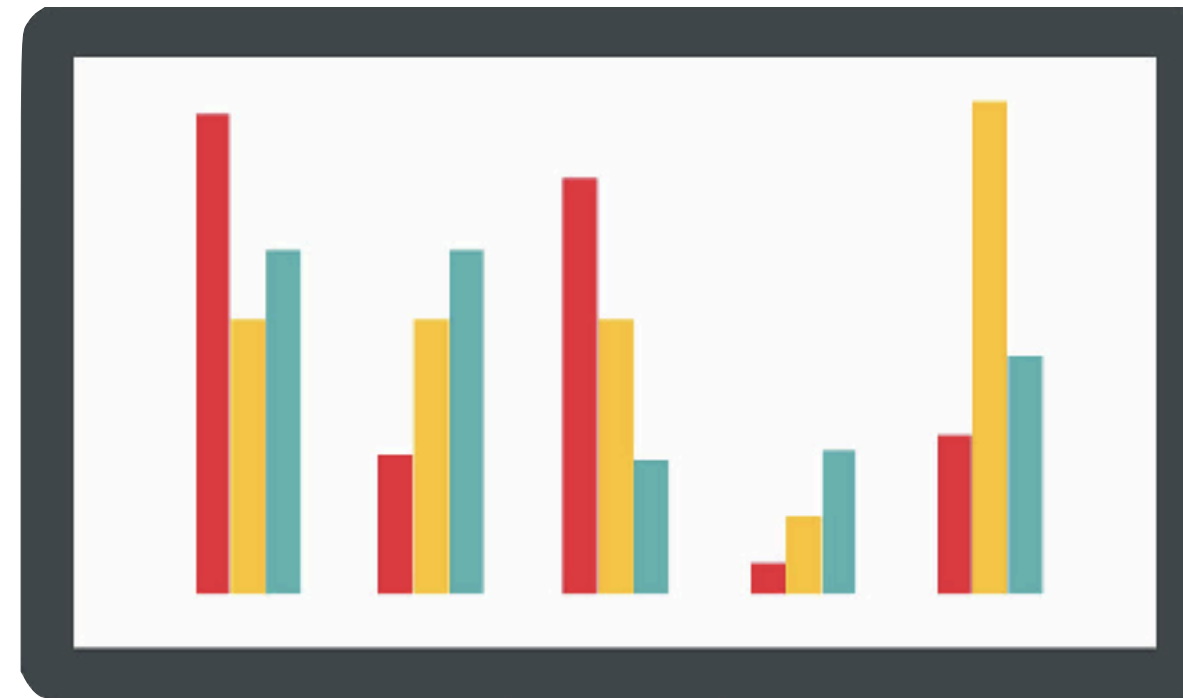Under the hood, each plotly graph is a JSON object

Plotly
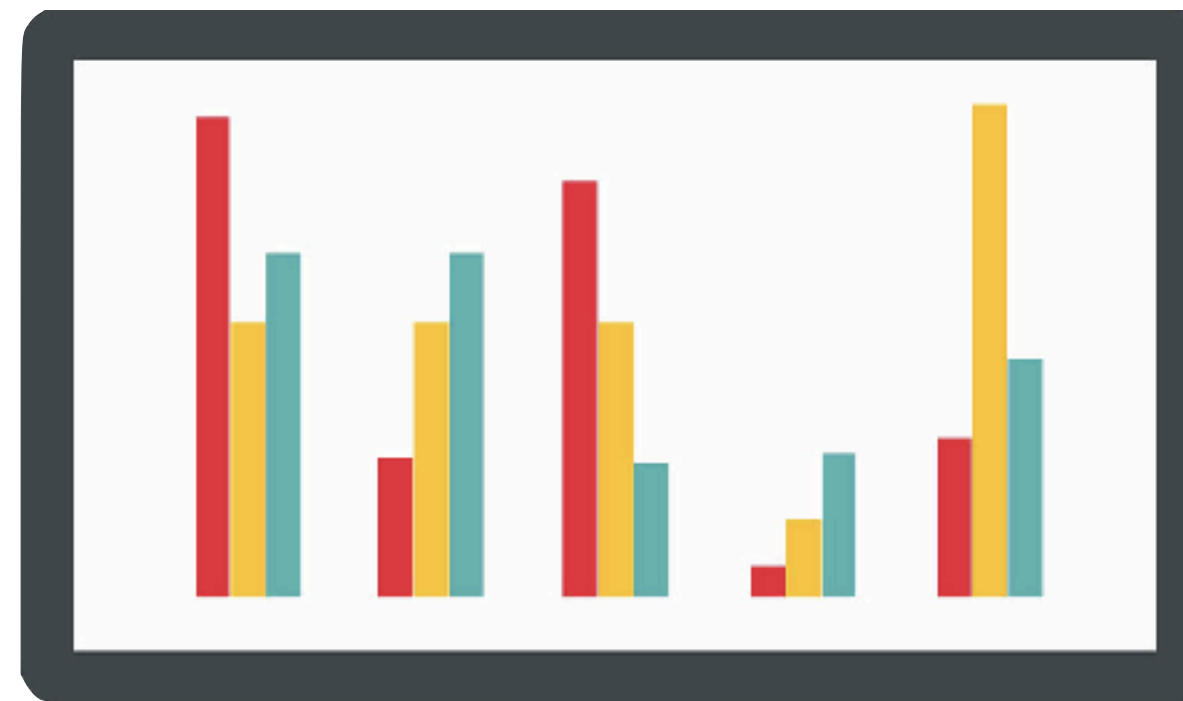
JSON

Plotly Python API

Python API interacts with the plotly.js library

Plotly

JSON

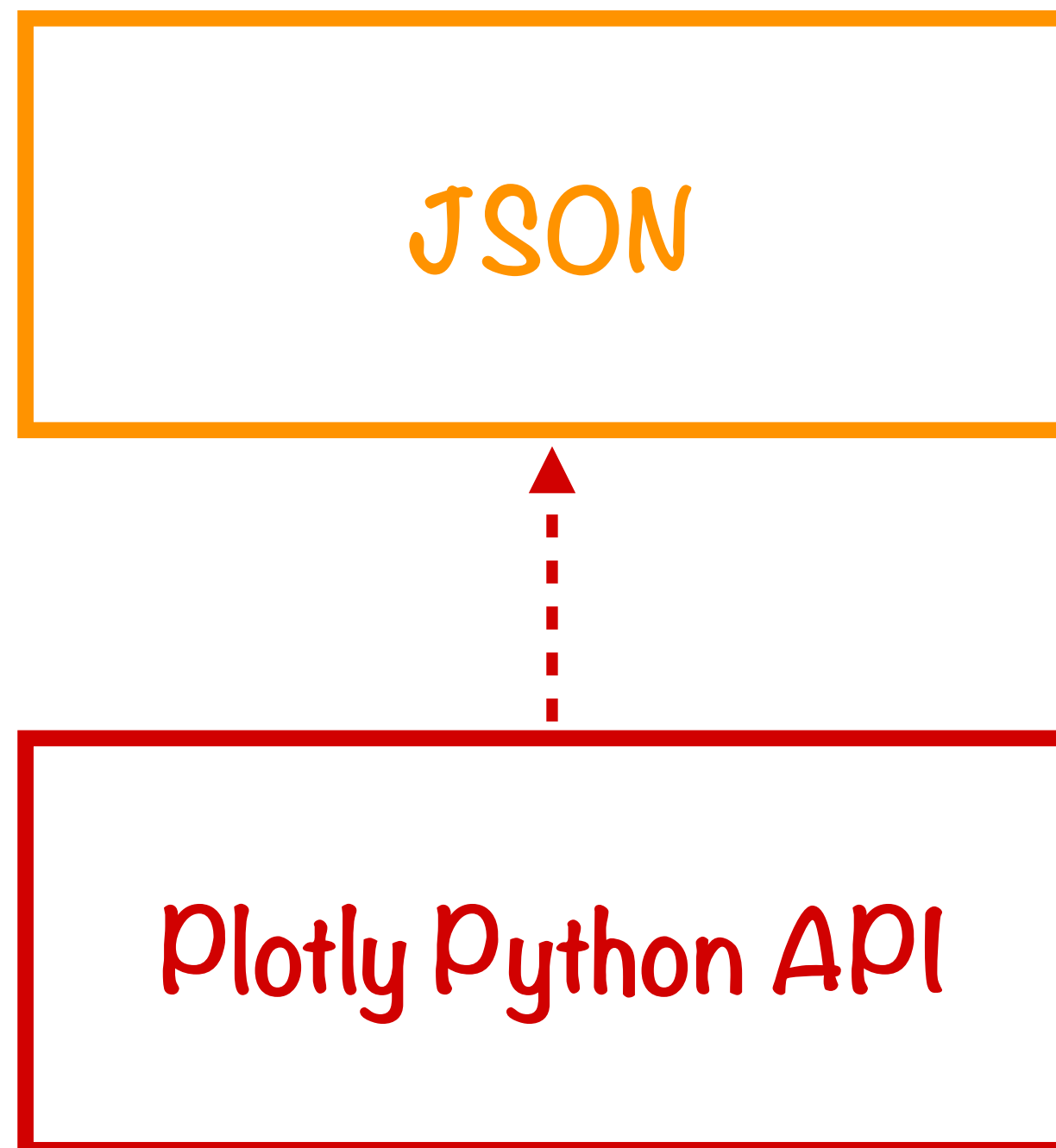Plotly Python API

Each object is based on the plotly.js library
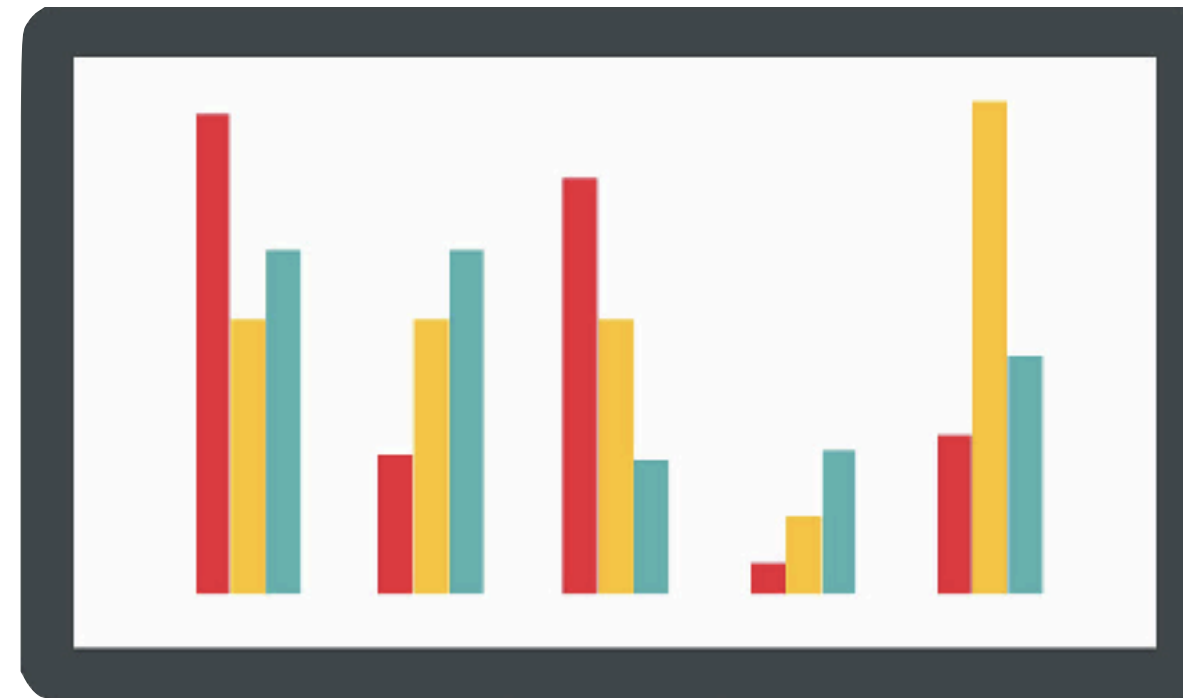
Plotly

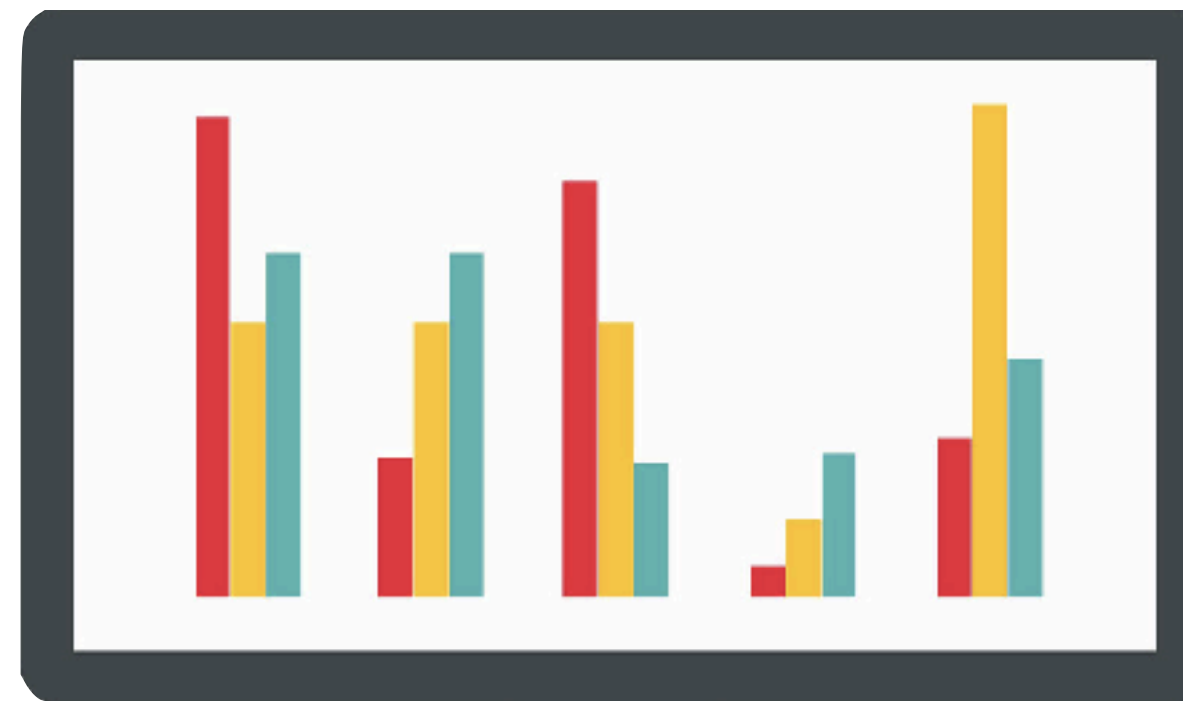This object supports visualizations and interactivity

Plotly

Python API interacts with the plotly.js library

Plotly

JSON
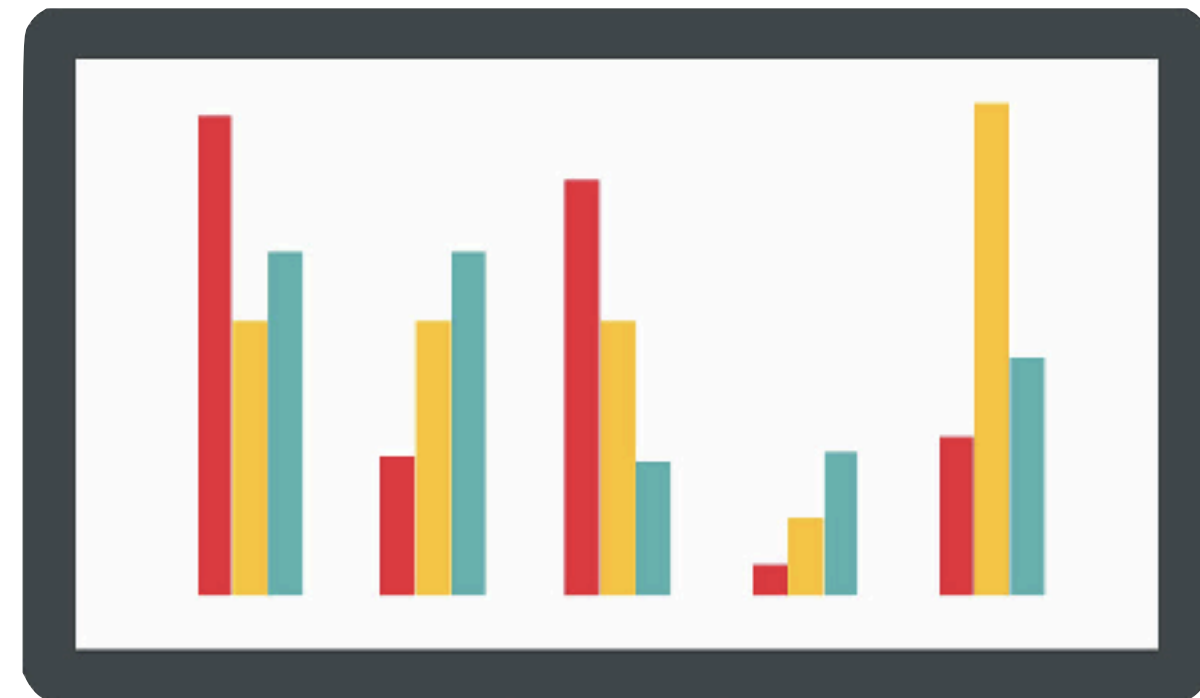
Plotly Python API

Python API allows Python developers to create plots

Plotly

plotly.plotly

plotly.graph_objs

Plotly APIs

plotly.plotly

plotly.graph_objs

Communicate with plotly
servers

Generate graph
objects

Elements of a Plot

Data

List object in python which contains the traces

Layout

Object that defines the look of the plot

Figure
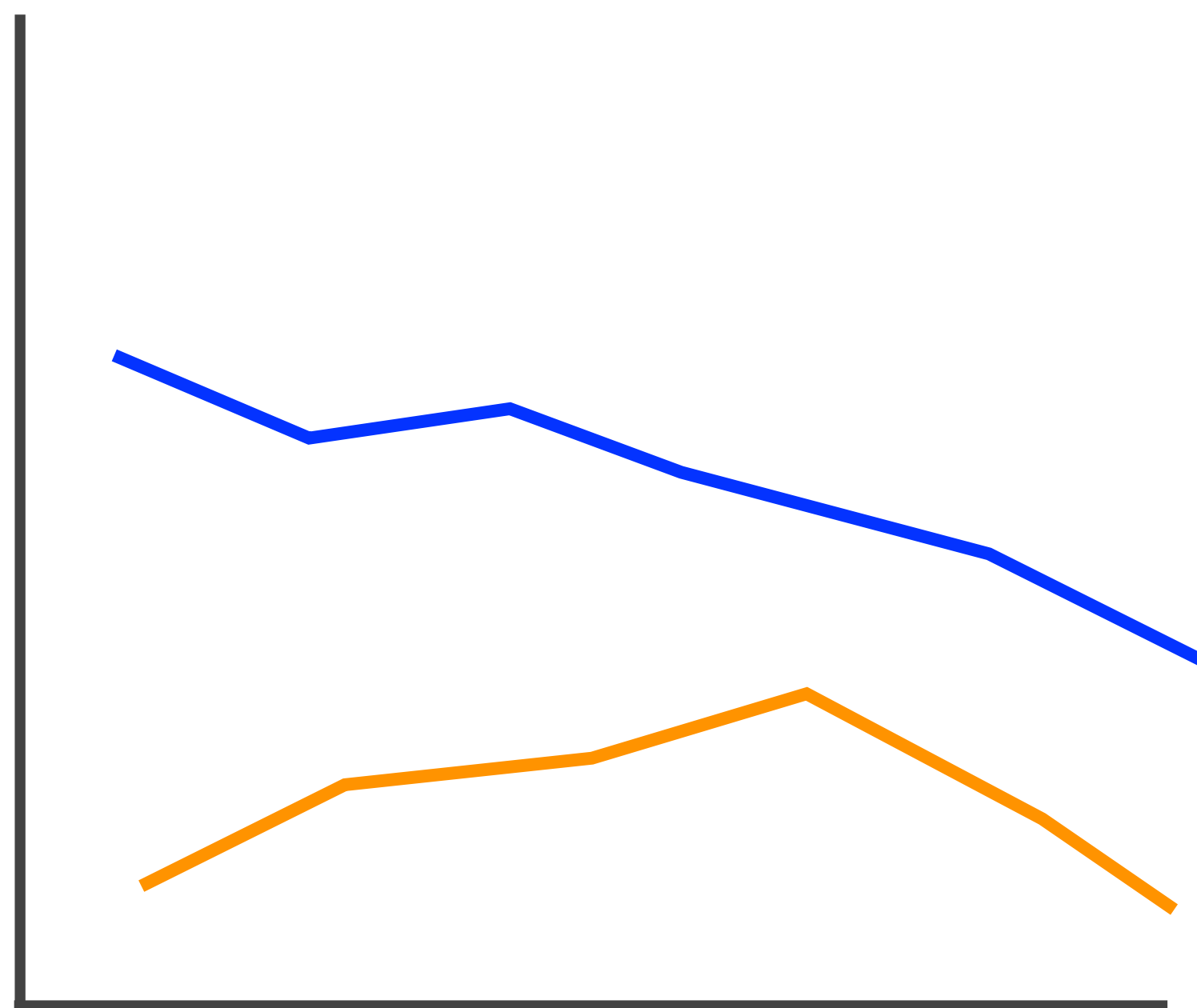
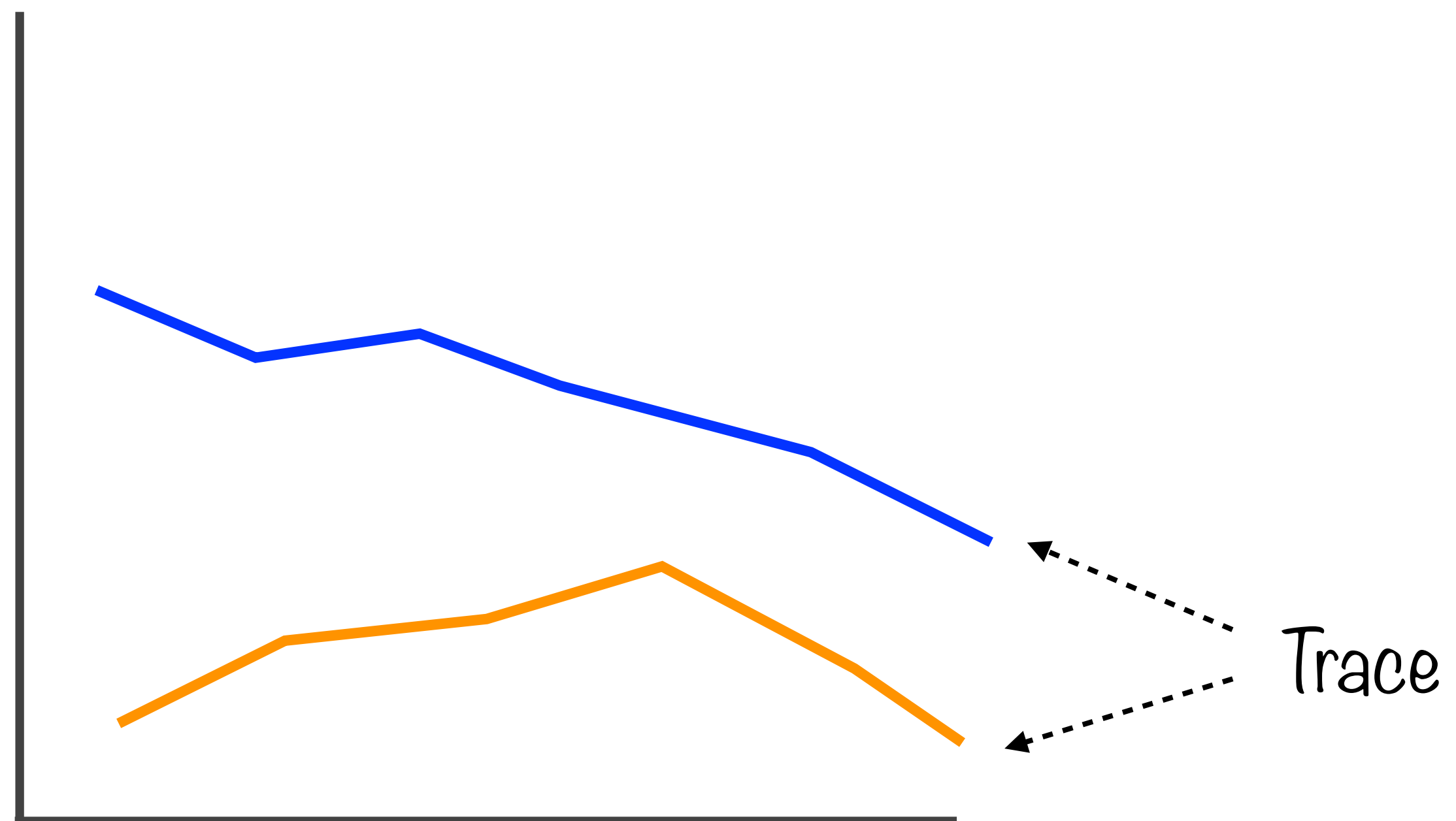Final object to actually be plotted

Elements of a Plot

Data

List object in python which contains the traces

Layout

Object that defines the look of the plot

Figure

Final object to actually be plotted

Trace

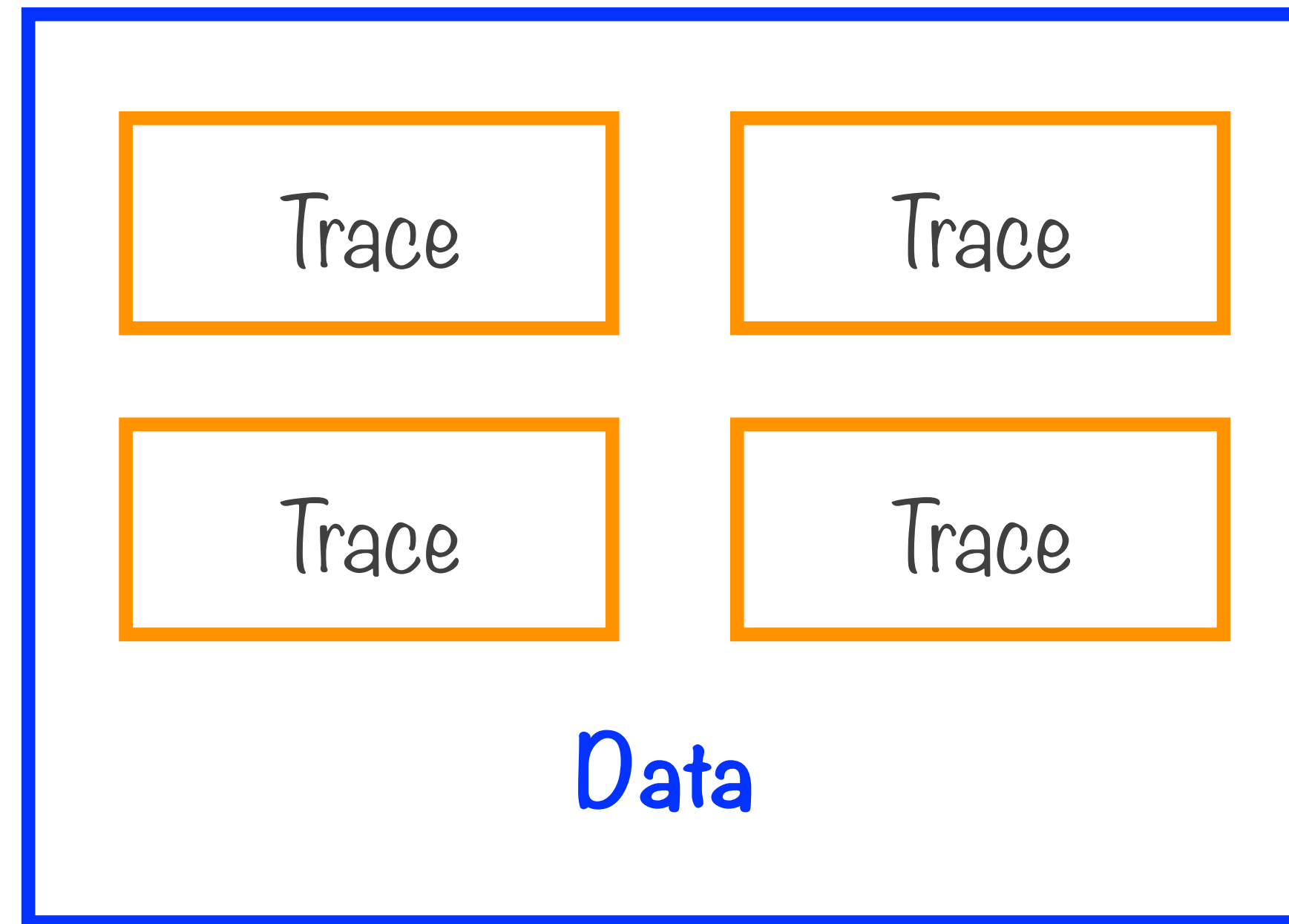Each individual element of the figure is called a trace

Trace

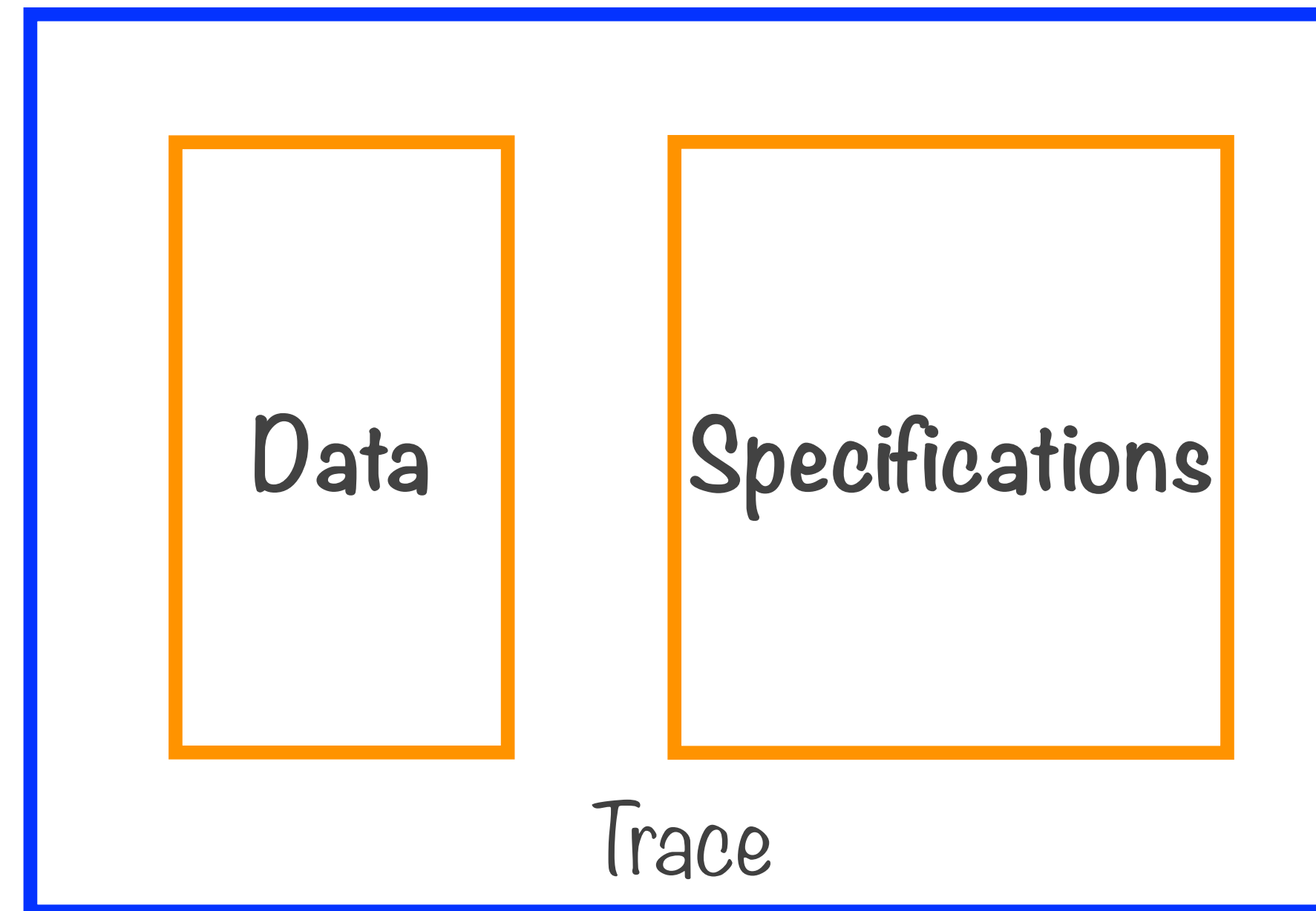Line chart with two different categories

Trace

Trace

Each line is a trace

Data

Data object encapsulates multiple traces

Trace

Data

Specifications

Trace

Each trace contains collection of data and its plotting specifications

Elements of a Plot

Data

List object in python which contains the traces

Layout

Object that defines the look of the plot

Figure

Final object to actually be plotted

Elements of a Plot
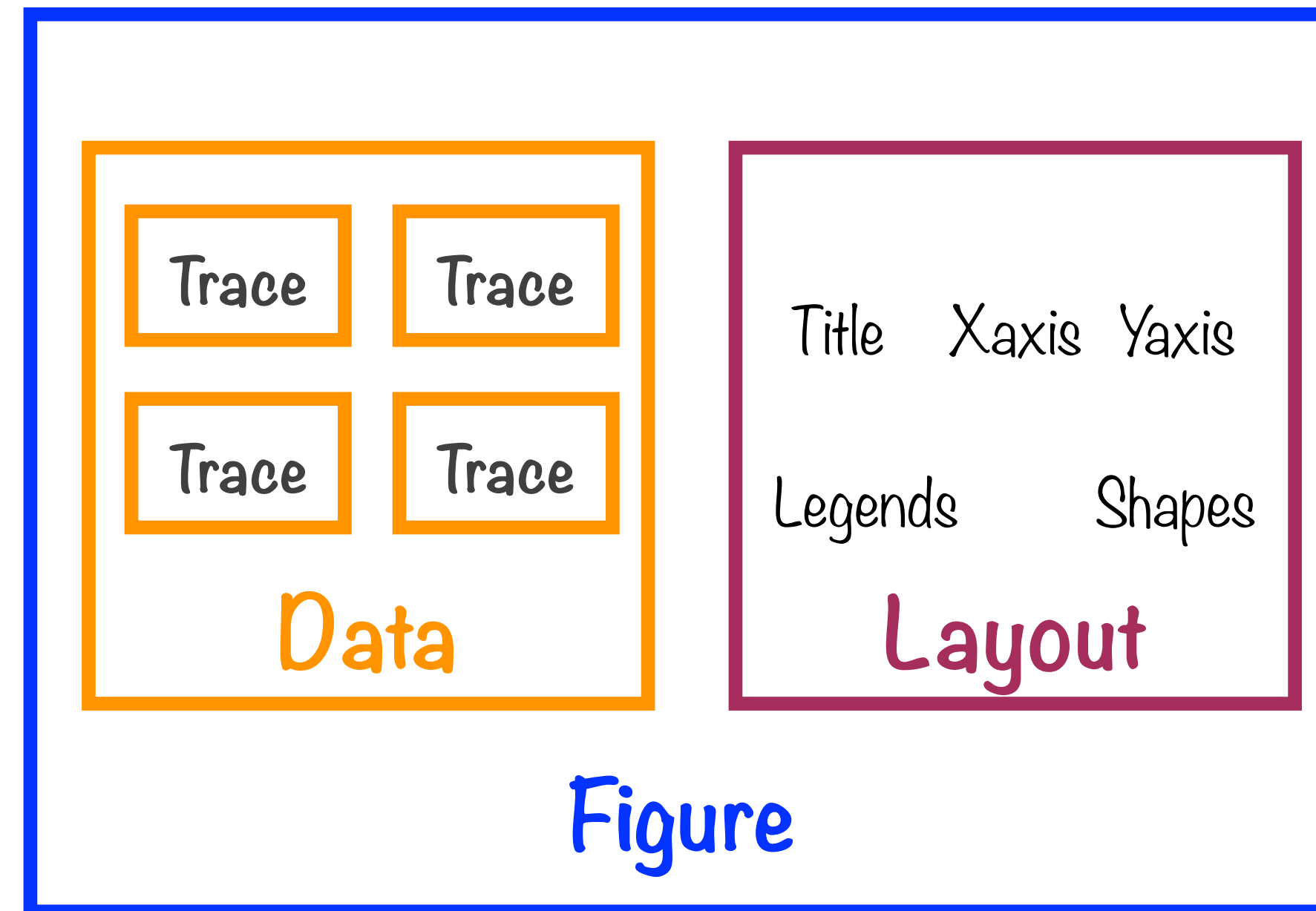
Data

List object in python which contains the traces

Layout

Object that defines the look of the plot

Figure

Final object to actually be plotted

Layout

Title   X-axis   Y-axis

Legends   Shapes

Layout

Elements of a Plot

Data

List object in python which contains the traces

Layout

Object that defines the look of the plot

Figure

Final object to actually be plotted

Elements of a Plot

Data

List object in python which contains the traces

Layout

Object that defines the look of the plot

Figure

Final object to actually be plotted

Figure

Dictionary-like object that contains both the data object and the layout object

Demo

Installation and offline plots

Demo

Online plots

Demo

Line charts

Demo

Pie charts

Demo

Bar charts

Demo

Histograms

Demo

Inset plots

Demo

Box plots

Demo

Scatter plots

Demo

Bubble
charts

Demo

Bubble maps

Demo

Heat maps

Demo

Time-series
data

Candlestick Charts

Candlestick Charts

Specifically designed to represent financial price information

Open, Close, High, Low

Each data point encapsulates four items of information

Color Coding

Two different colors to represent "up" and "down" price moves

"Up" and "Down" Price Moves
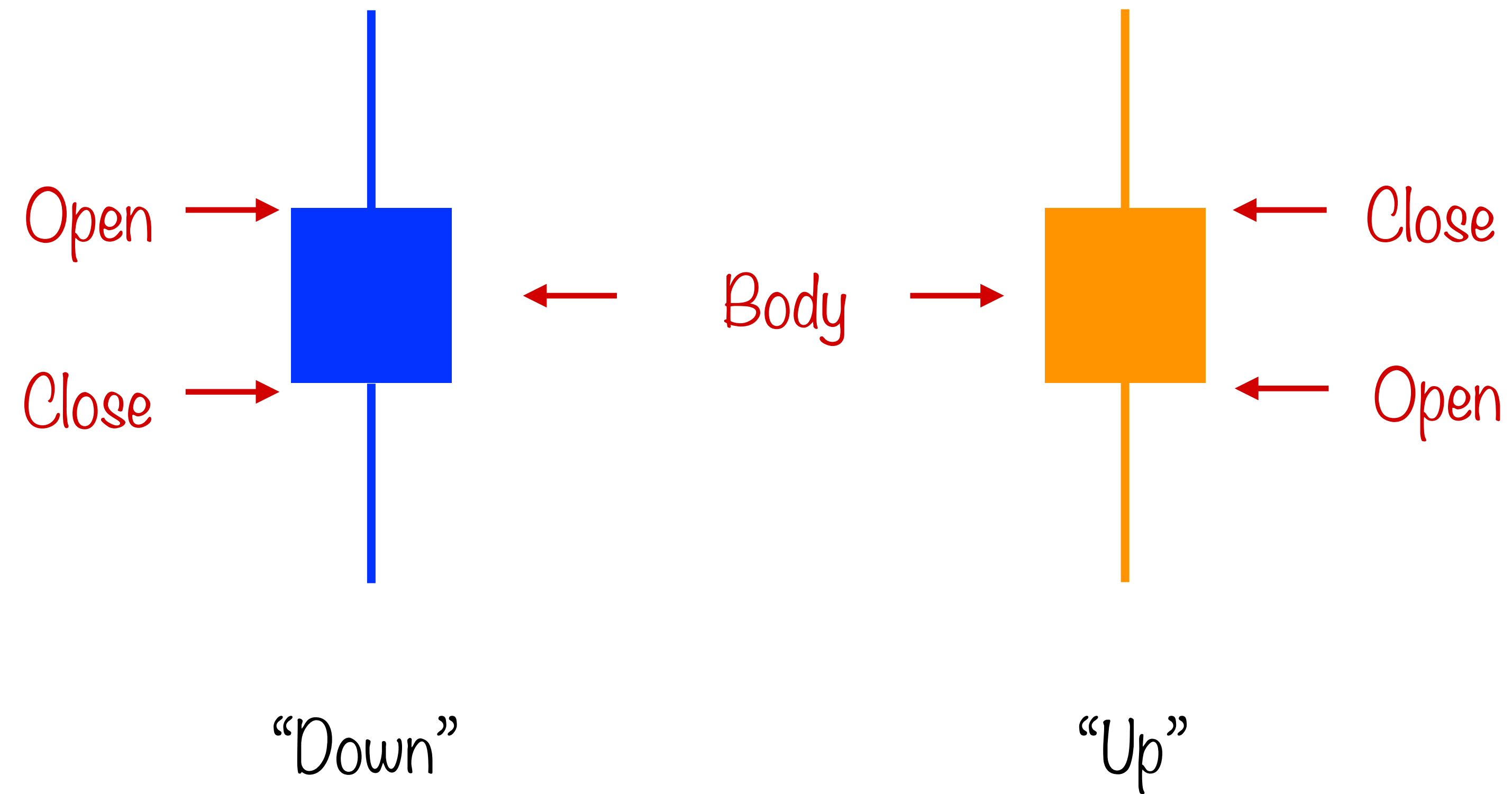
"Down" Price Move
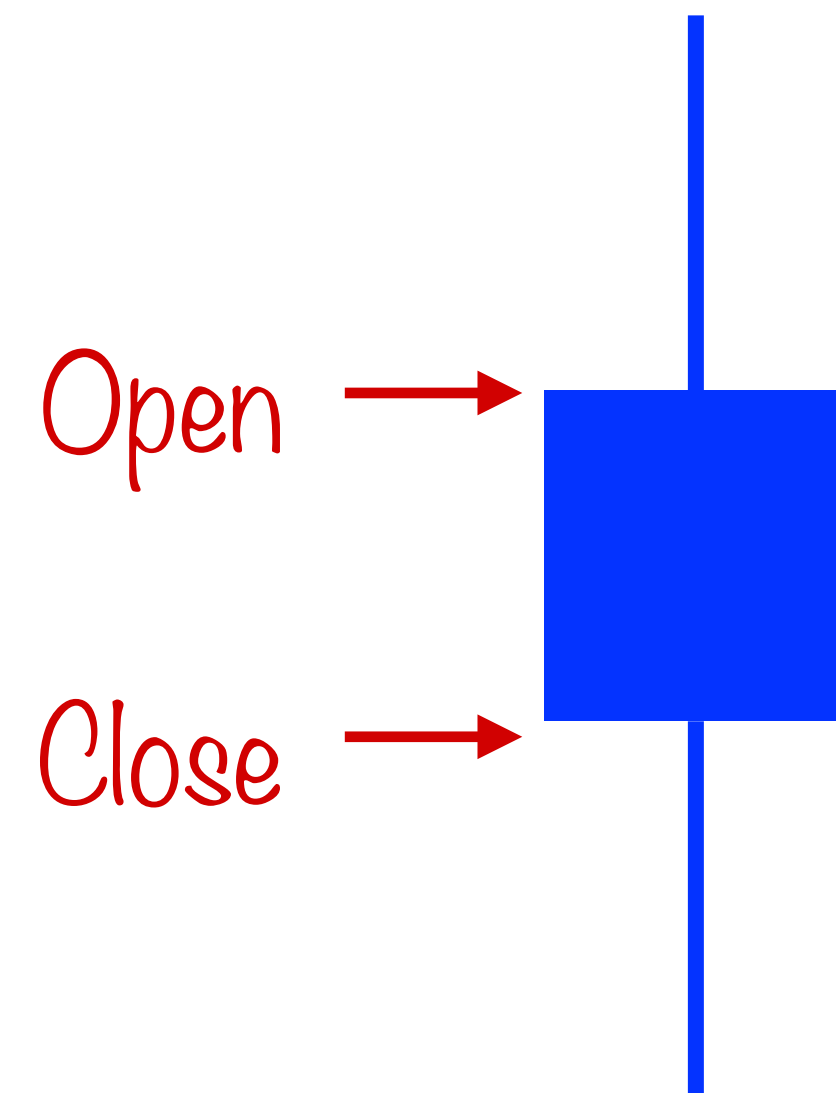
Open →

Close →

Opening price > Closing price

"Up" and "Down" Price Moves

Closing price > Opening price

← Close

← Open

"Up"
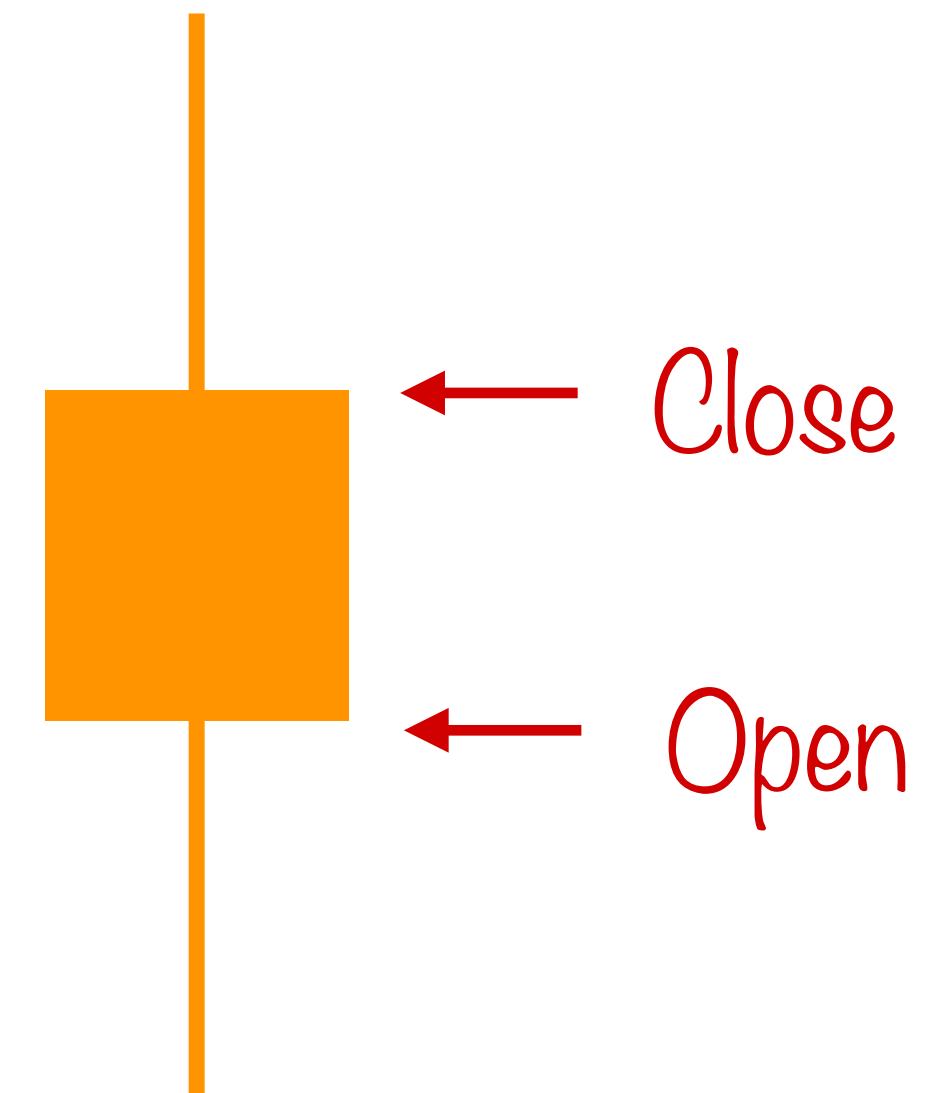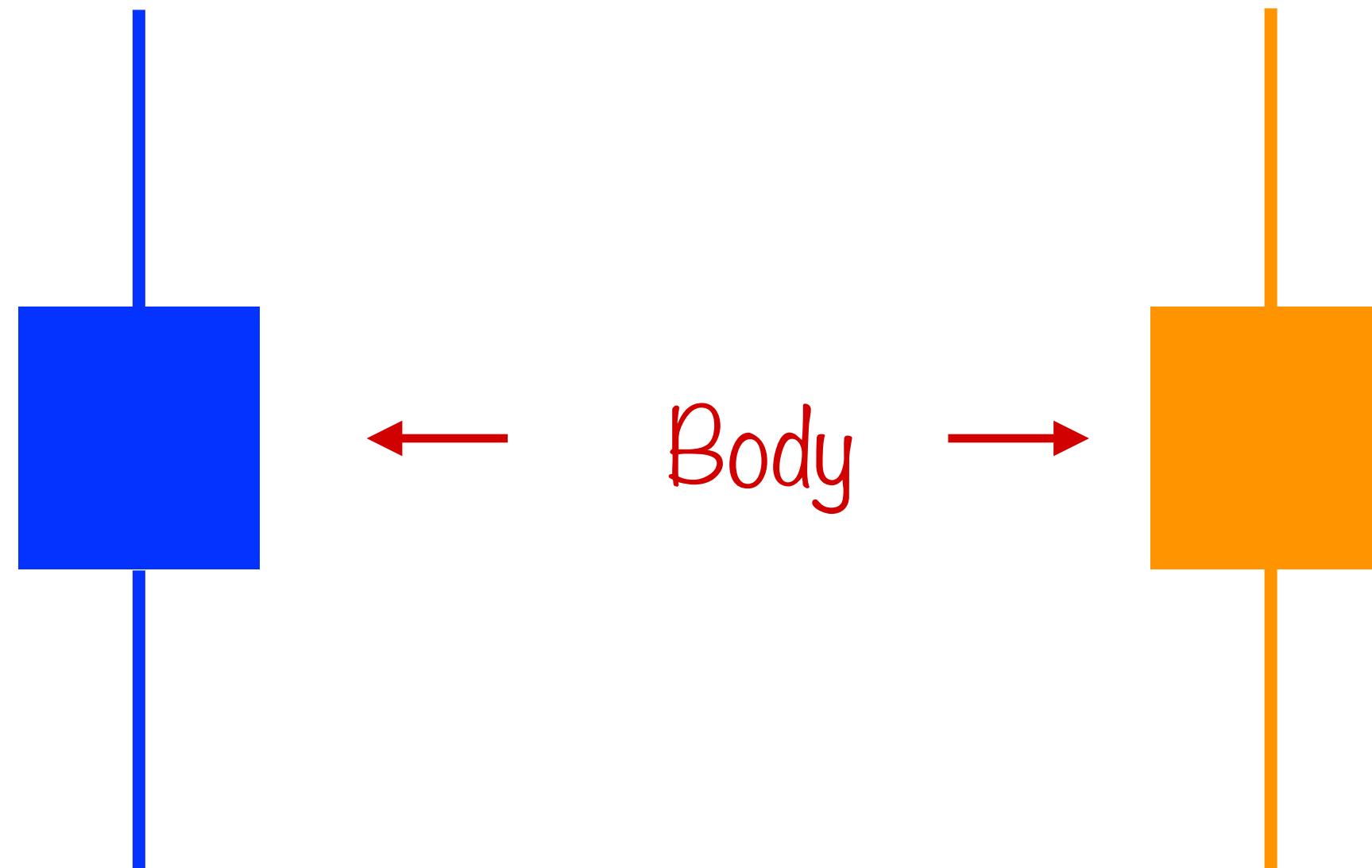
Body

Body

The body represents price range between open and close

High and Low
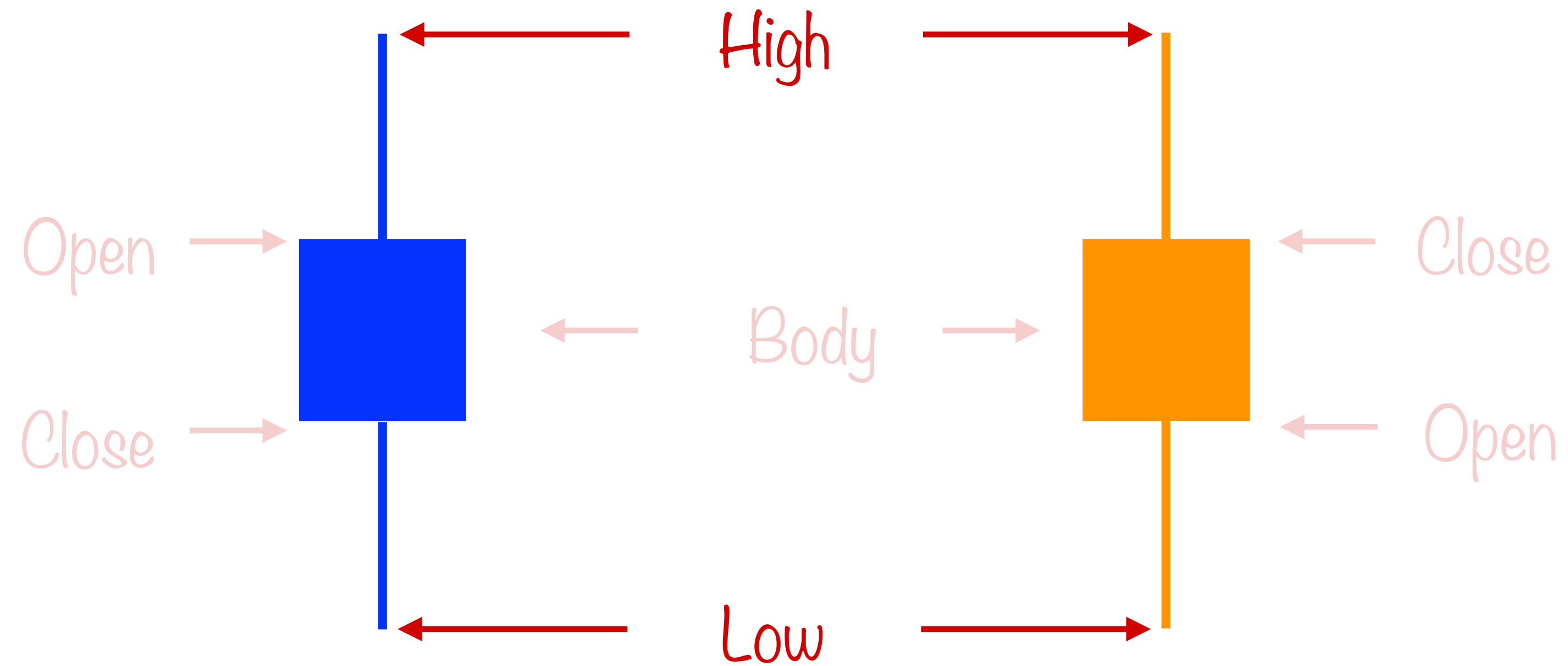
High and low are easy to infer from shape

Demo

Candlestick charts

SVG

Scalable Vector Graphic (SVG)

An XML-based vector image format for two-dimensional graphics with support for interactivity and animation, based on an open standard

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SVG

Used to draw shapes using a vector representation
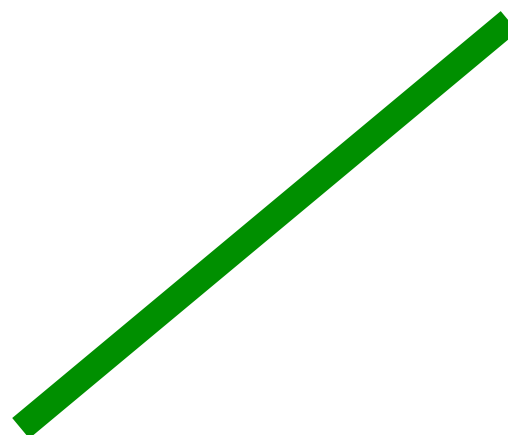
SVG

XML format for shape specification
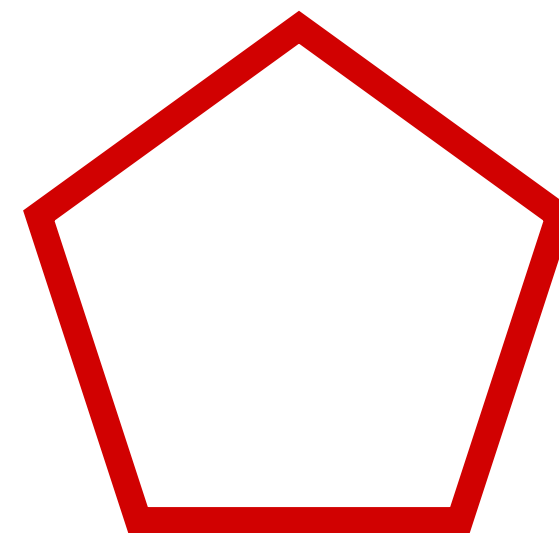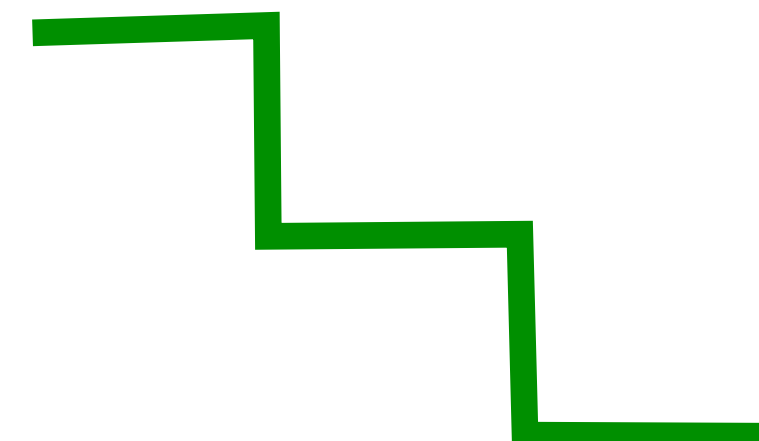
SVG Shapes

Rectangle
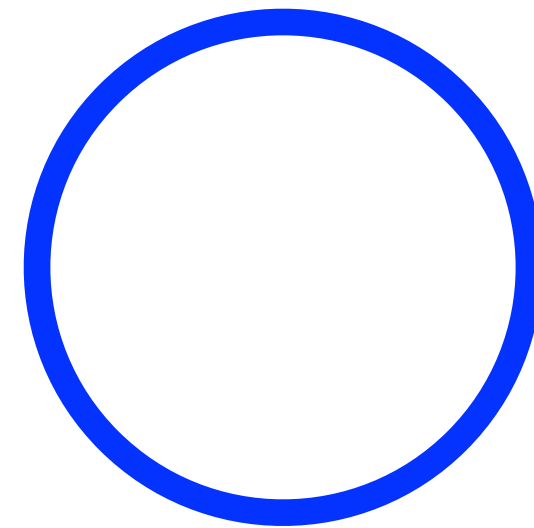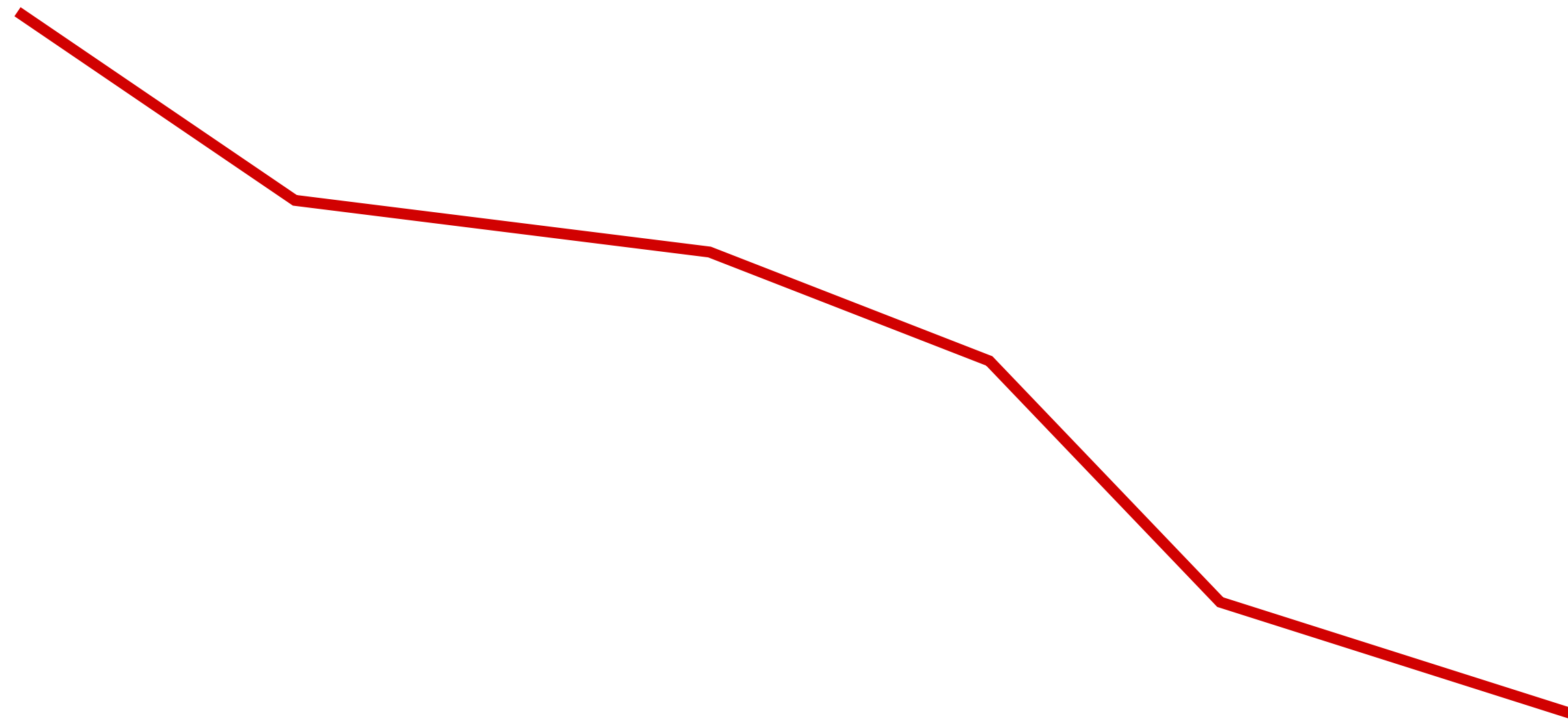
Circle
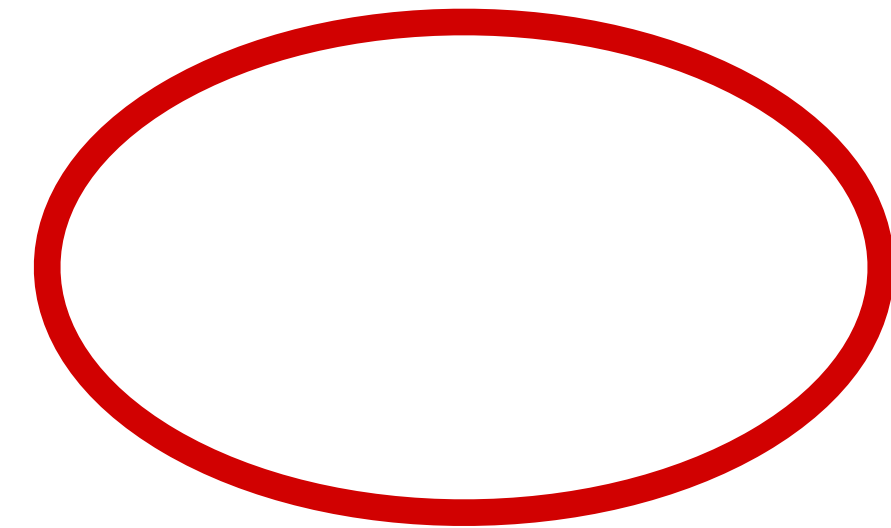
Ellipse

Line

Polygon

Polyline

Predefined shape elements

SVG Path

<path> element is used to define a path

SVG Path

M 1,1 L 1,4 L 4,1 Z

Path is defined with a series of commands

SVG Path
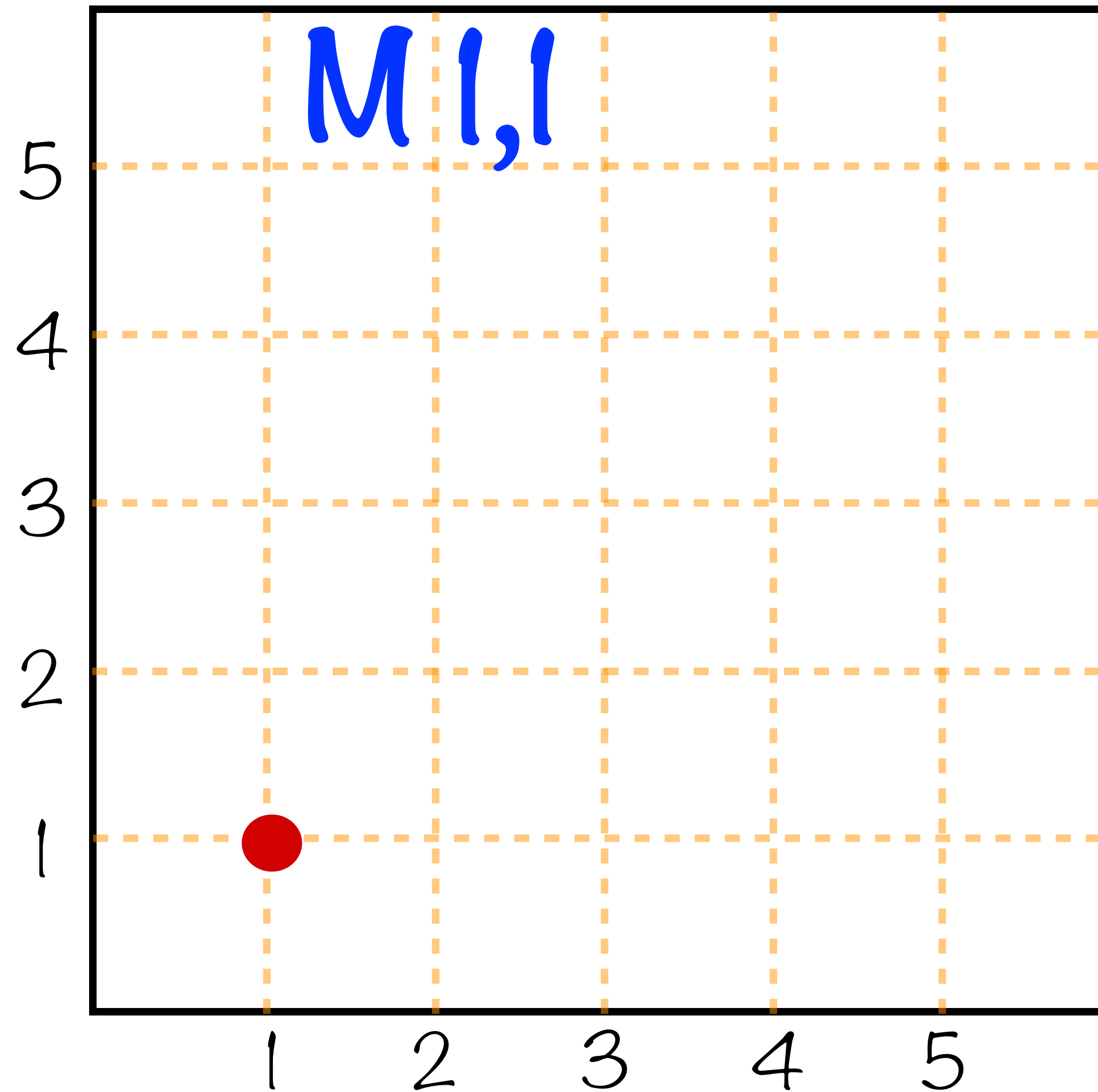
M1,1 L1,4 L4,1 Z

Commands

SVG Path

M 1,1 L 1,4 L 4,1 Z

Points on the axes

SVG Path

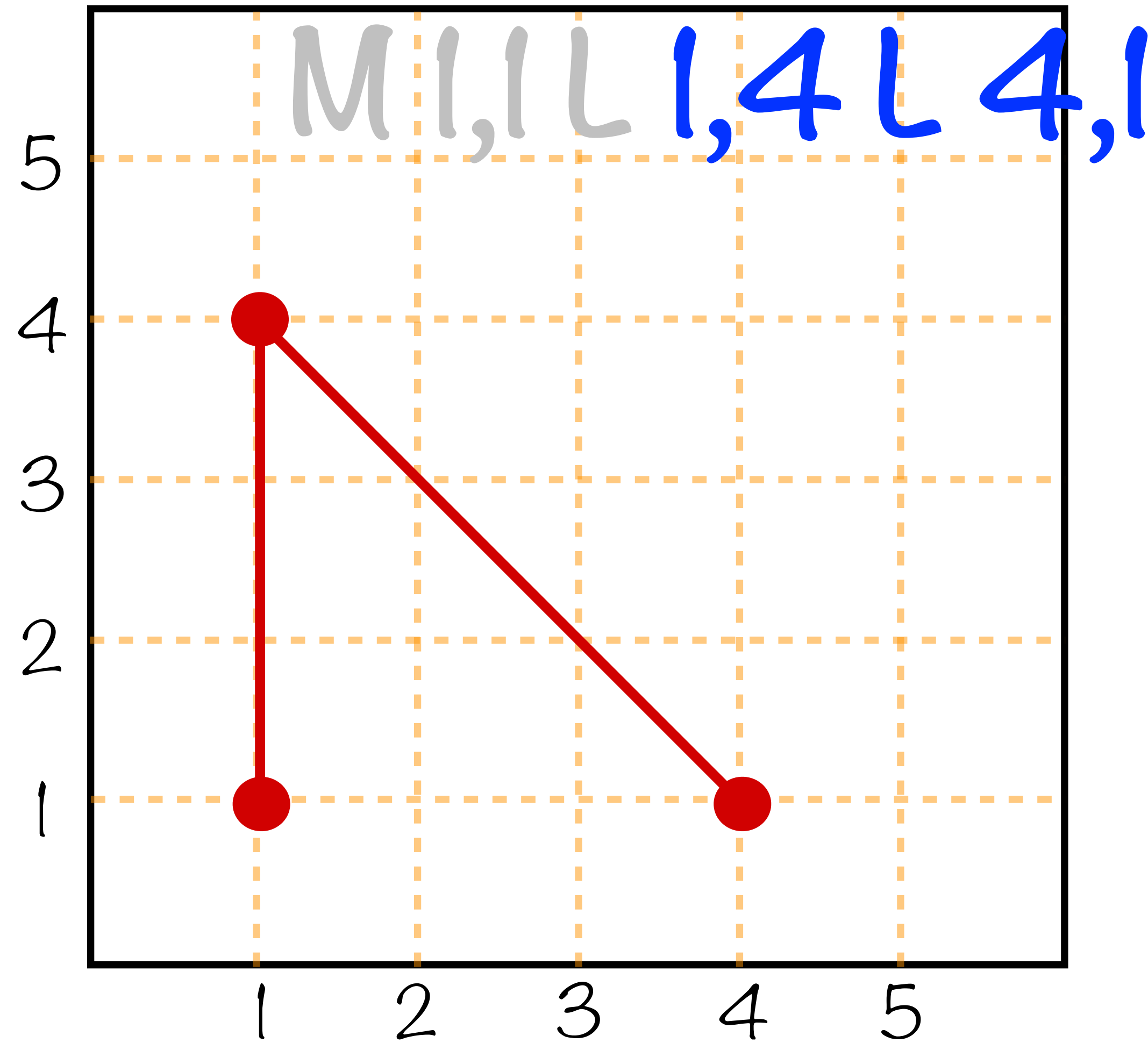|		
M	move to	Move from one point to another
L	line to	Create a line
C	curve to	Create a curve
Q	quadratic bezier curve	Create a quadratic bezier curve
Z	close path	Close the path

Basic path commands

SVG Path

M 1,1

5

4

3

2

1

1   2   3   4   5

Move cursor to point 1,1

SVG Path
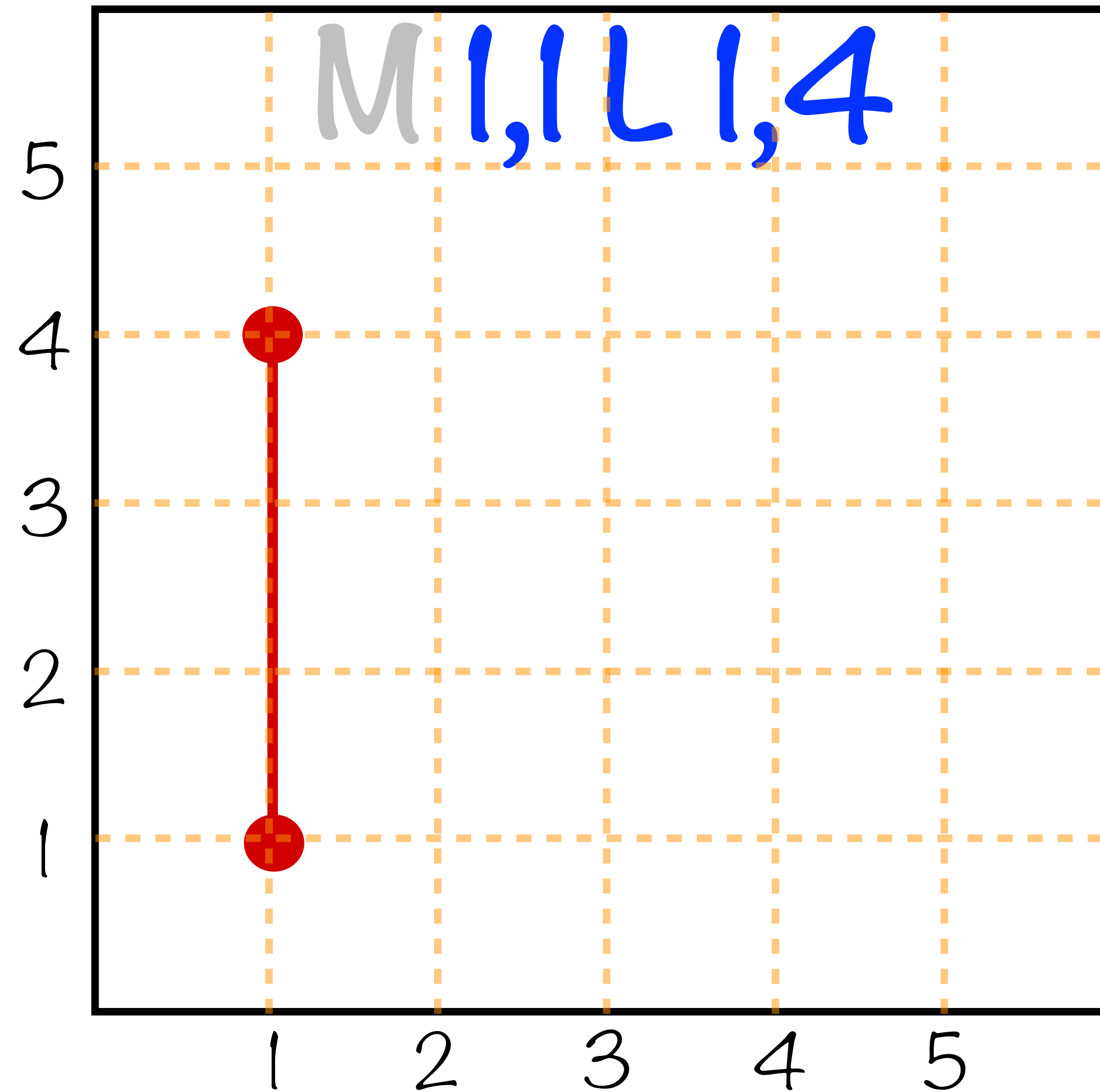
M 1,1 L 1,4

Draw line from 1,1 to 1,4

SVG Path

M 1,1 L 1,4 L 4,1

Draw line from 1,4 to 4,1

SVG Path
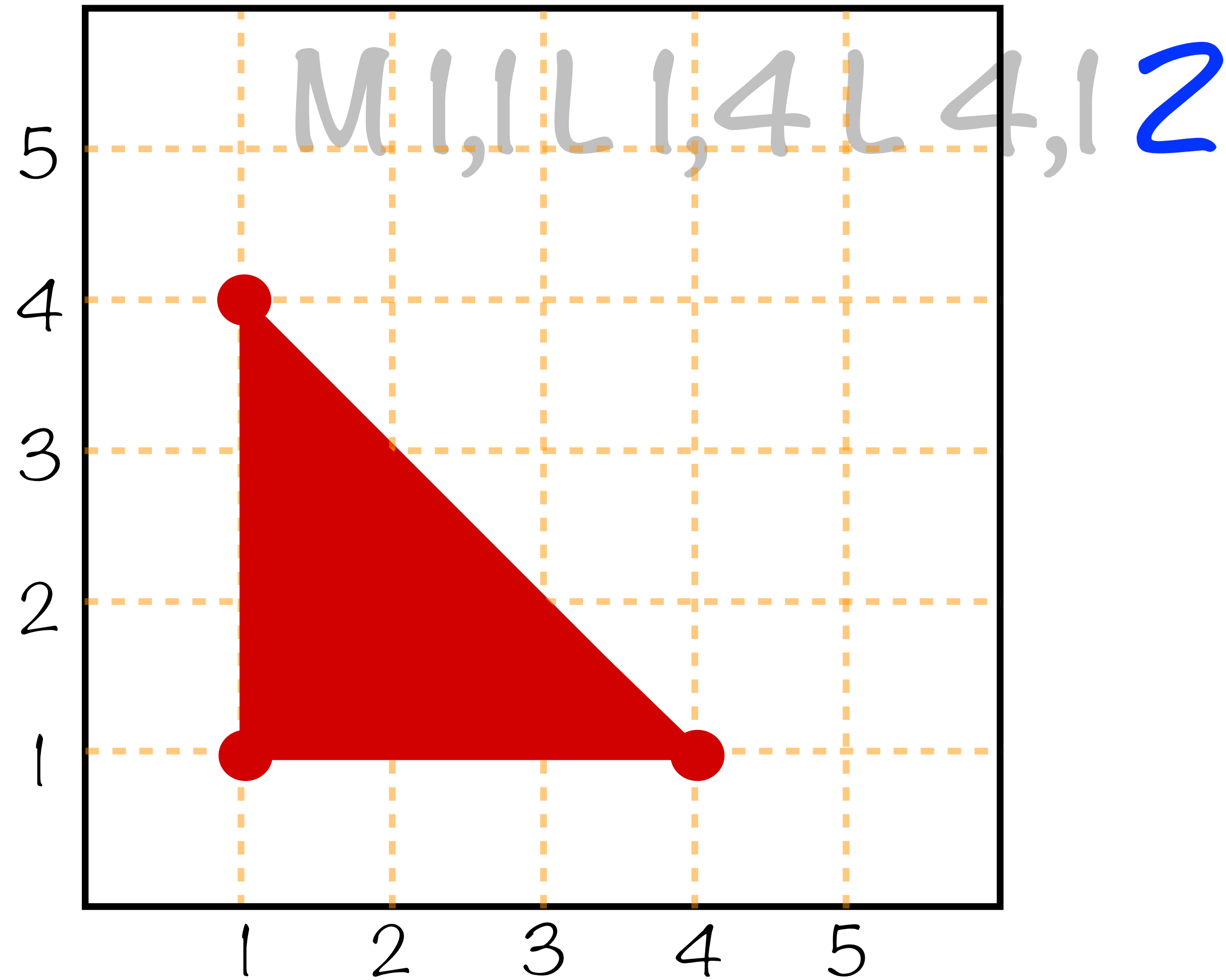
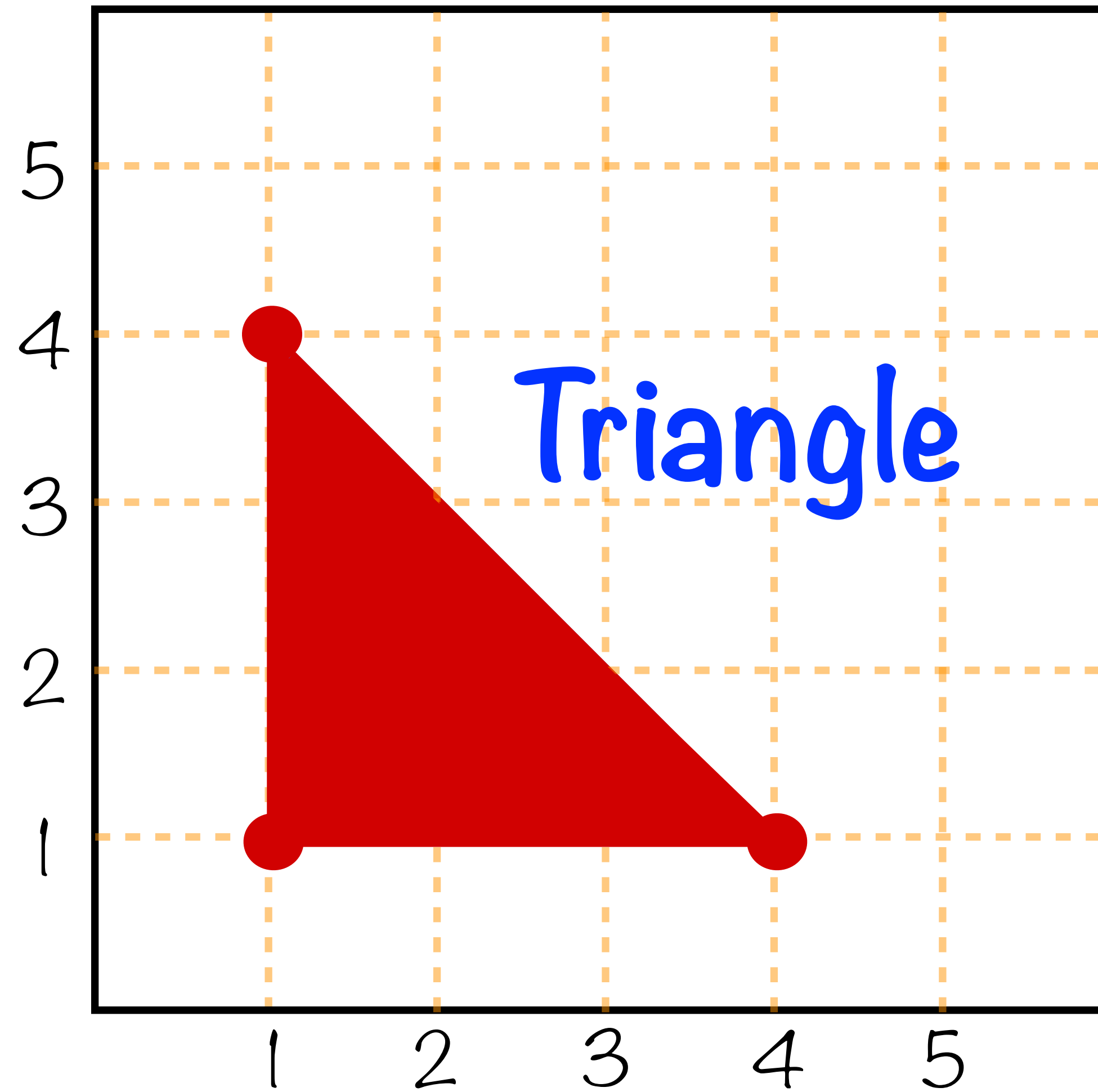M1,1L1,4L4,1Z

Close the path

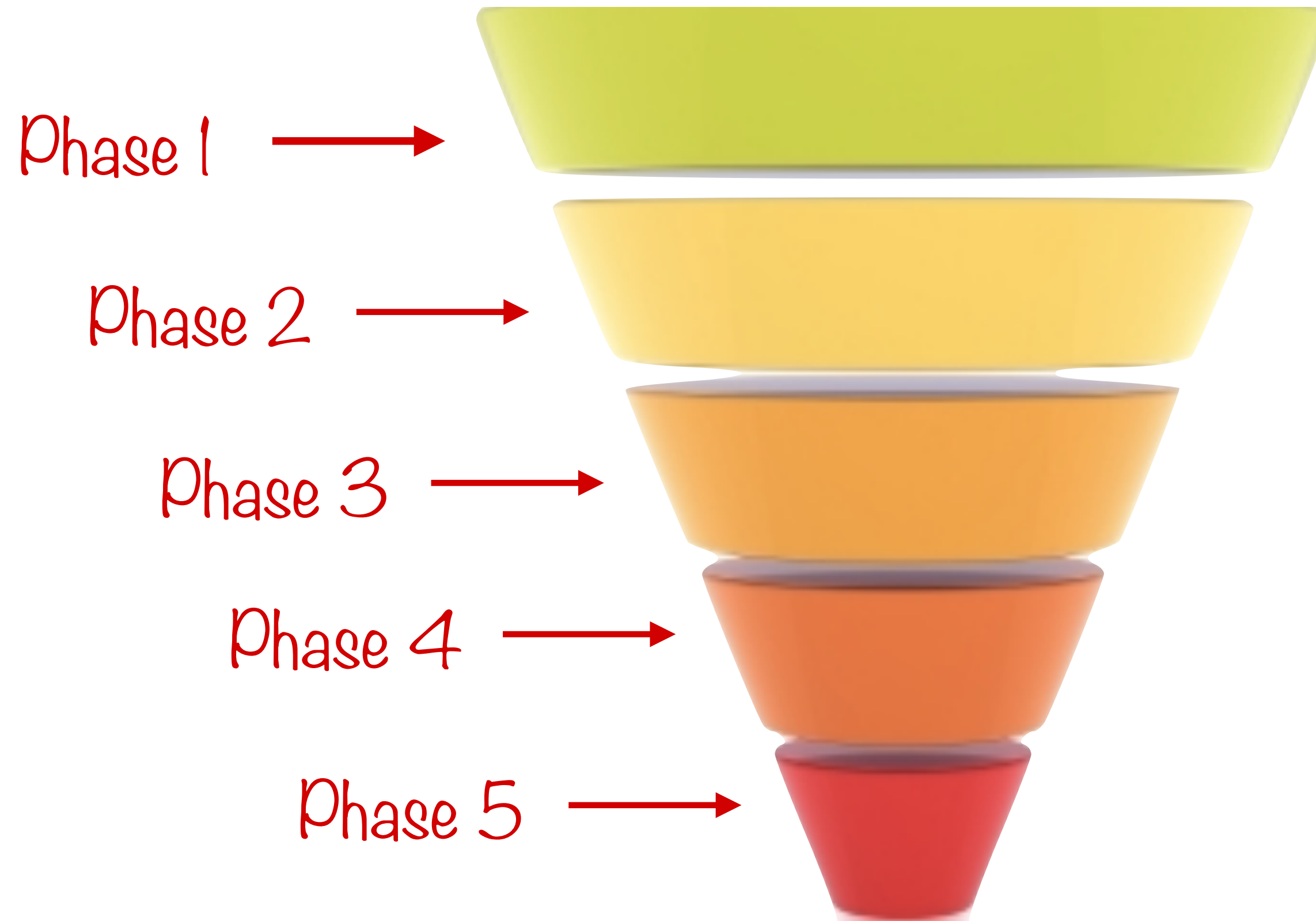# SVG Path

M 1,1 L 1,4 L 4,1 Z

Demo

Introducing shapes

Funnel Charts

Funnel Chart

Visualize progressive reduction of data as it passes from one phase to another

Funnel Chart

Phase 1

Phase 2

Phase 3

Phase 4

Phase 5

Data in each phase is represented as percentage of total

Uses of Funnel Charts

Evaluate recruitment process

Efficacy of steps in sales process

E-commerce order fulfillment

Analysis of promotional campaign
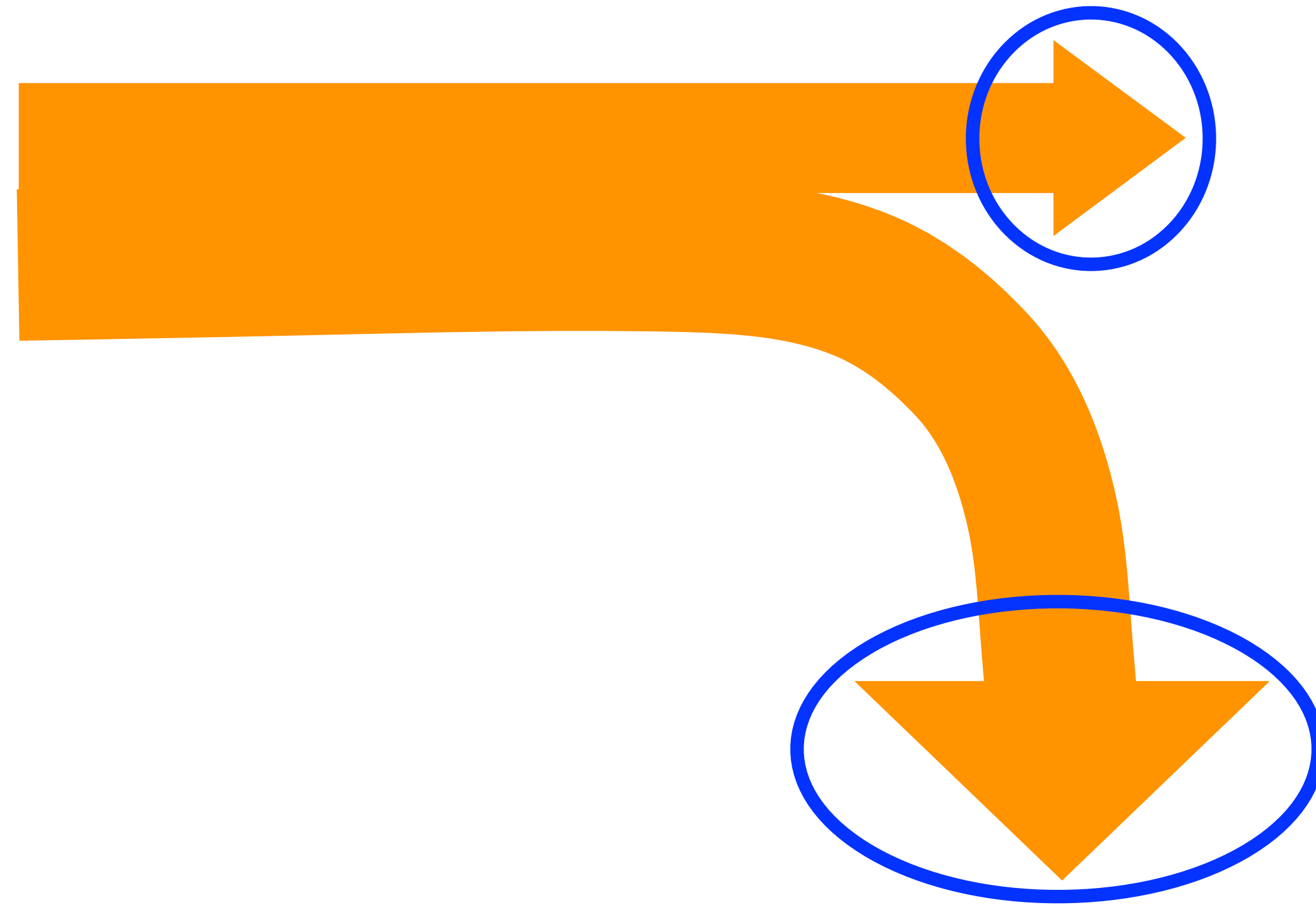
Demo

Funnel charts

Demo

Gantt charts

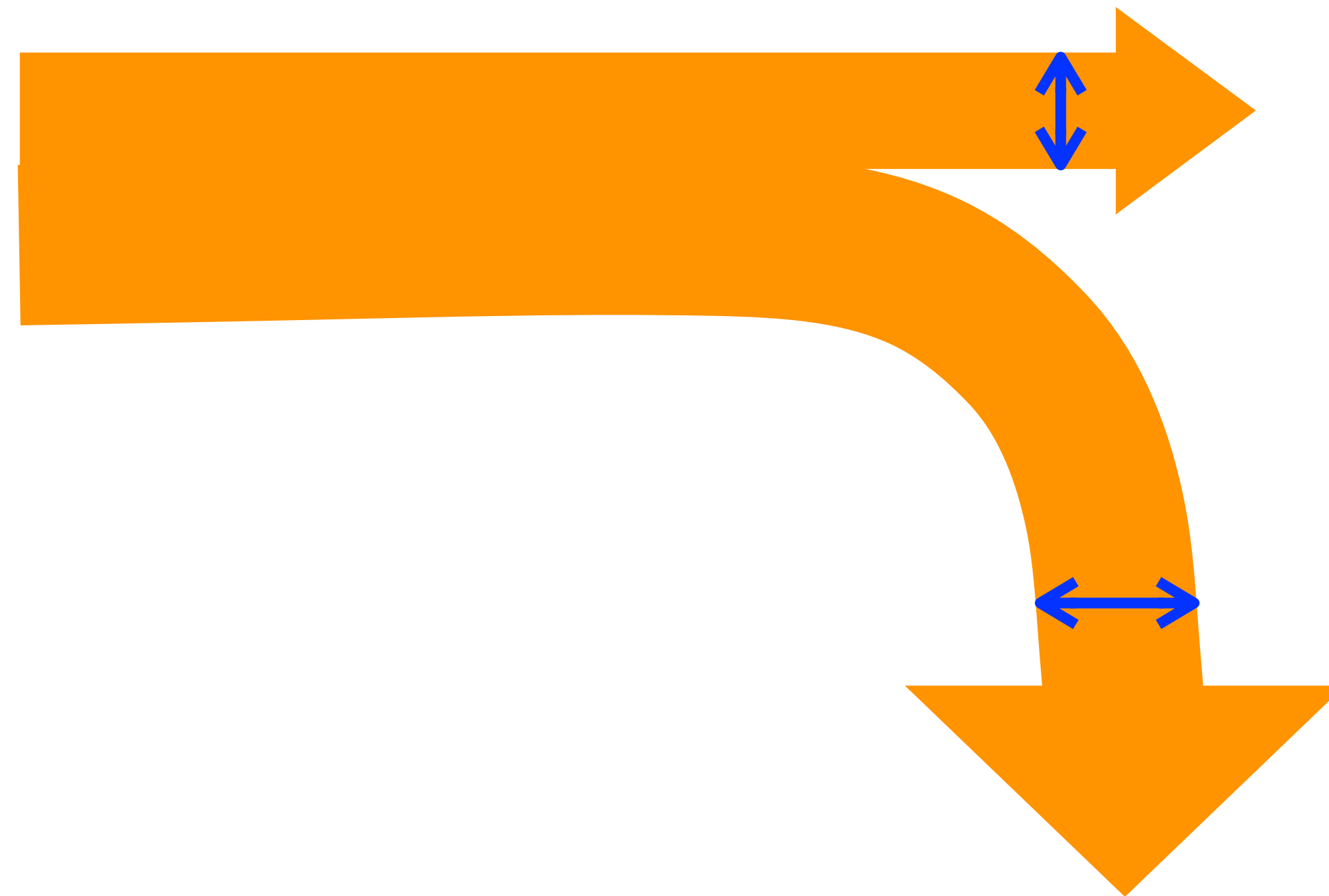# Sankey Diagrams

Sankey Diagrams

Specific type of flow diagram

Sankey Diagrams
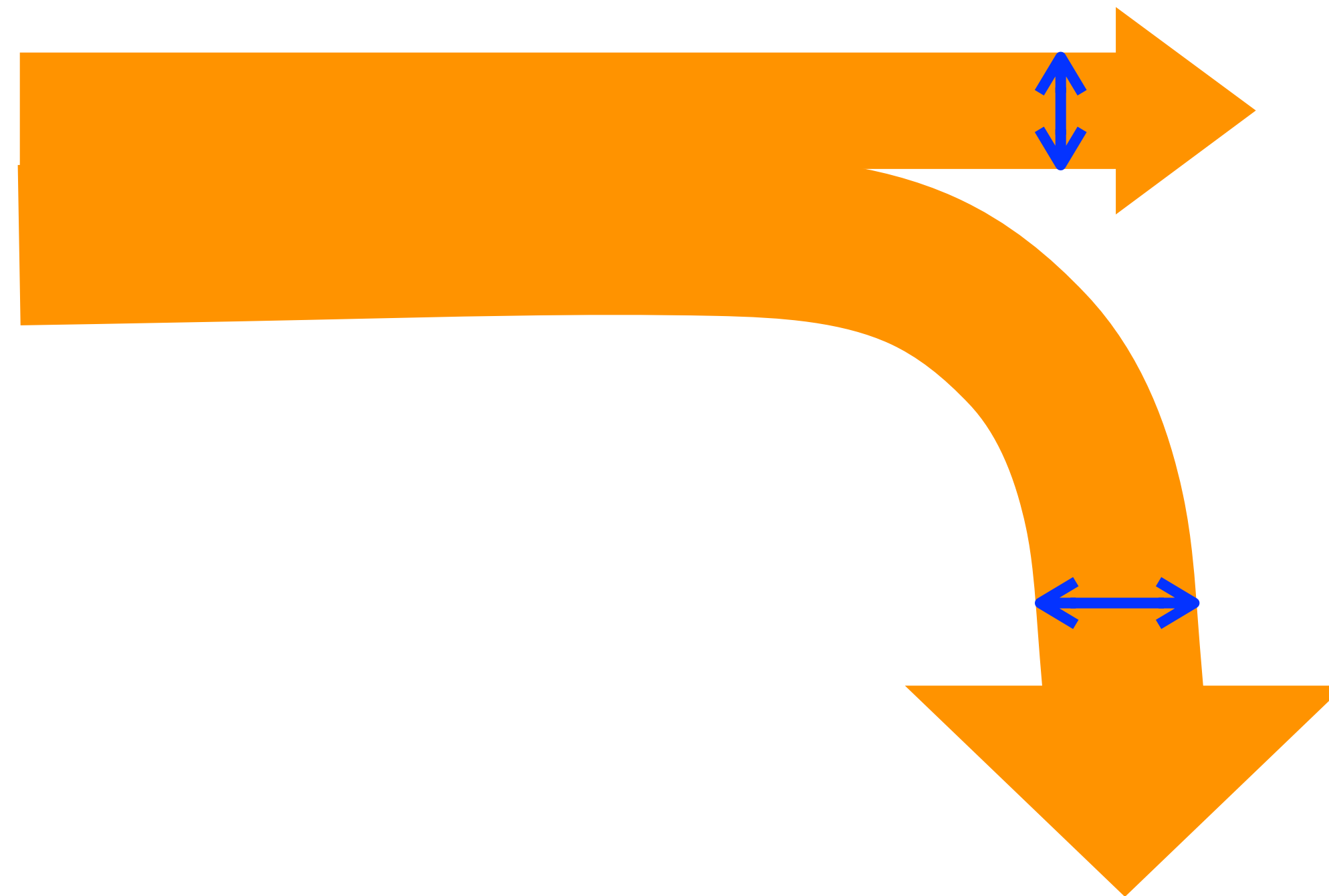
Arrows indicate direction of flow

Sankey Diagrams

Width of arrow indicates magnitude
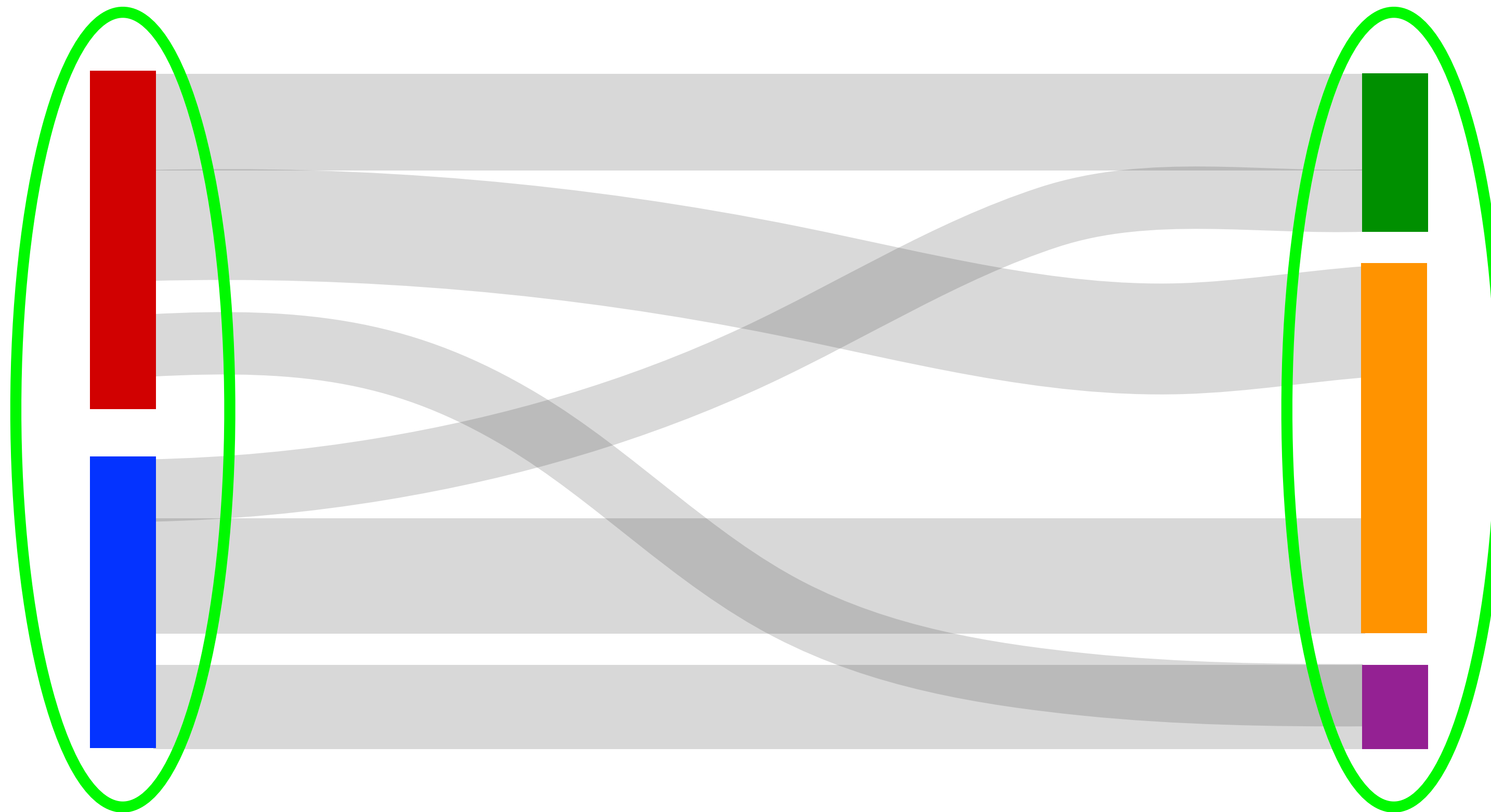
Sankey Diagrams

The broader the arrow, the larger the flow

Sankey Diagrams

Depict a flow from one set of values to another
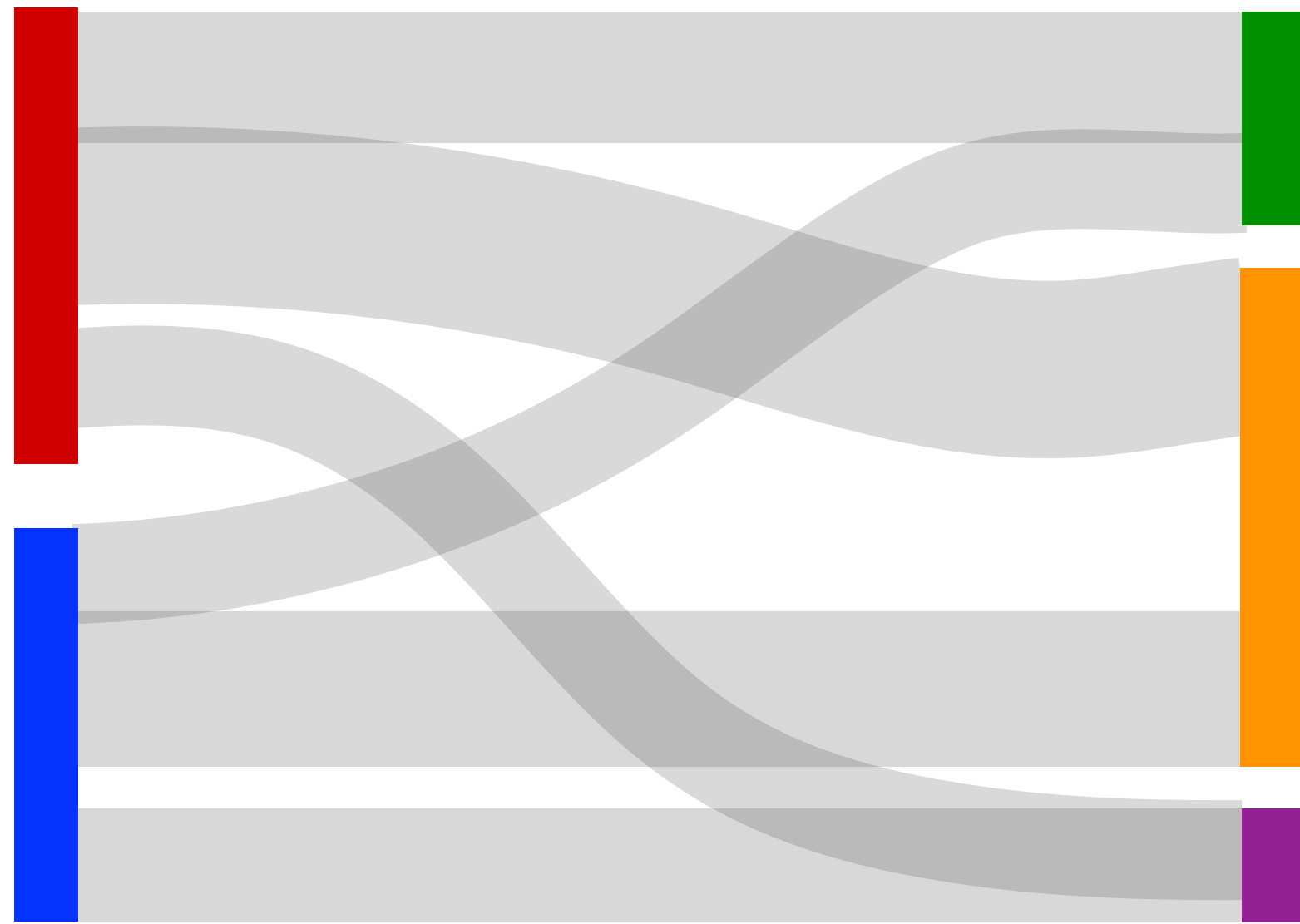
Sankey Diagrams

Nodes

Sankey Diagrams

Connections

Use of Sankey Diagrams

Used to depict

- Transfers within a system

- Many-to-many mapping between two domains

- Multiple paths through a set of stages

Demo

Sankey diagrams

Demo

3D scatter plots

Demo

3D surface plots

Demo

Animations

Summary

High-quality online visualizations

Plot and customize bubble charts and heat maps

Visualize and analyze time-series data

Plot basic shapes

Use candlestick and funnel charts

Gantt charts and Sankey diagrams

3D plotting using scatter plots and surface charts