Graph Elements

Brenton Candelaria
CSE-585

Overview

1. Scaling/Labeling Elements
    a. Tick Marks
    b. Grid Lines
    c. Legends
2. Non-Data Component Design
    a. Axes
    b. Aspect Ratio
    c. Data Region

Tick Marks

Not terribly informative on their own

- Encode information about the graph based on their position and labels
- Should be omitted when unnecessary

Important questions to consider:

- The visibility of tick marks?
- Where to place them?
- When to use them?
- Should minor tick marks be used?
- How many tick marks?
- What values to use?

Tick Marks

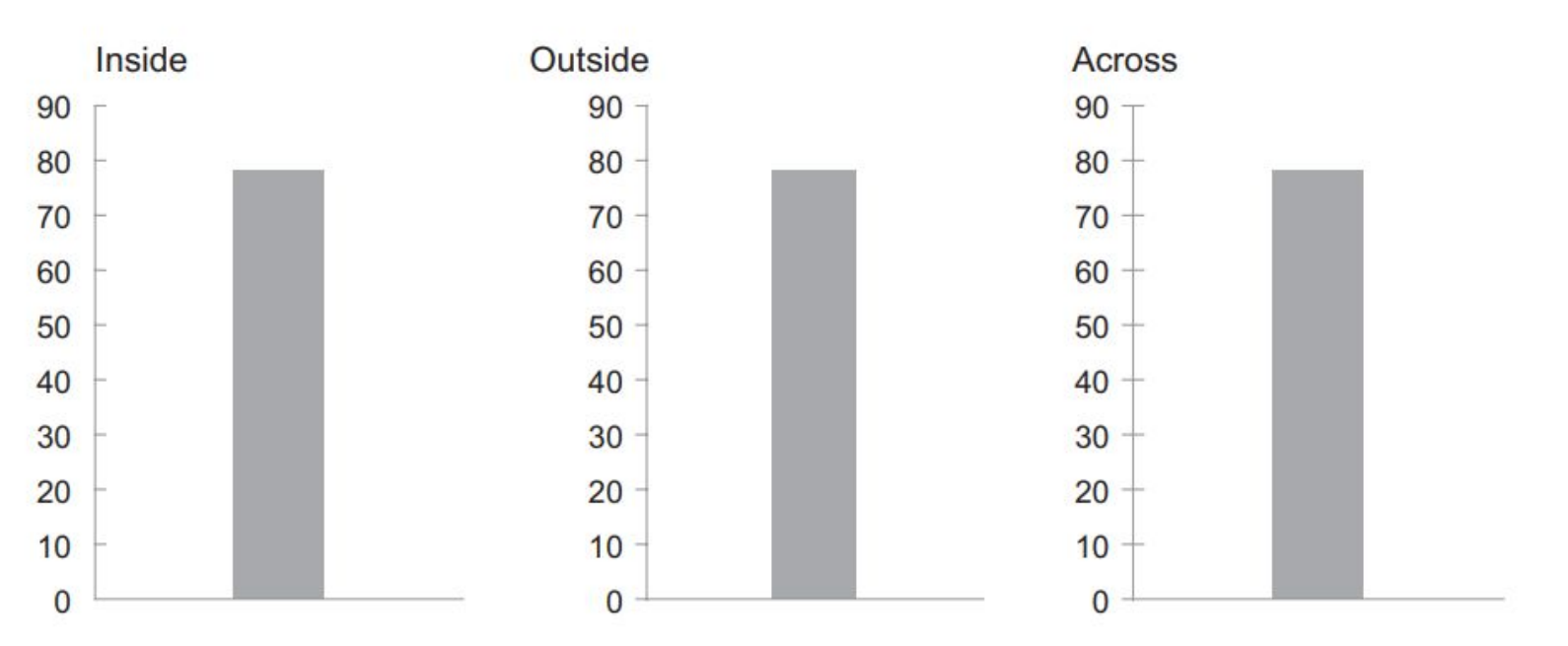
Visibility:

- Tick marks should provide some context to quantitative data, not distract

Where:

- The author states that tick marks can go through an axis, be inside the graph, or be outside. This decision isn’t the most important, but keeping tick marks outside of the data region can leave more space for the graph

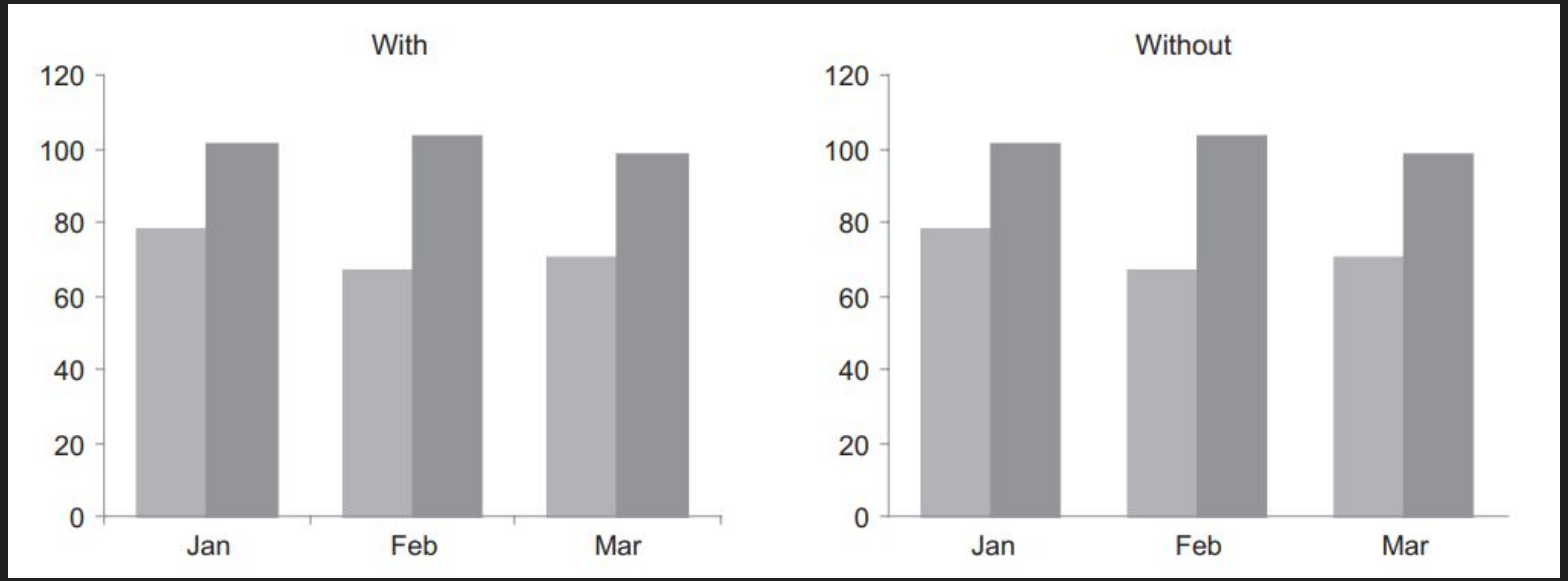
Tick Marks - Where



Tick Marks - When

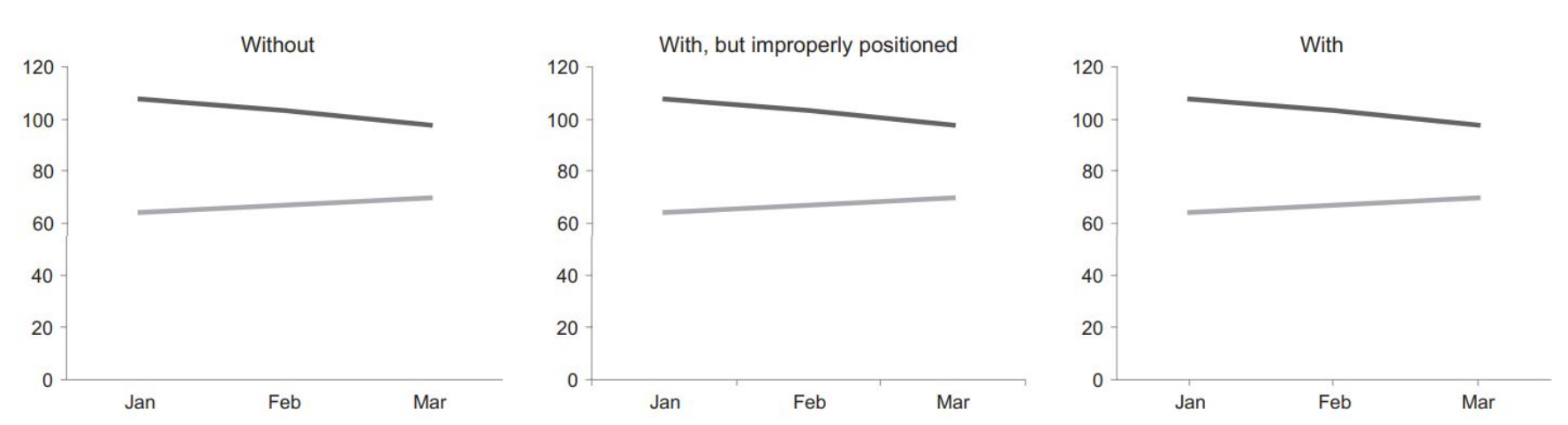
When to avoid tick marks:

- Categorical data, how are ticks useful?



Tick Marks - When

If you consider tick marks for categories, a different representation might be better

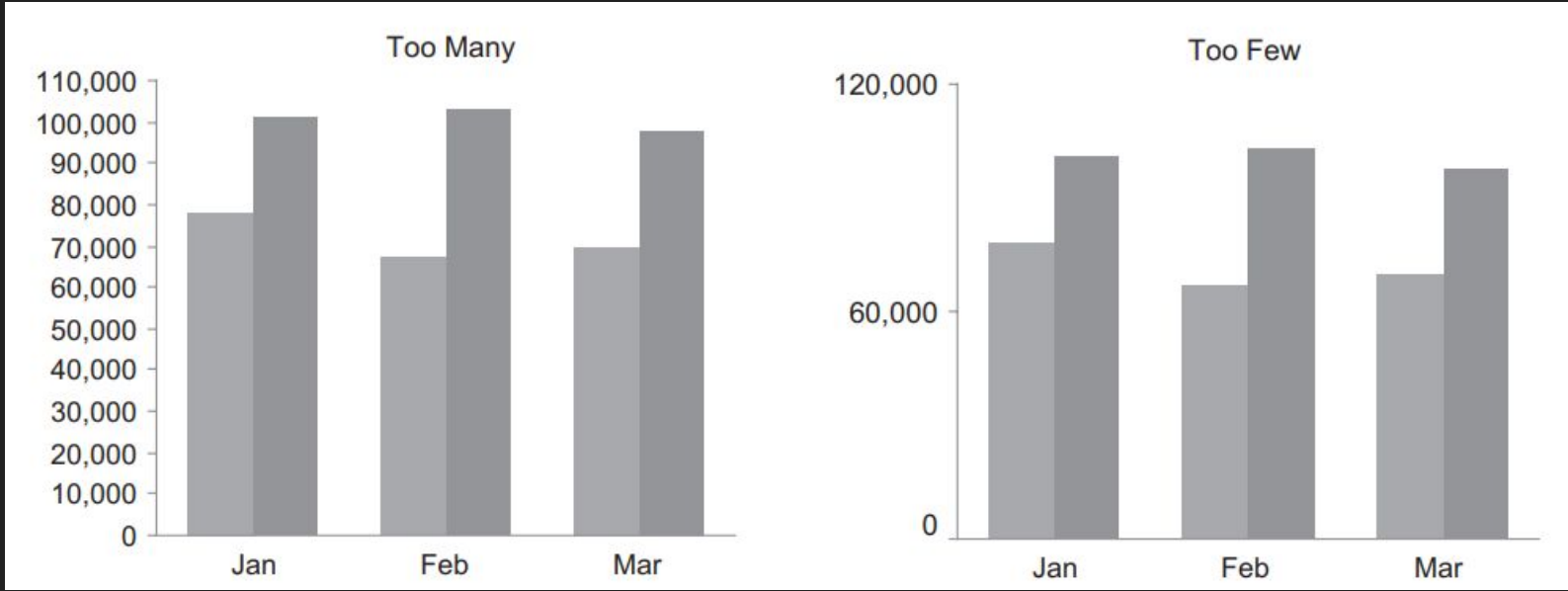


Tick Marks

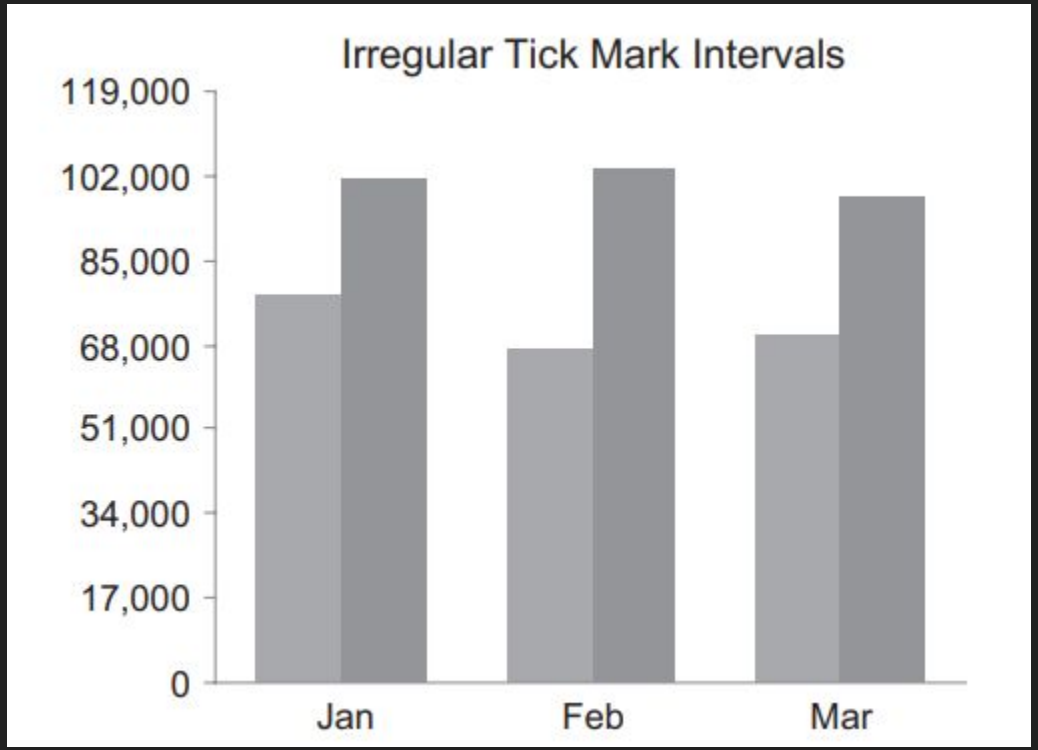
Values for tick marks:

- Minor tick marks shouldn’t be used for precision, but can be useful for giving alternative scales (e.g.: logarithmic)
- Tick marks shouldn’t be too densely packed, nor so spaced apart that values are ambiguous
- Values should also be sensible and in reasonable increments

Tick Marks - Spacing



Tick Marks - Values



Grid Lines

Originally, grid lines were meant to make scaling and sizing graphs easier

Now, grid lines aid in one of three main areas:

- Easy value lookup
- Value comparison
- Make it easy to identify trends/patterns

Again, grid lines should aid a figure, not steal the focus of the reader

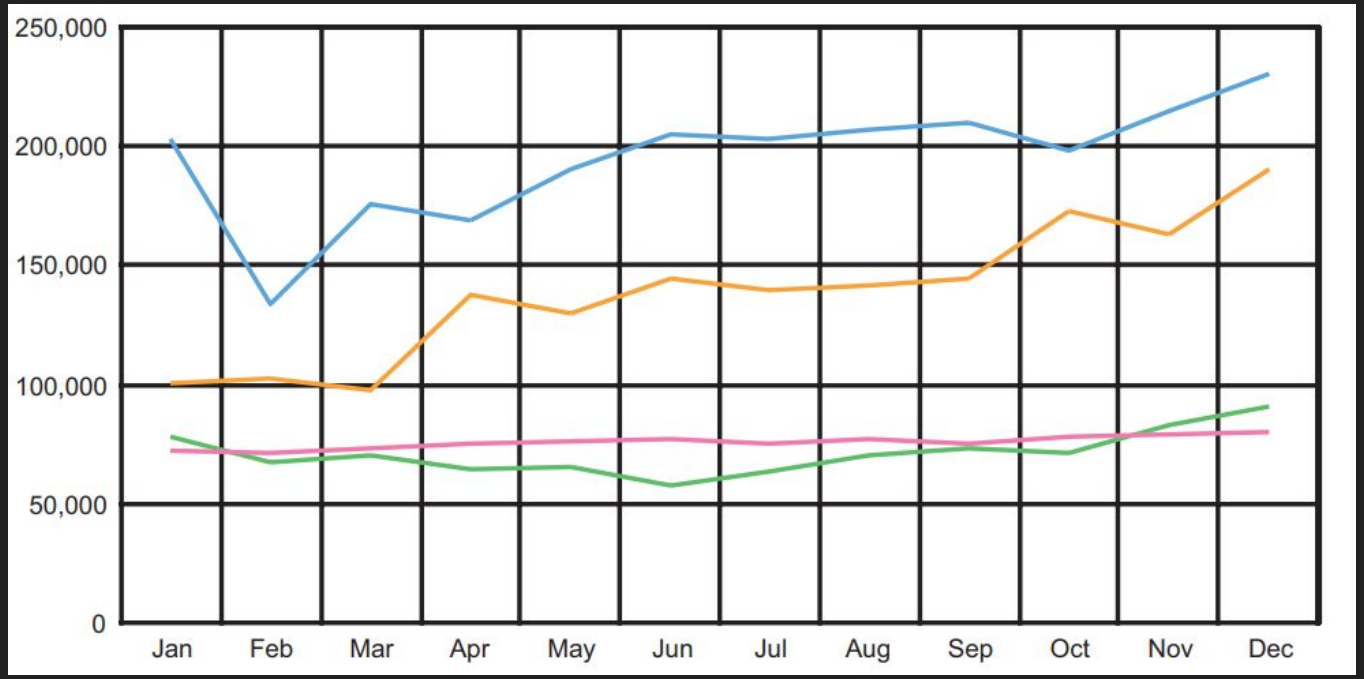
Grid Lines - Lookup

Tables are often better for precision lookup of a value, but grid-lines can aid interpretation of a graph

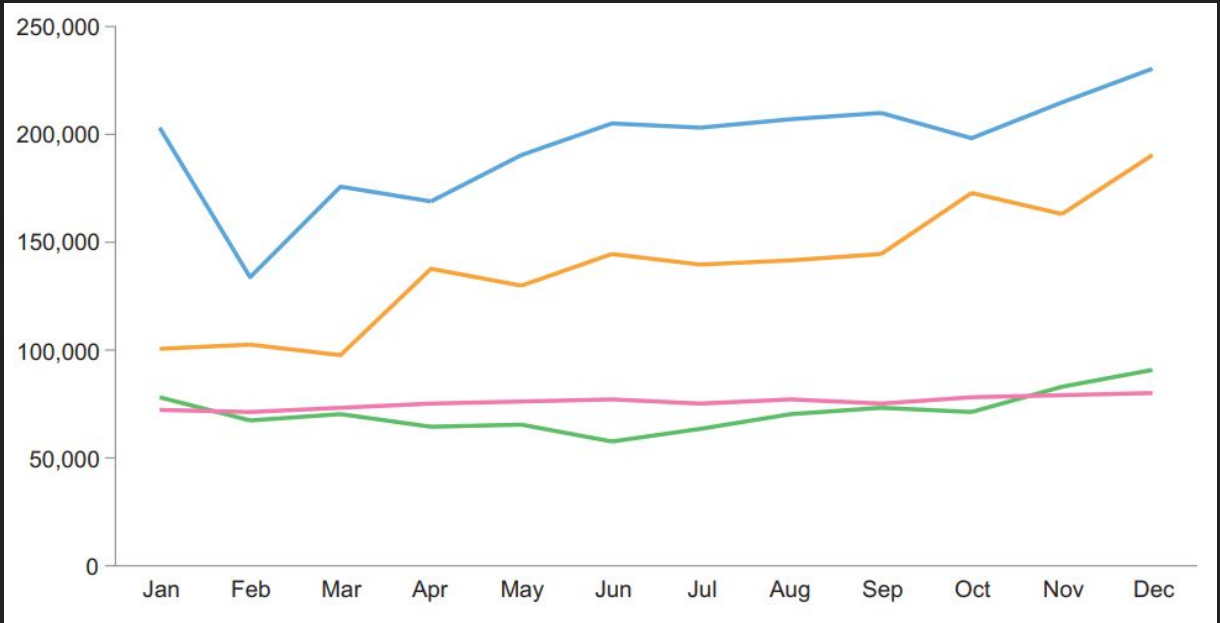
Even more so when the graph is particularly wide

Grid lines should be subtle though, as not to be distracting from the data at hand

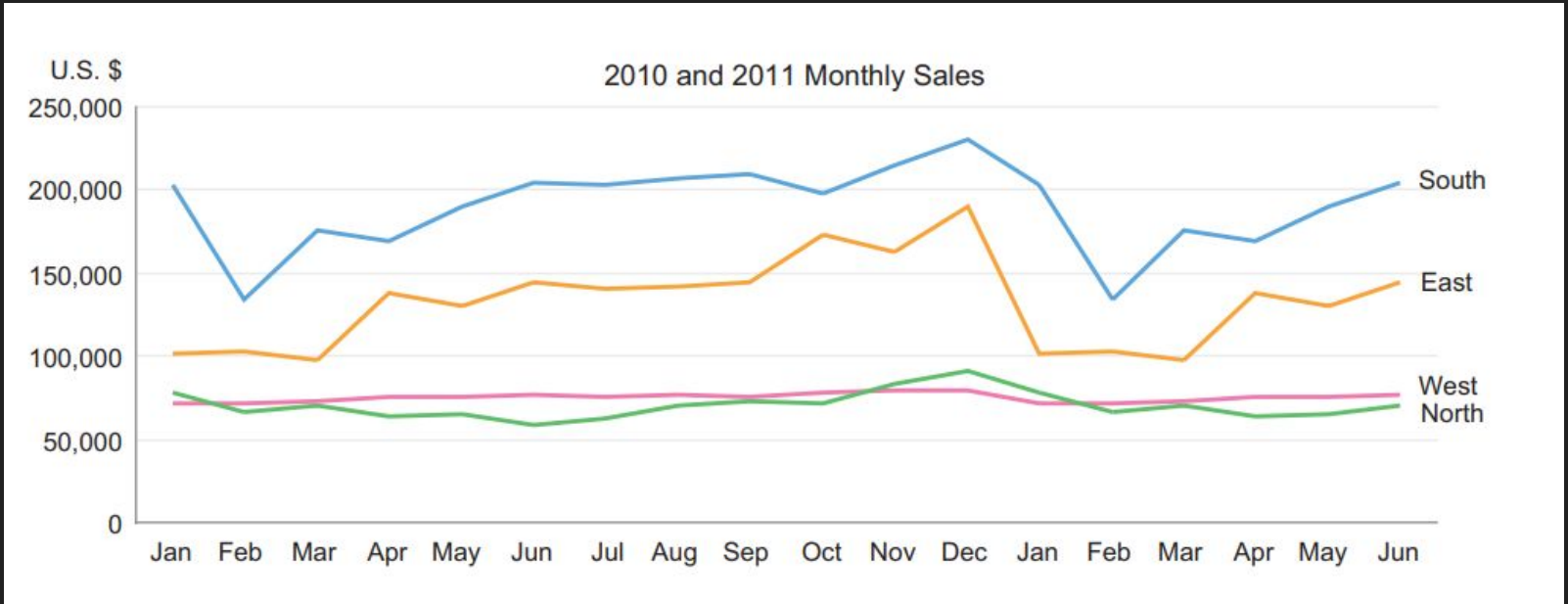
Grid Lines - Lookup



Grid Lines - Lookup

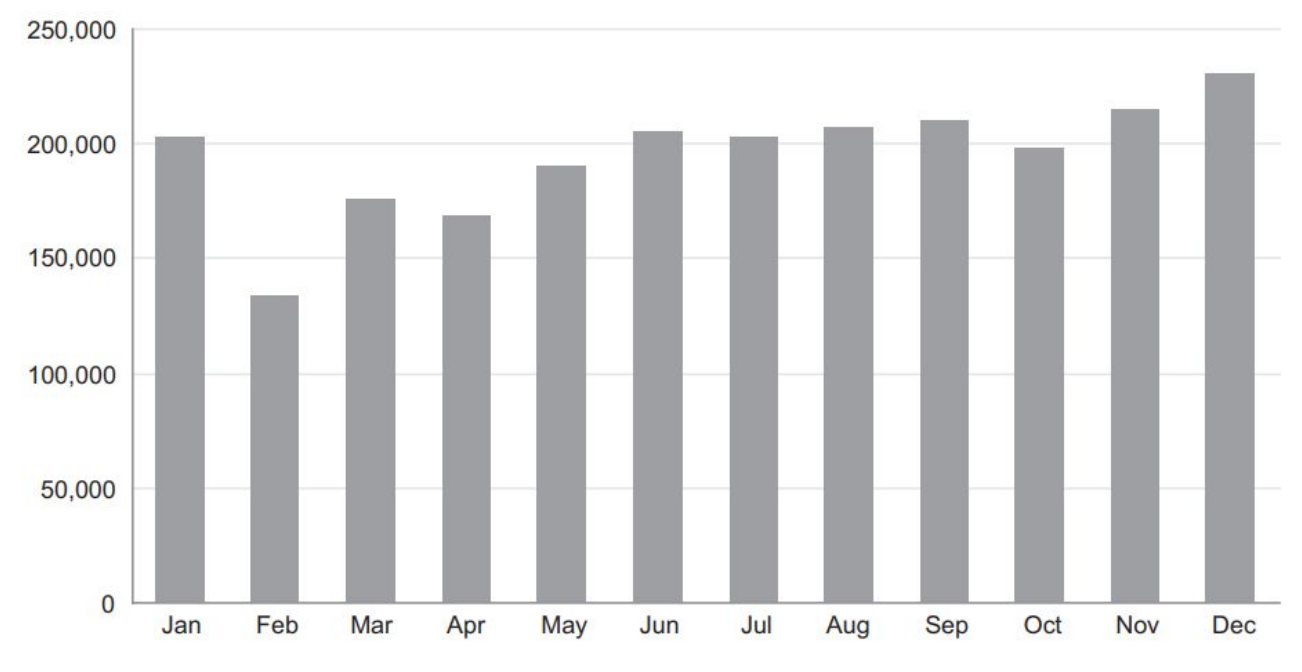


Grid Lines - Lookup



Grid Lines - Comparison

When data points can appear similar in a graph but have subtle differences, grid lines can make those differences more apparent



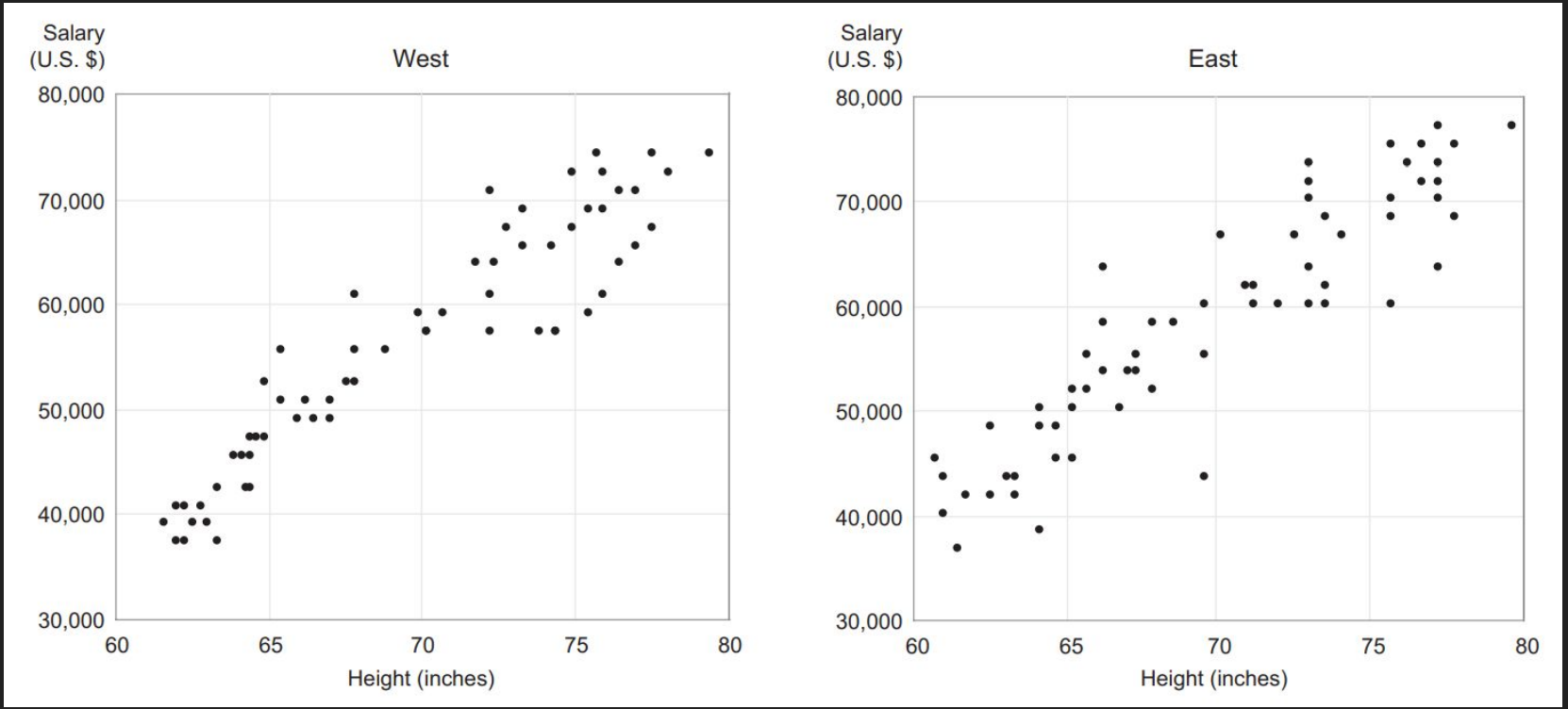
Grid Lines - Patterns and Trends

Since grid lines add *some* precision to a graph, they can be useful in highlighting patterns or trends in data

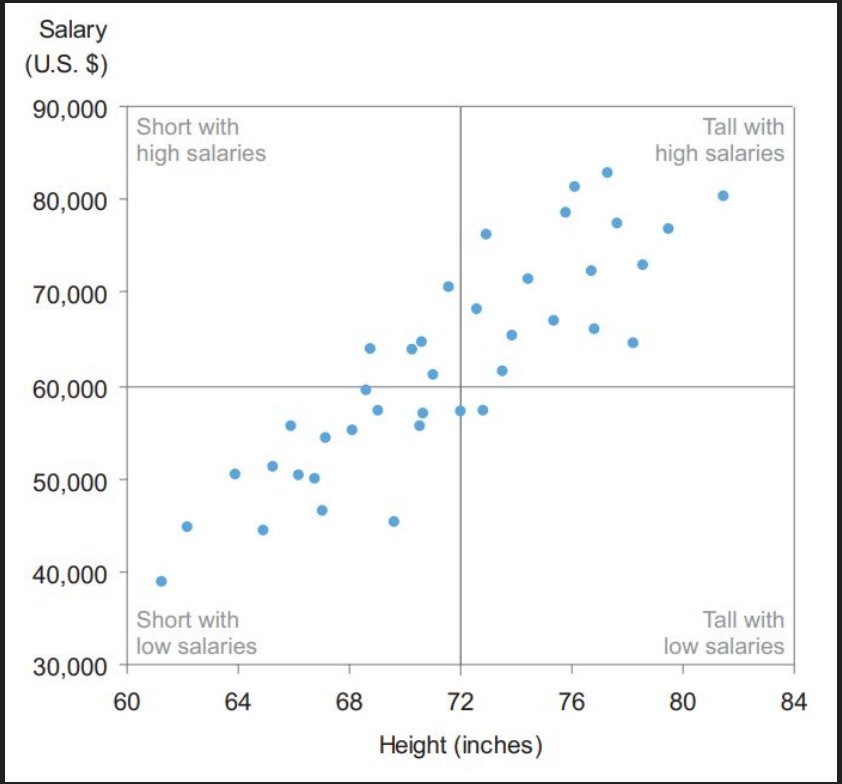
- Subdividing data into regions that can be identified across graphs

Fewer but more prominent gridlines can also be used to partition a graph into meaningful sections

Grid Lines - Patterns and Trends



Grid Lines - Patterns and Trends



Legends

Legends are a useful feature to label several series of data of the same type

Occasionally, legends can be omitted whenever the series may be labeled directly (such as in line graphs).

Placement of the legend isn’t terribly important, as long as it can fit without obstructing data and without distracting from the data.

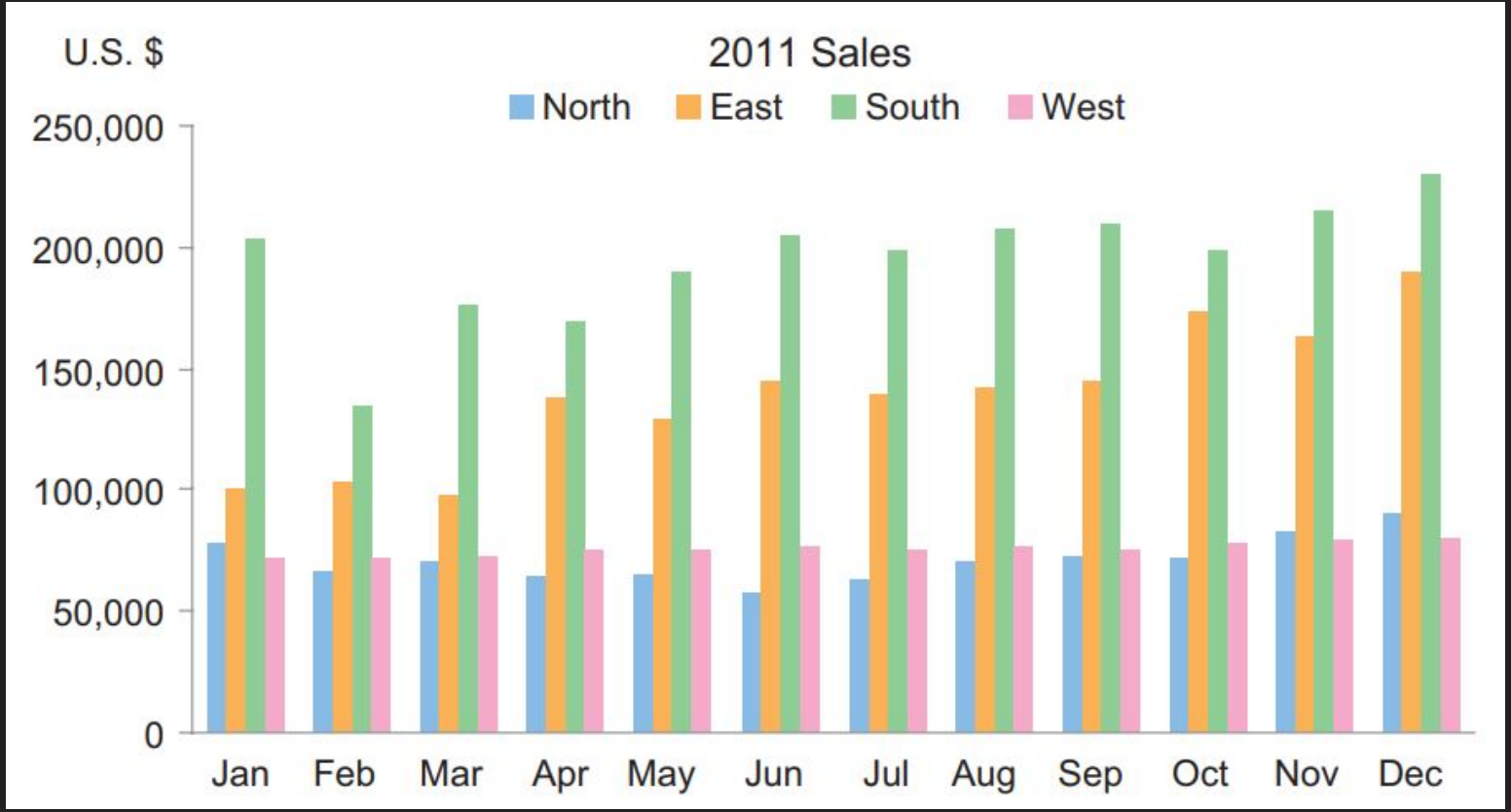
Whenever legends are used, they should be easily visible, but not distracting

Legends should not clutter the data, avoid information overload

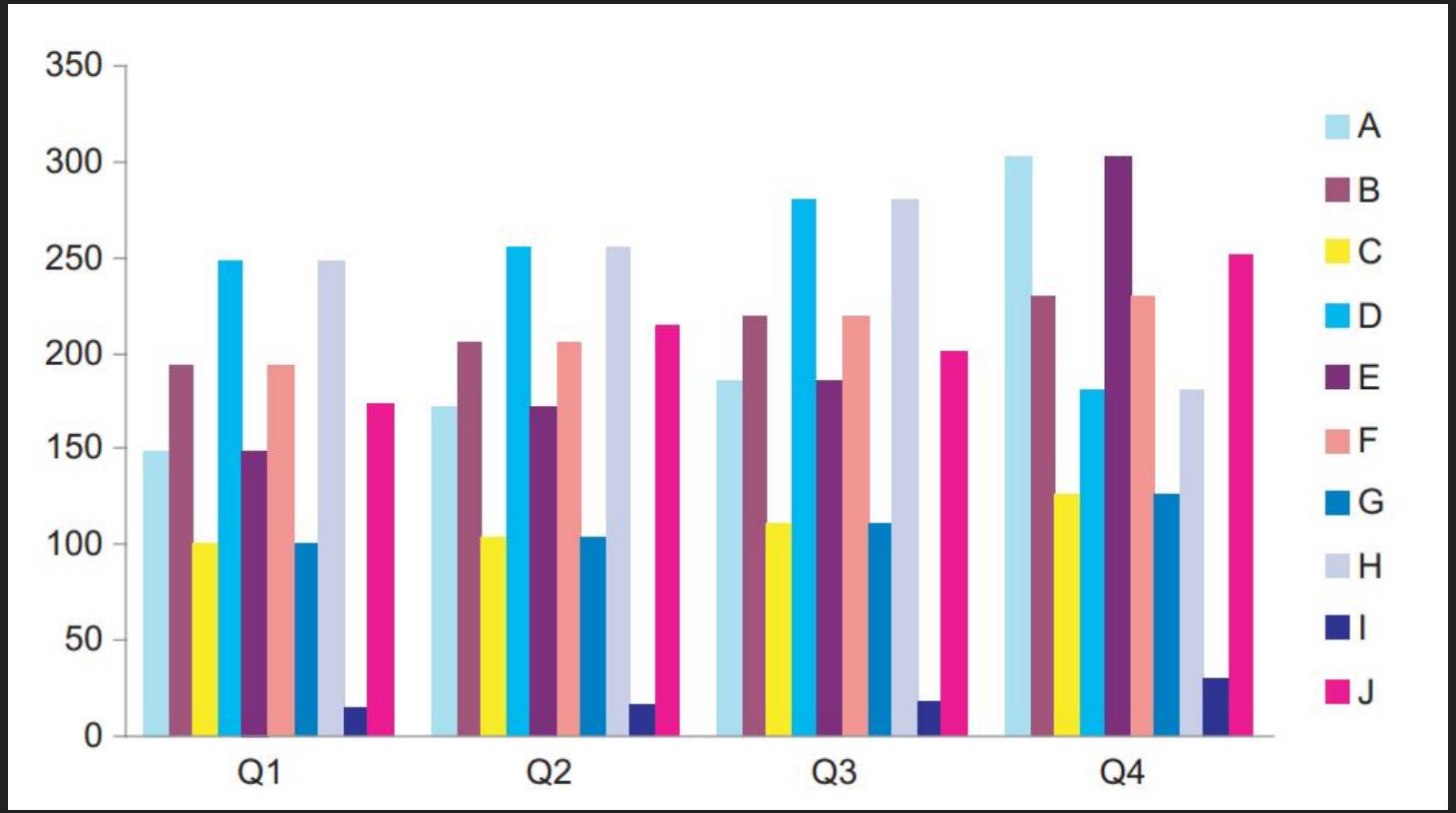
Legends


250,000
200,000
150,000
100,000
50,000
0
Jan
Feb
Mar
North
East
South
West
250,000
200,000
150,000
100,000
50,000
0
Jan
Feb
Mar
North
East
South
West

Legends


U.S. $
2011 Sales
North
East
South
West
250,000
200,000
150,000
100,000
50,000
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

Legends



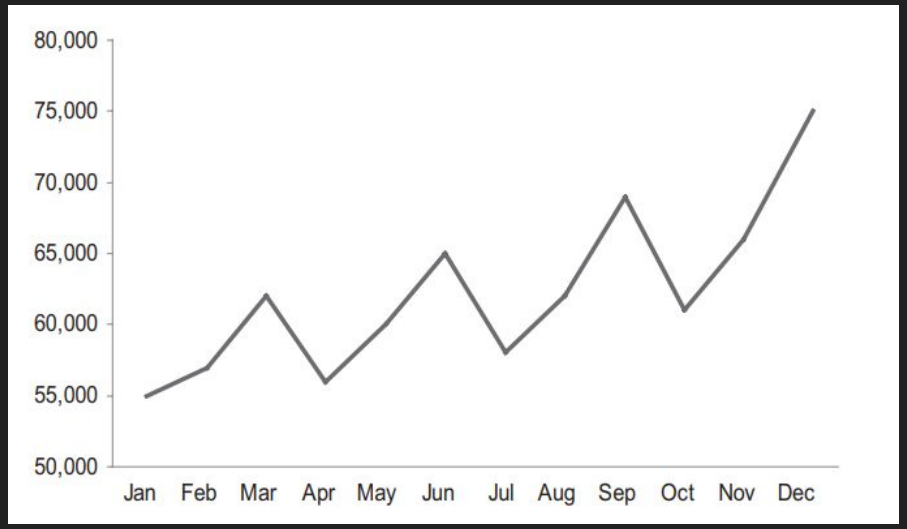
Axes

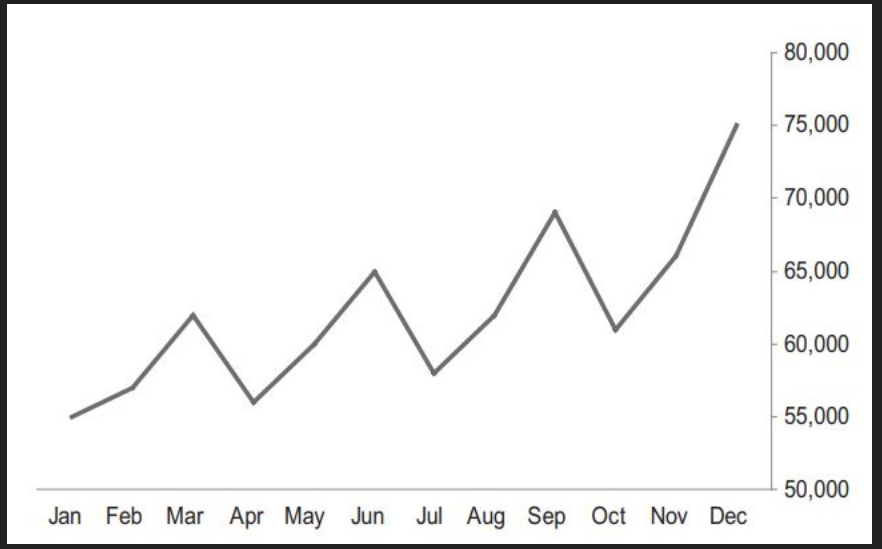
Axes define a data region and enclose a graph. 2D graphs are most common

Often, only two perpendicular axes are necessary to bound a graph, but it might be favorable to enclose a graph on all 4 sides if it is competing for a reader’s attention

Placement of axes can also redirect a reader’s attention

Axes - Placement





Axes - Aspect Ratio

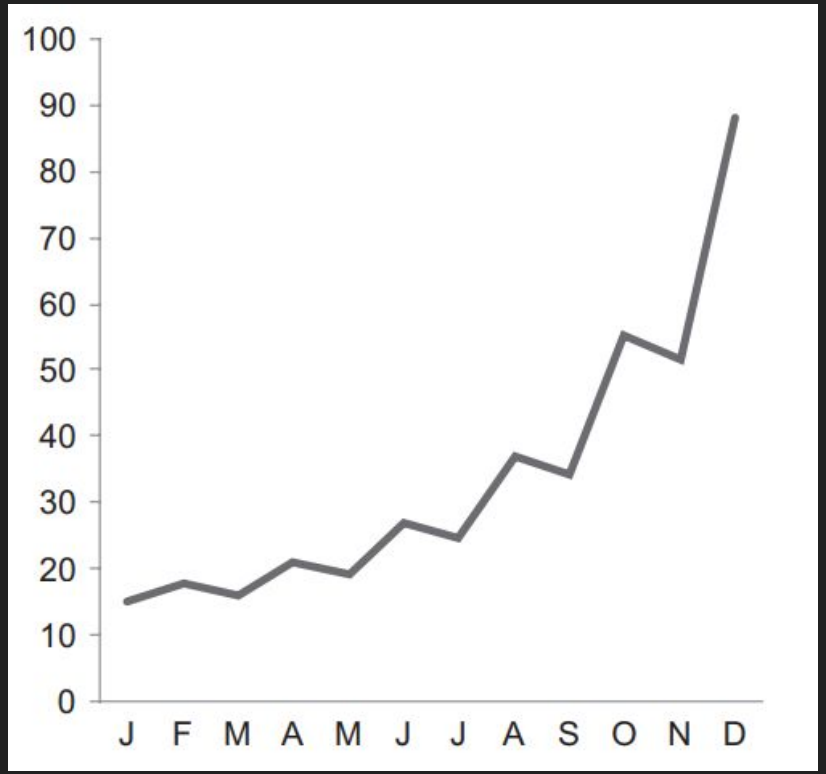
The length of axes can affect the scale of the graph produced, even with identical data. This can affect the perception of rate of change.

Aspect Ratio = Horizontal Axis : Vertical Axis

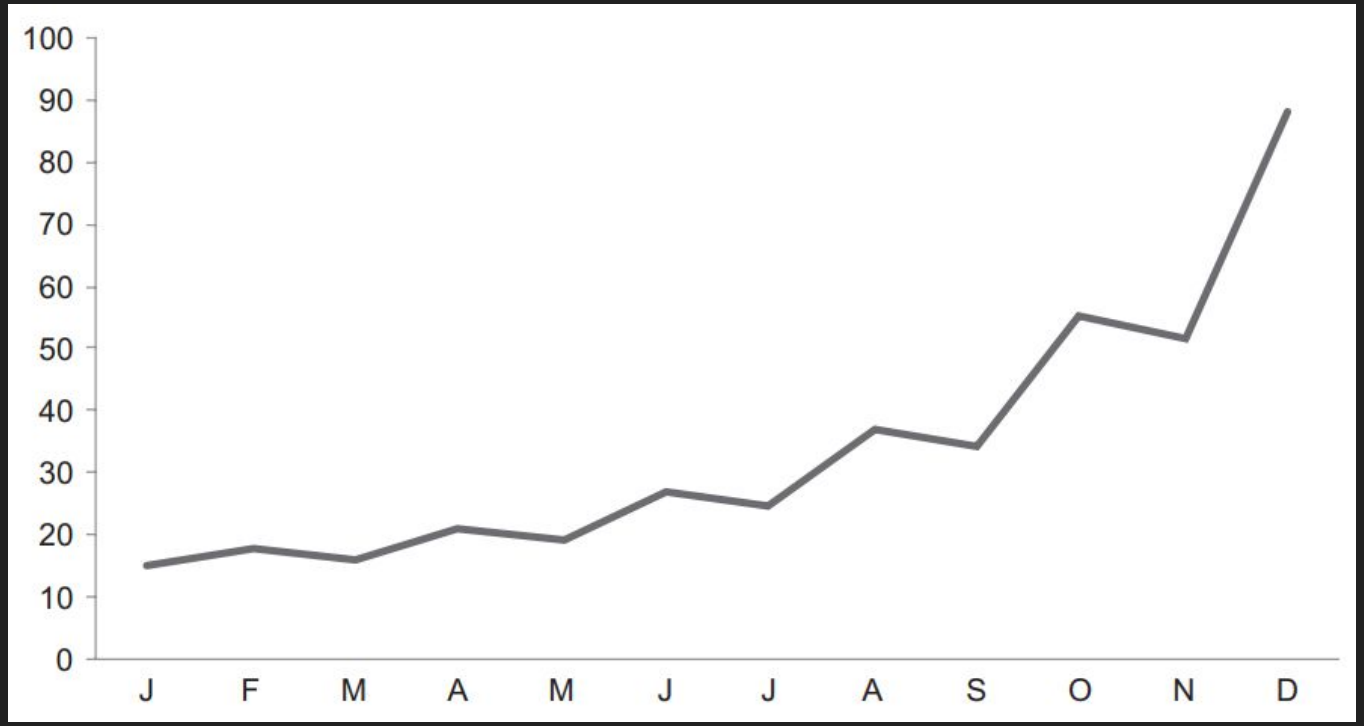
Large aspect ratio → Wider graph, diminished rate of change

Small aspect ratio → Taller graph, exaggerated rate of change

Axes - Aspect Ratio



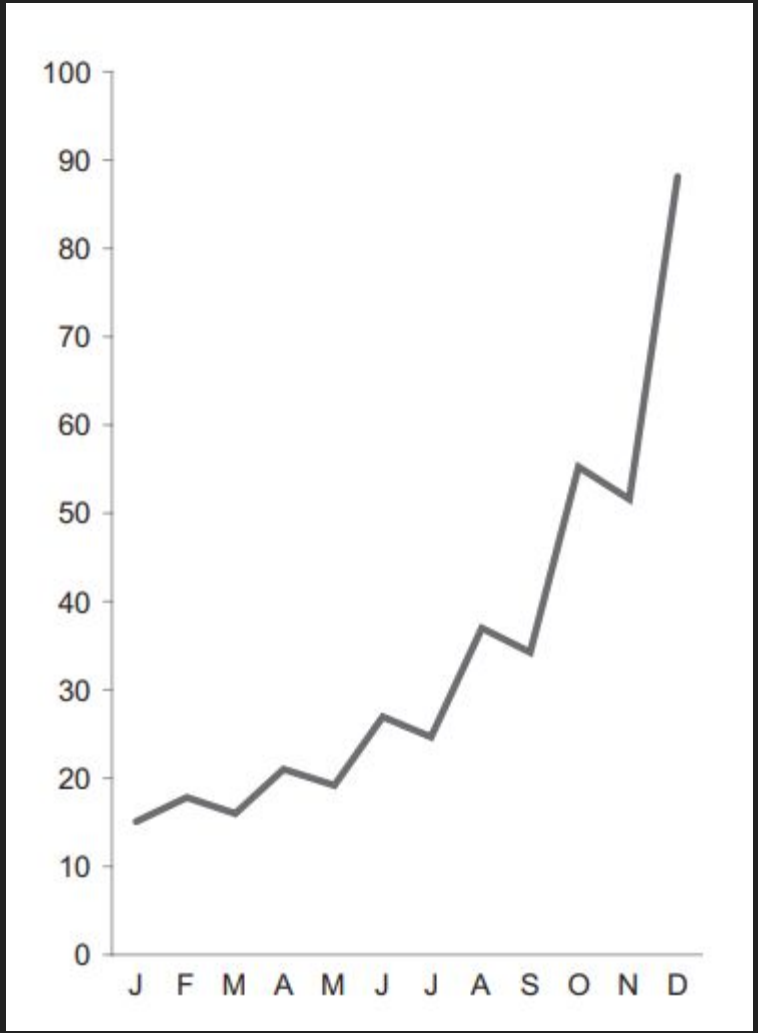
Axes - Aspect Ratio



Axes - Aspect Ratio

Figures like the one to the right are misleading due to the aspect ratio, it's best to avoid this.

For time series graphs, it is typical (and encouraged) to make graph wider than tall (i.e.: emphasize the time axis)



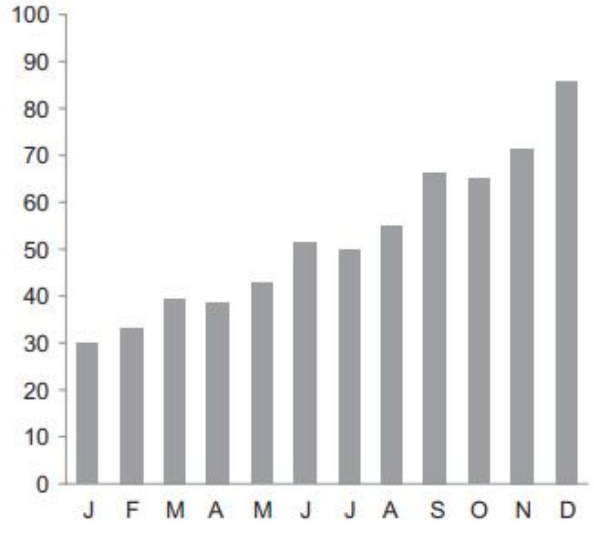
Data Region

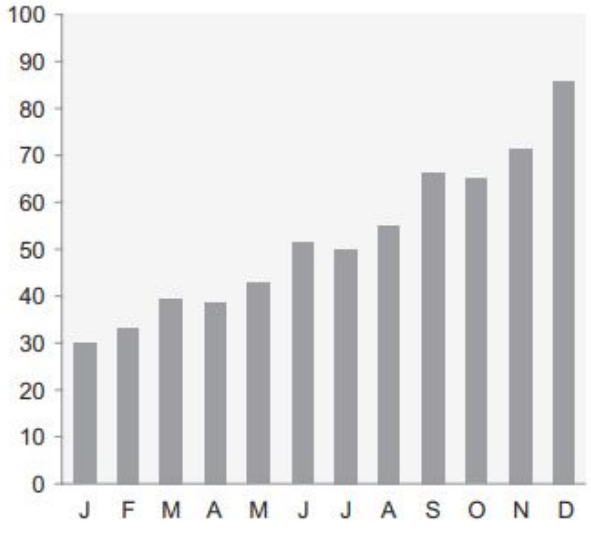
The data region is the main portion of a graph, and should be the focus of a figure

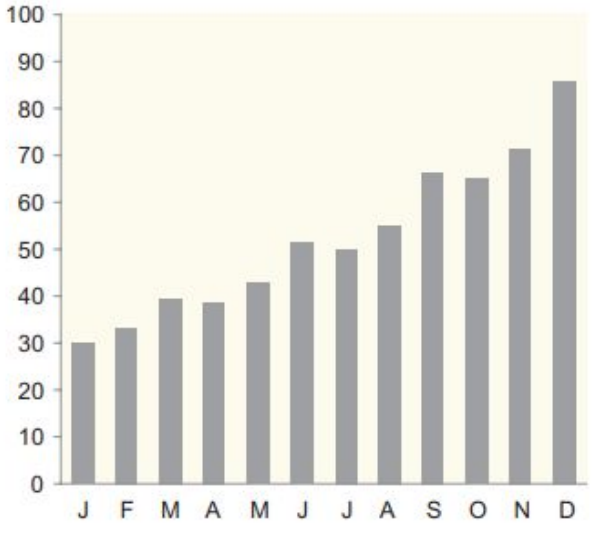
Light backgrounds are preferred (unless the data visualization is light itself), and a solid white background is usually best.

Subtle off-white coloring can draw attention to a graph, but is not always necessary

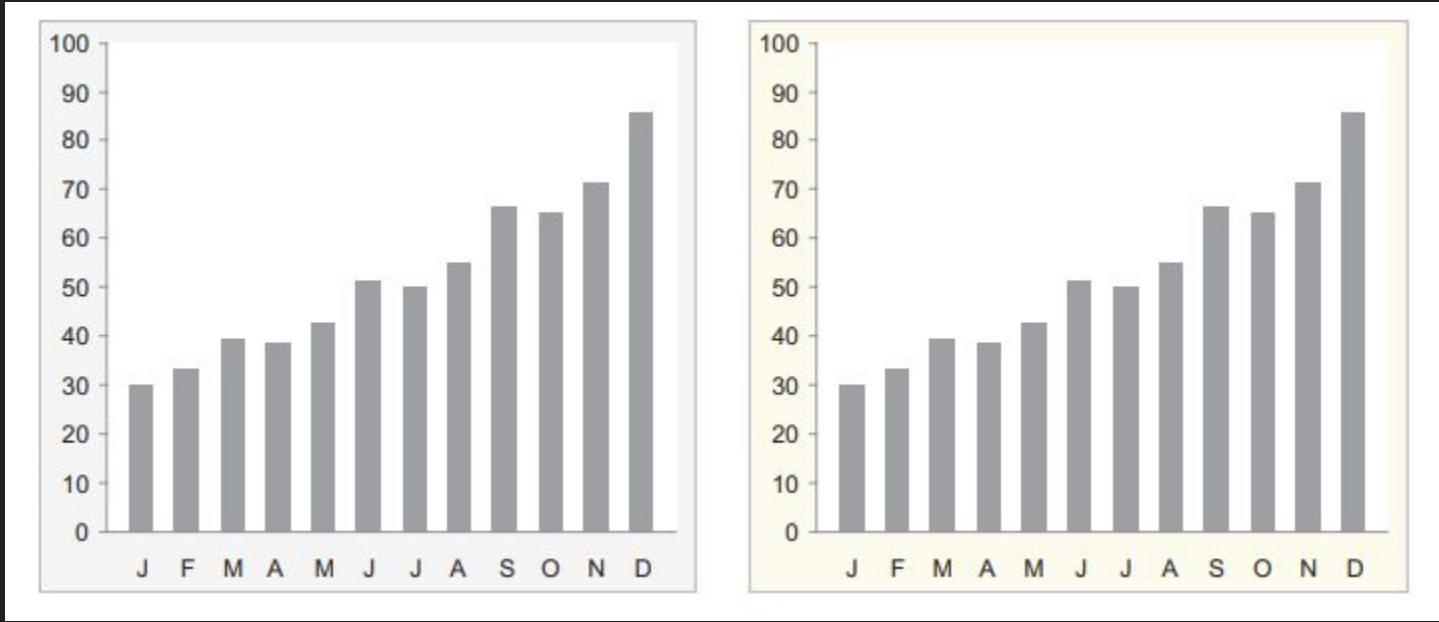
Data Region


100
90
80
70
60
50
40
30
20
10
0
J F M A M J J A S O N D


100
90
80
70
60
50
40
30
20
10
0
J F M A M J J A S O N D


100
90
80
70
60
50
40
30
20
10
0
J F M A M J J A S O N D

Data Region

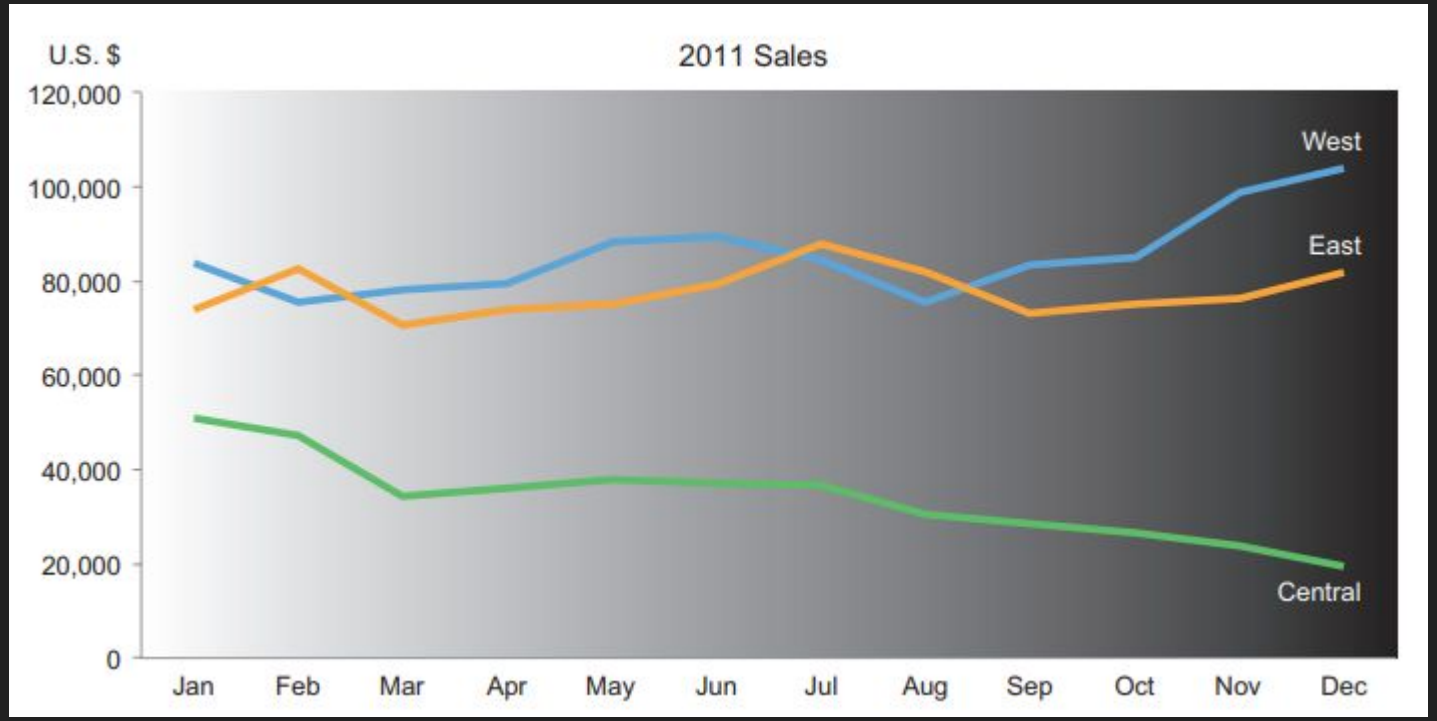

100
90
80
70
60
50
40
30
20
10
0
J F M A M J J A S O N D
100
90
80
70
60
50
40
30
20
10
0
J F M A M J J A S O N D

Data Region

Since the data region is the focus of a graph, it’s best to avoid distracting colors, gradients, or backgrounds in a graph. Gradients in particular can make the presentation of data hard to make out, or misleading.

Using images as an additional/supplementary figure can be useful, but not within the data region of a graph

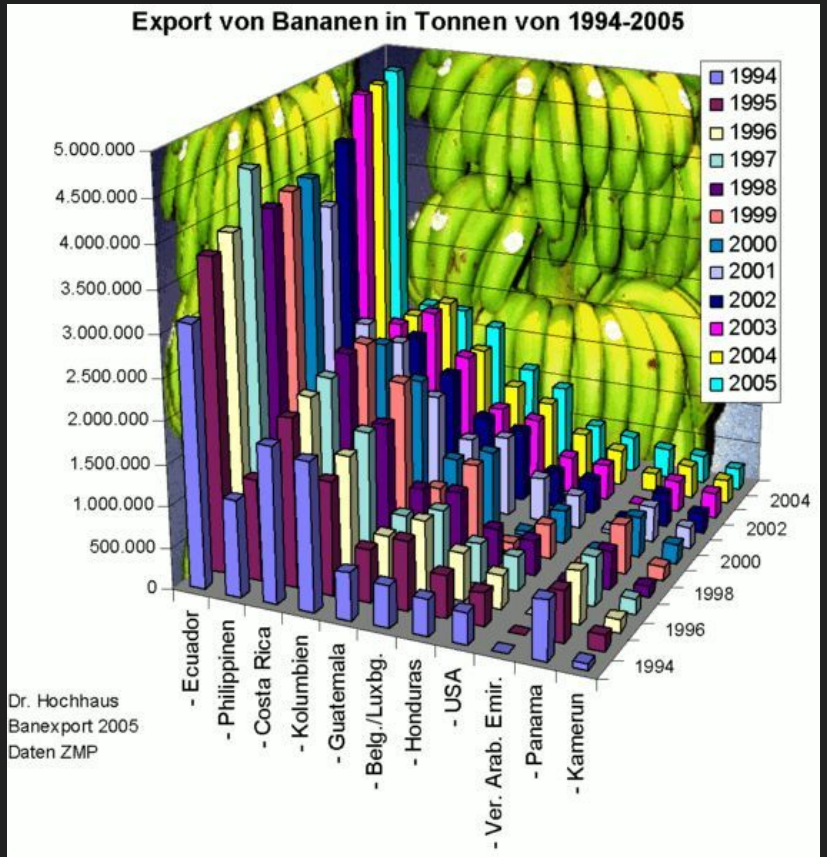
Data Region


U.S. $
2011 Sales
120,000
100,000
80,000
60,000
40,000
20,000
0
West
East
Central
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

Data Region


U.S. $
2011 Wine Sales
120,000
100,000
80,000
60,000
40,000
20,000
0
West
East
Central
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

An Excellent Example



Questions?