DS4200: Information Presentation and Visualization

Marks & Channels

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Goals for Today

- Learn the basic visual primitives of visualizations (marks and channels)
- Understand how marks and channels are assembled to make visualizations
- Learn which marks and channels are most effective for a given task ("perceptual ordering")

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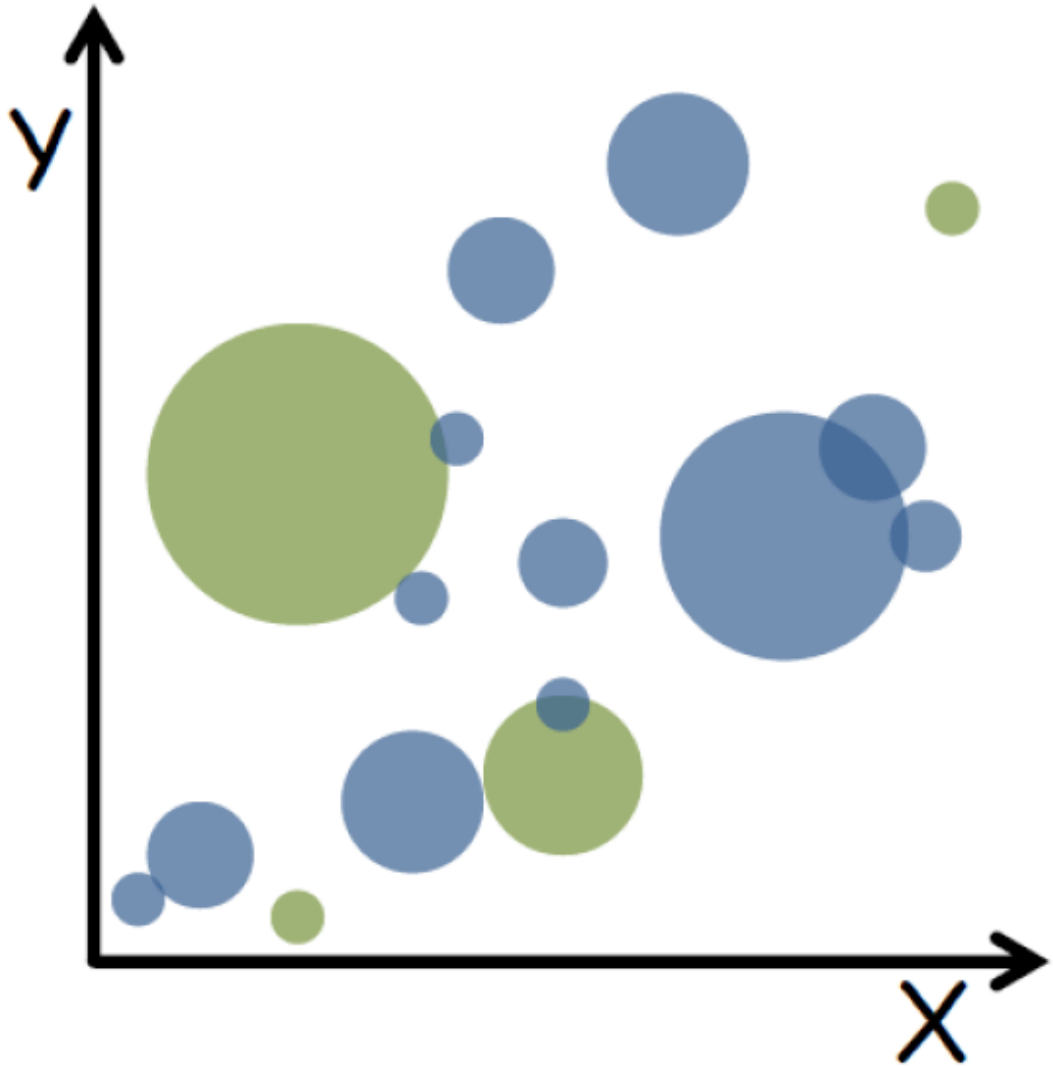
We are going to break down a data visualization!

What you have seen?



Visualization Building Blocks

Mark = basic graphical element in an image

- Mark as Items/Nodes
- Mark as Links

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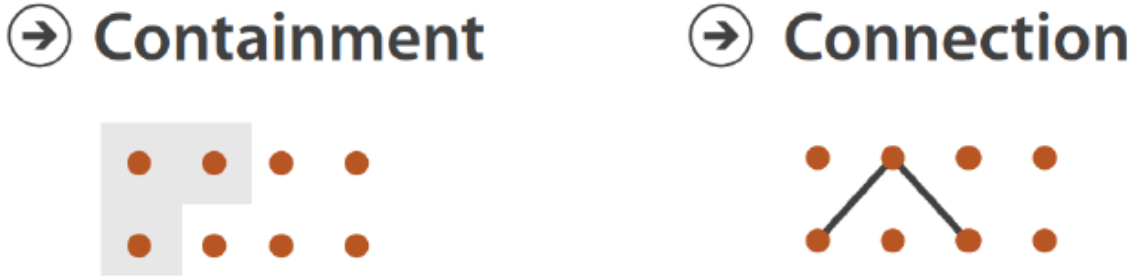

Visualization Building Blocks

Channel = way to control the appearance of independent of the dimensionality of the geometric primitive

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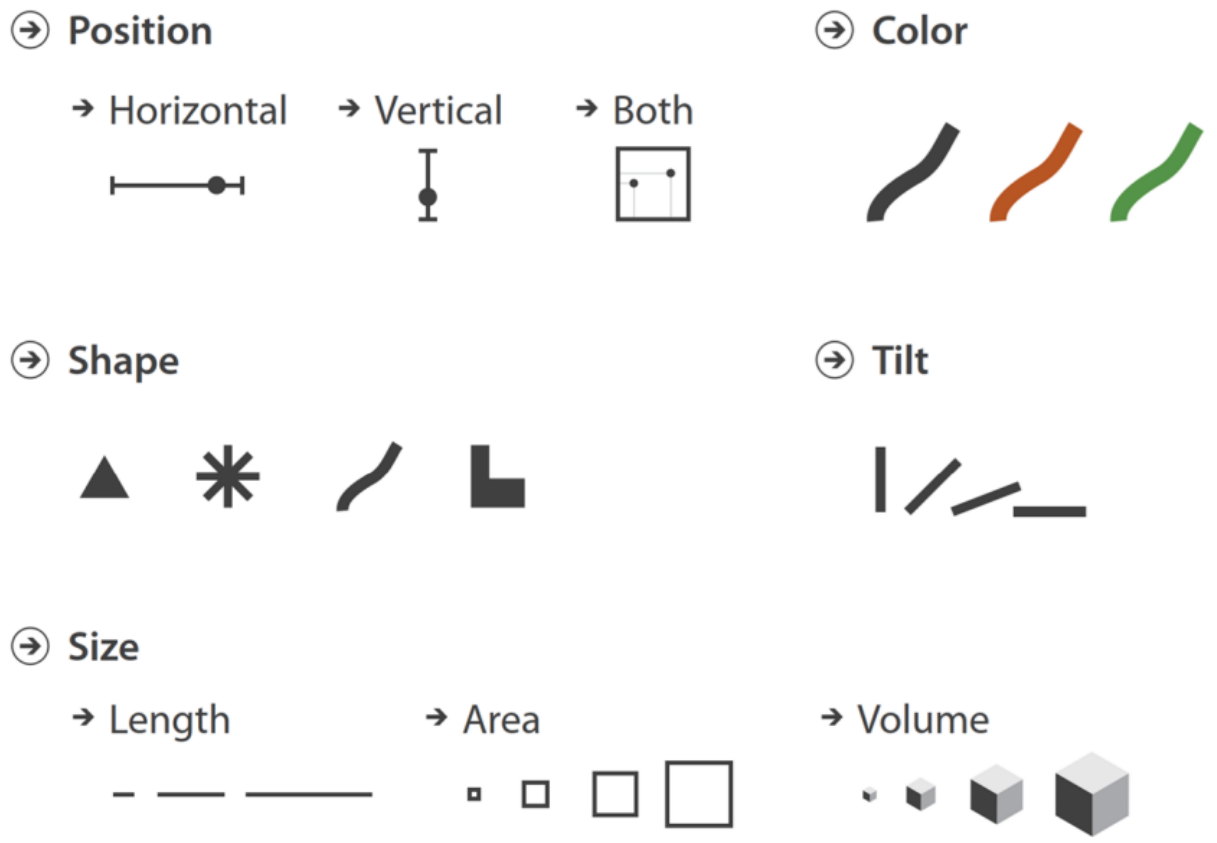
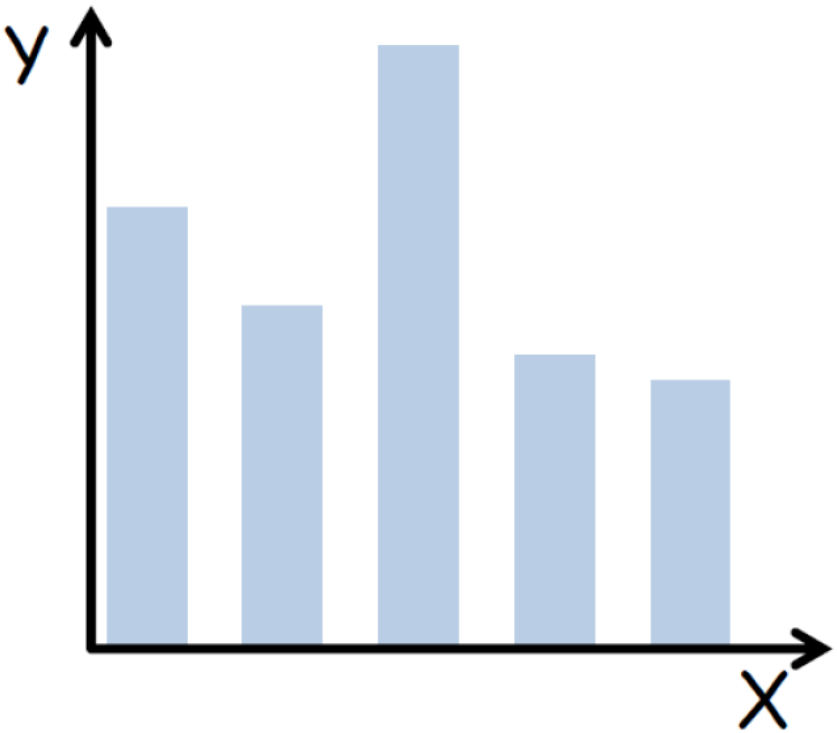


Example 1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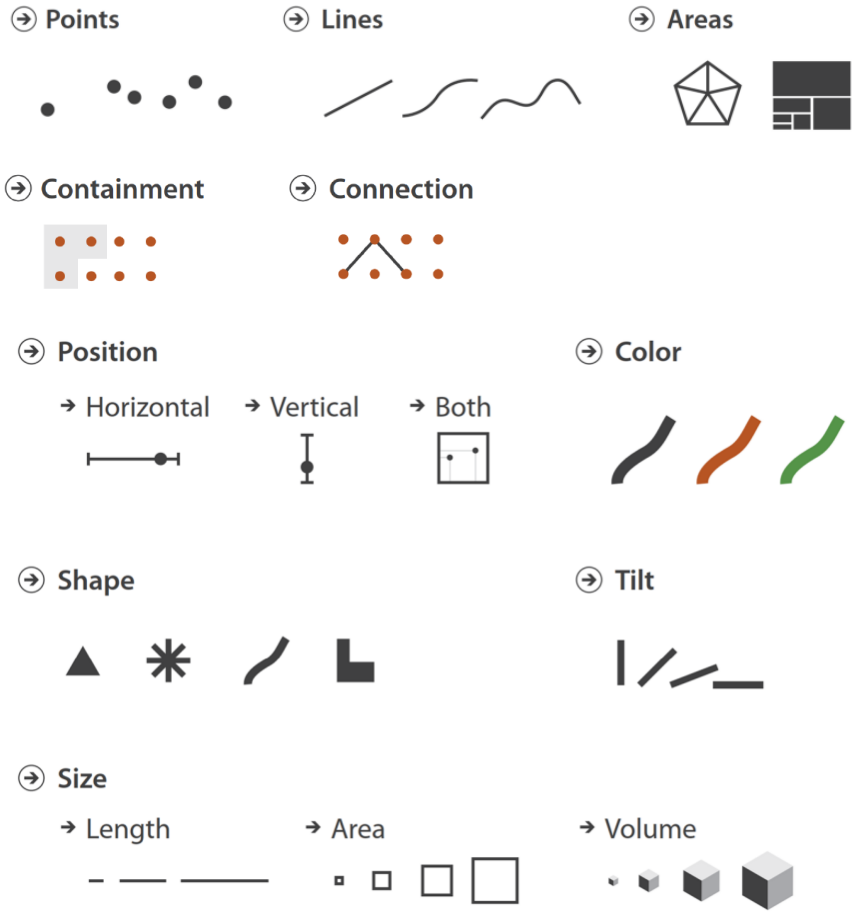
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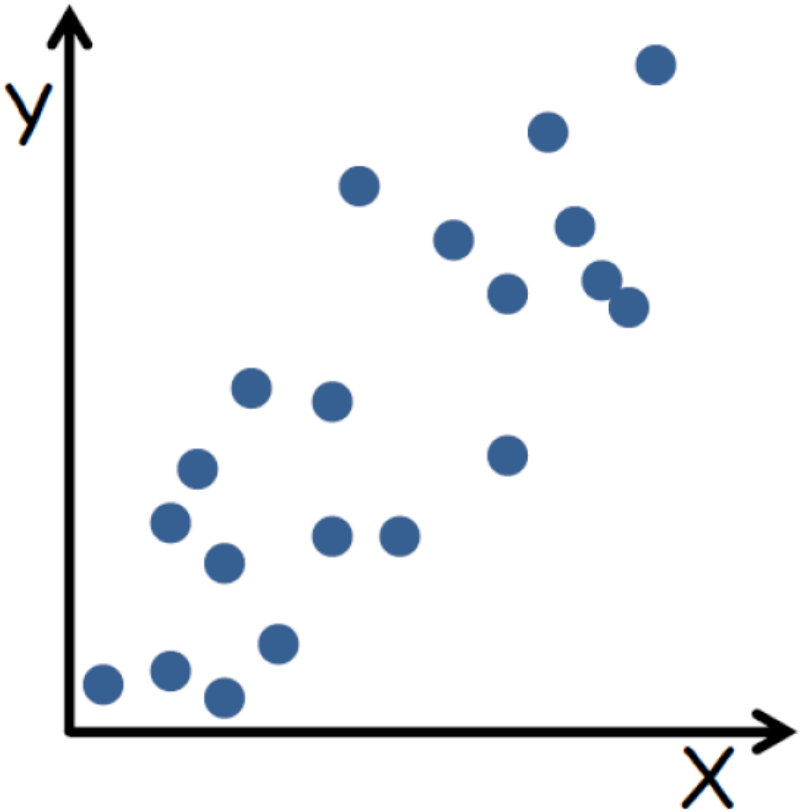
Example 2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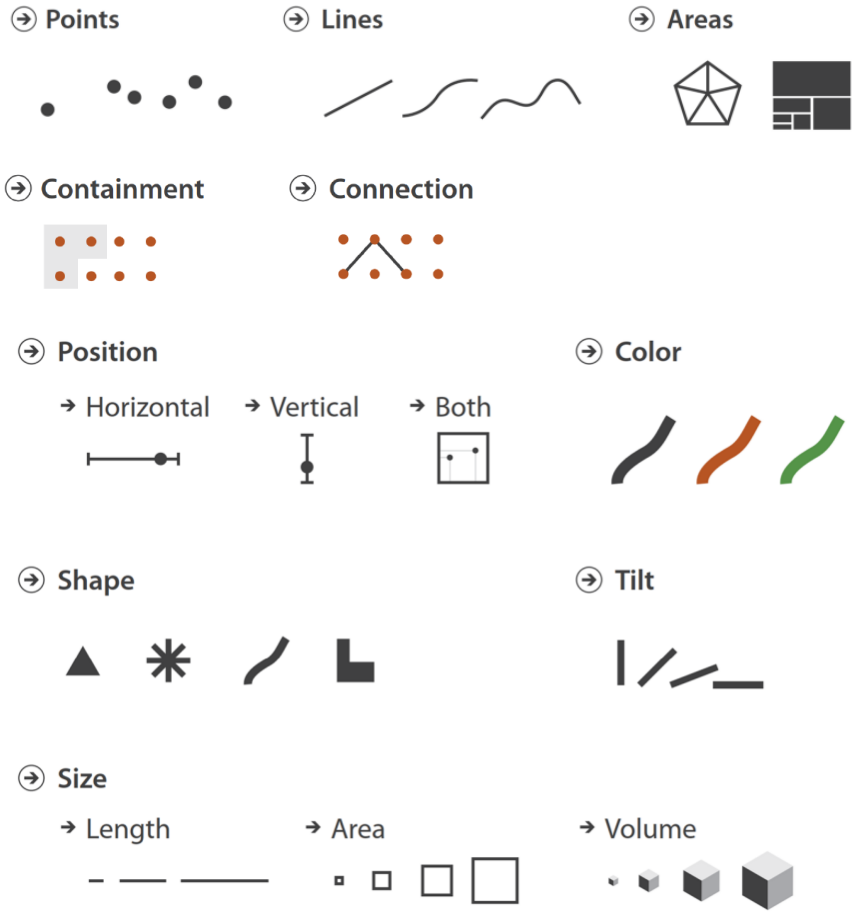
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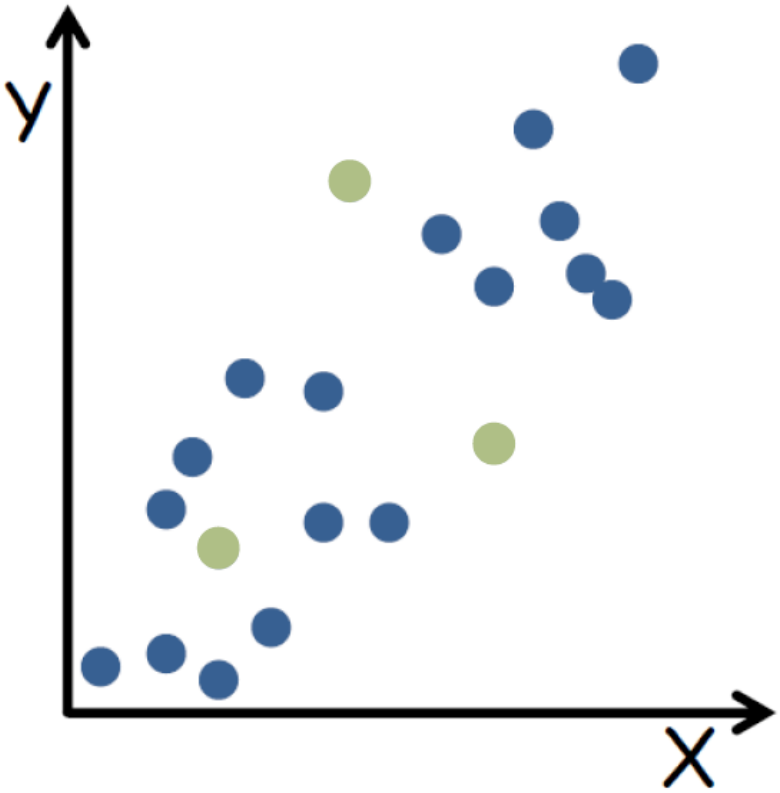
Example 3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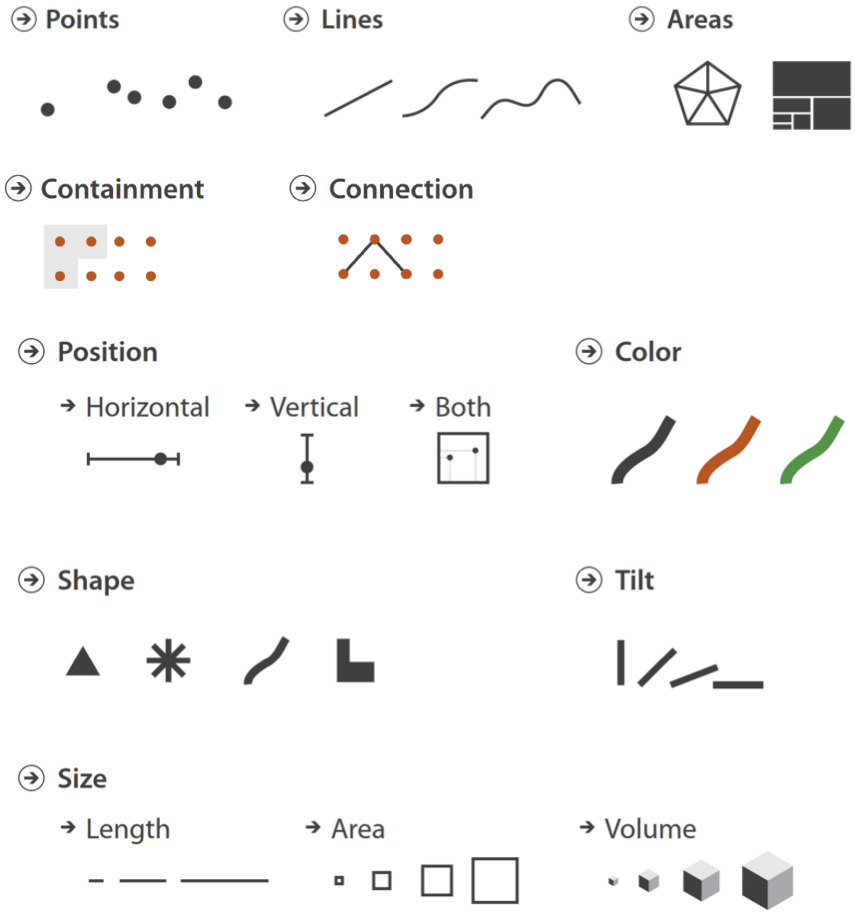
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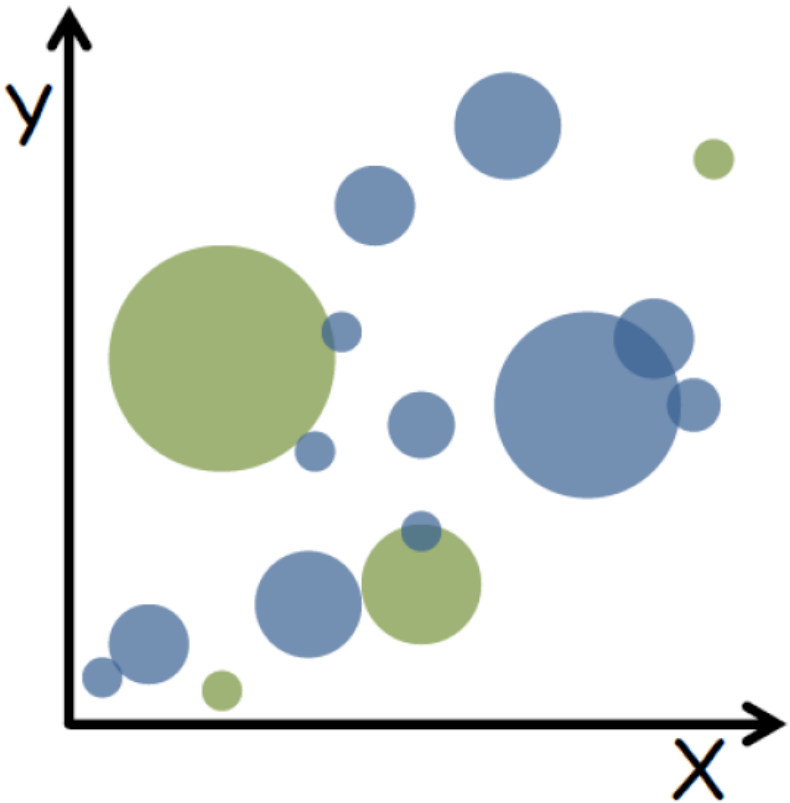
Example 4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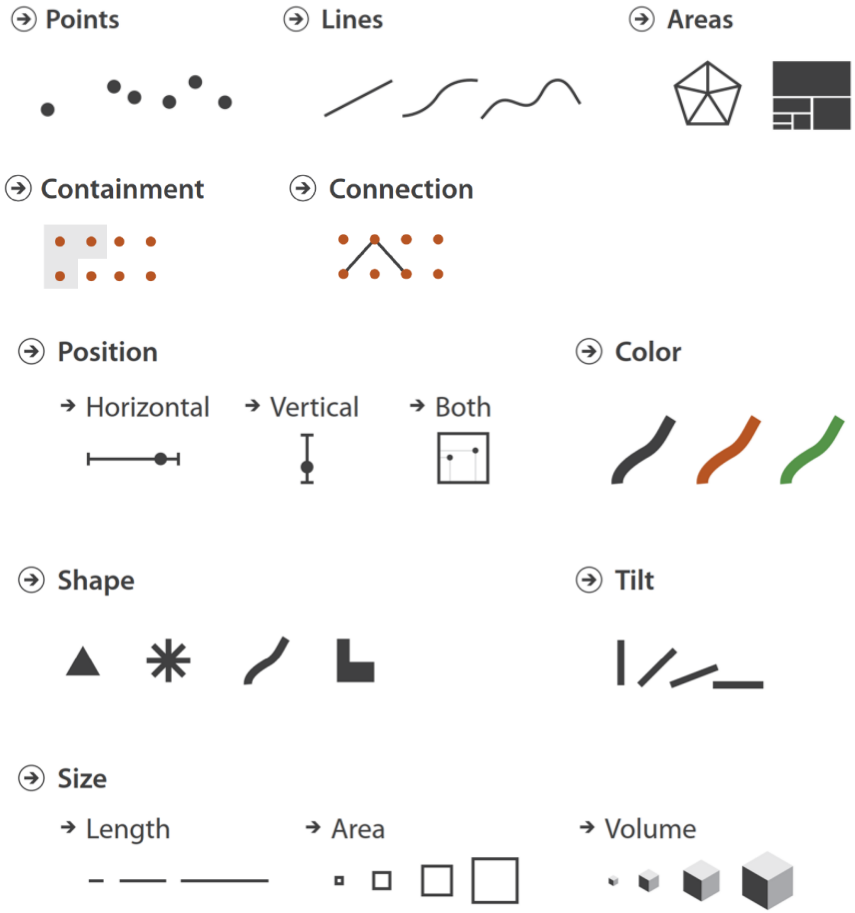
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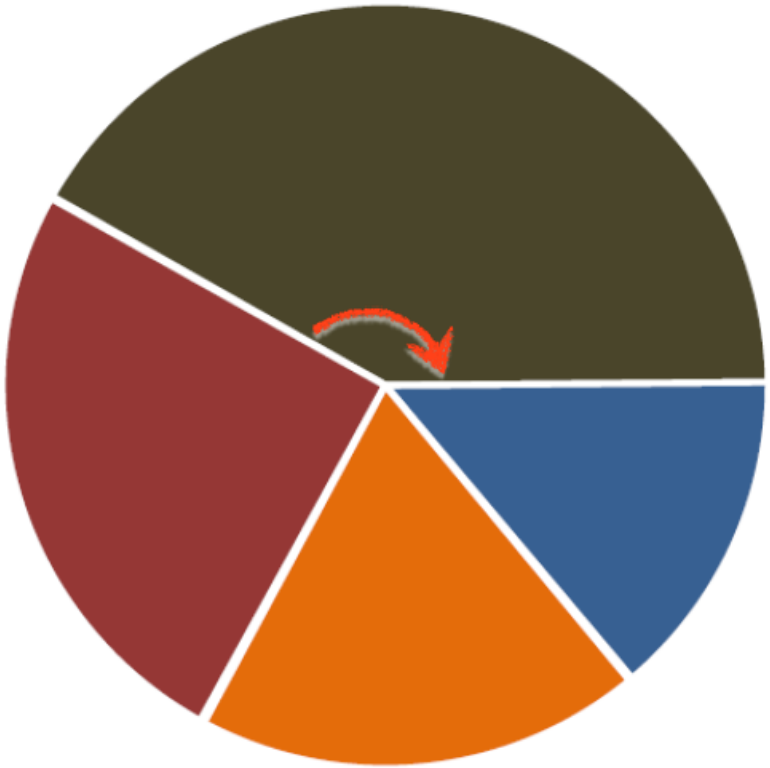
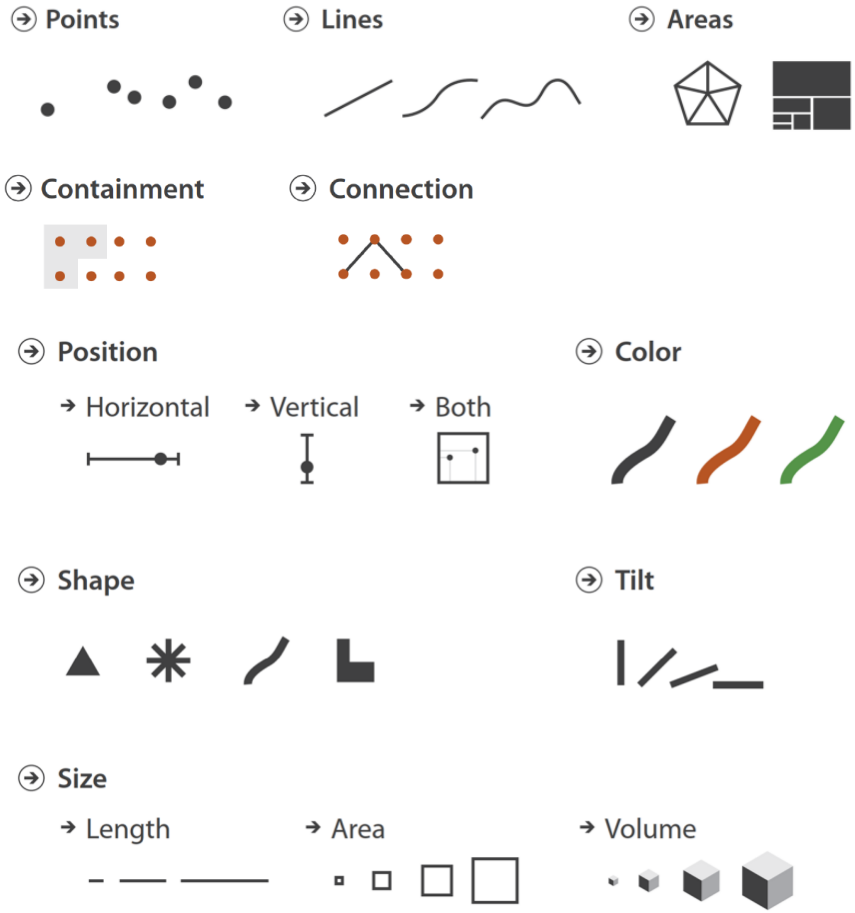
Example 5

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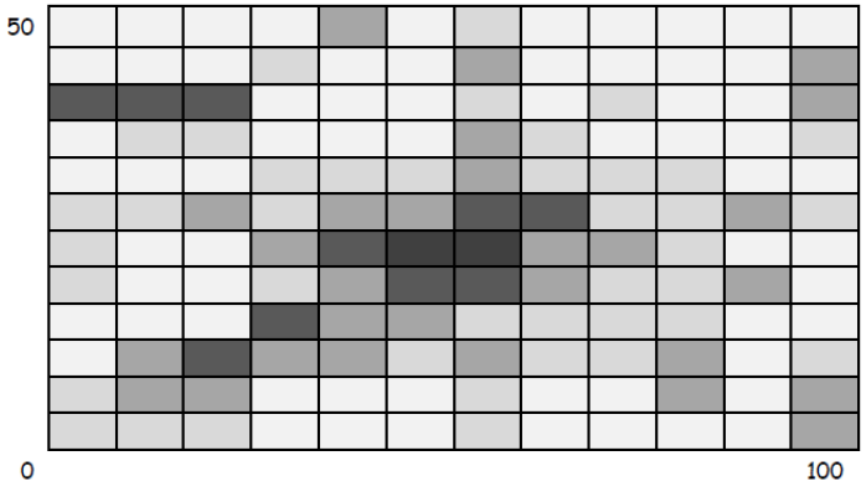
Example 6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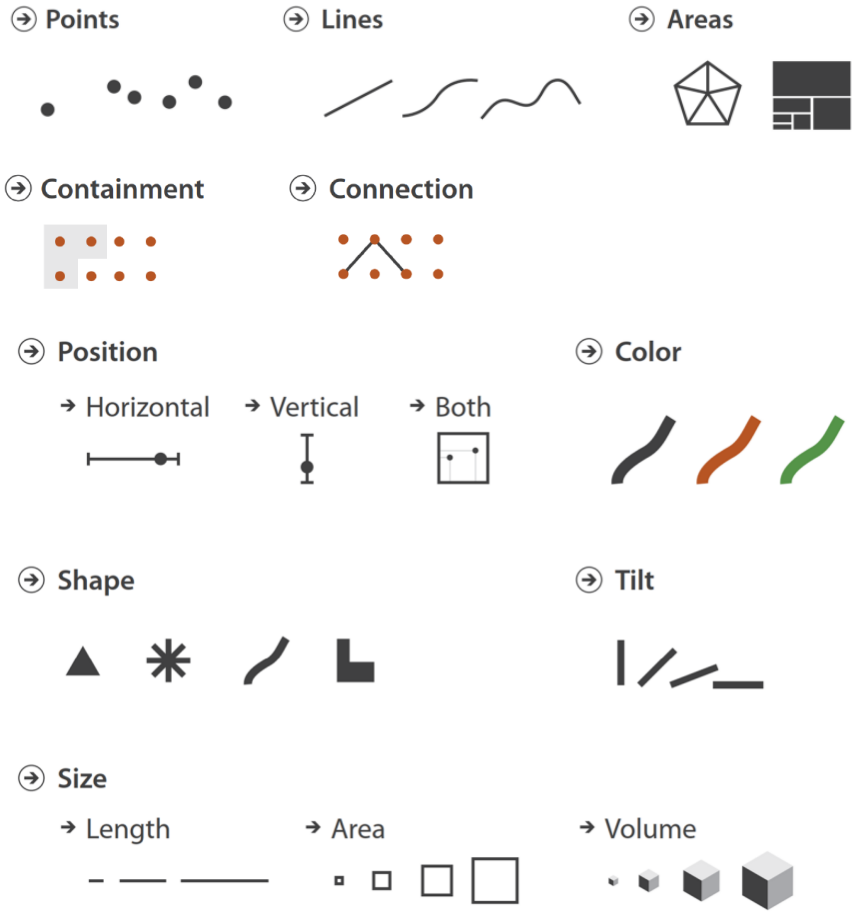
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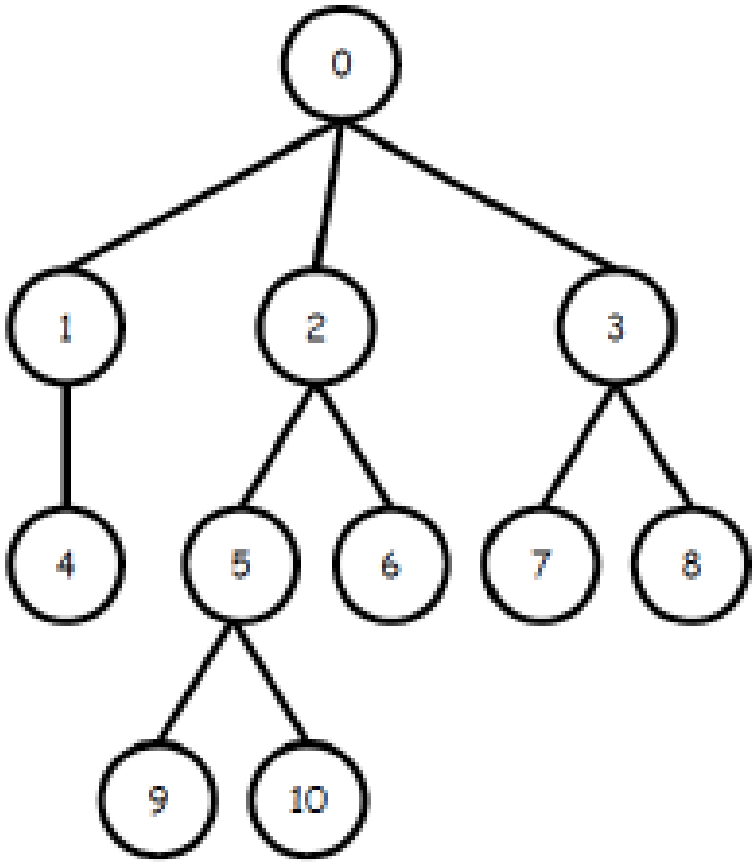
Example 7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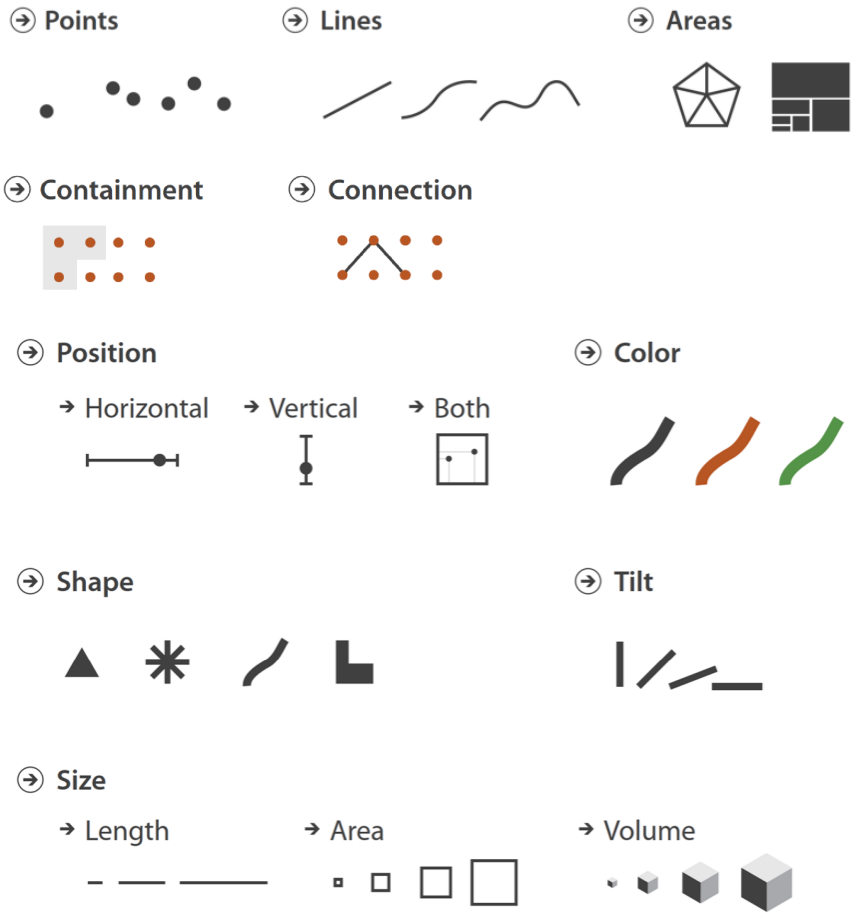
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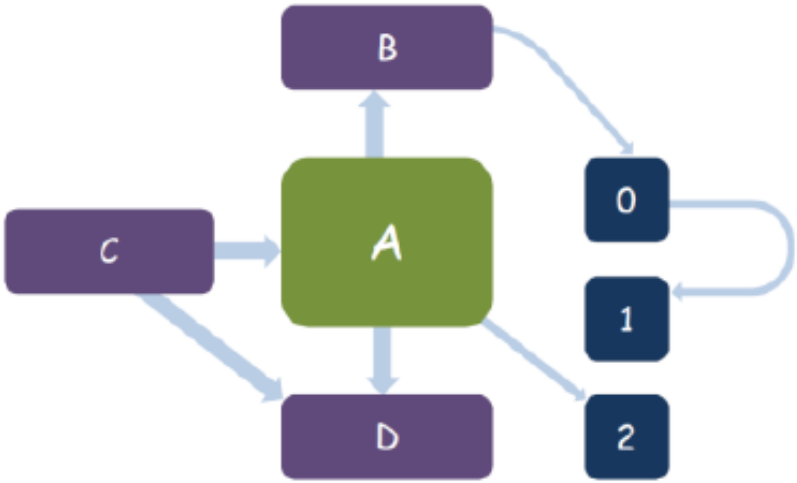
Example 8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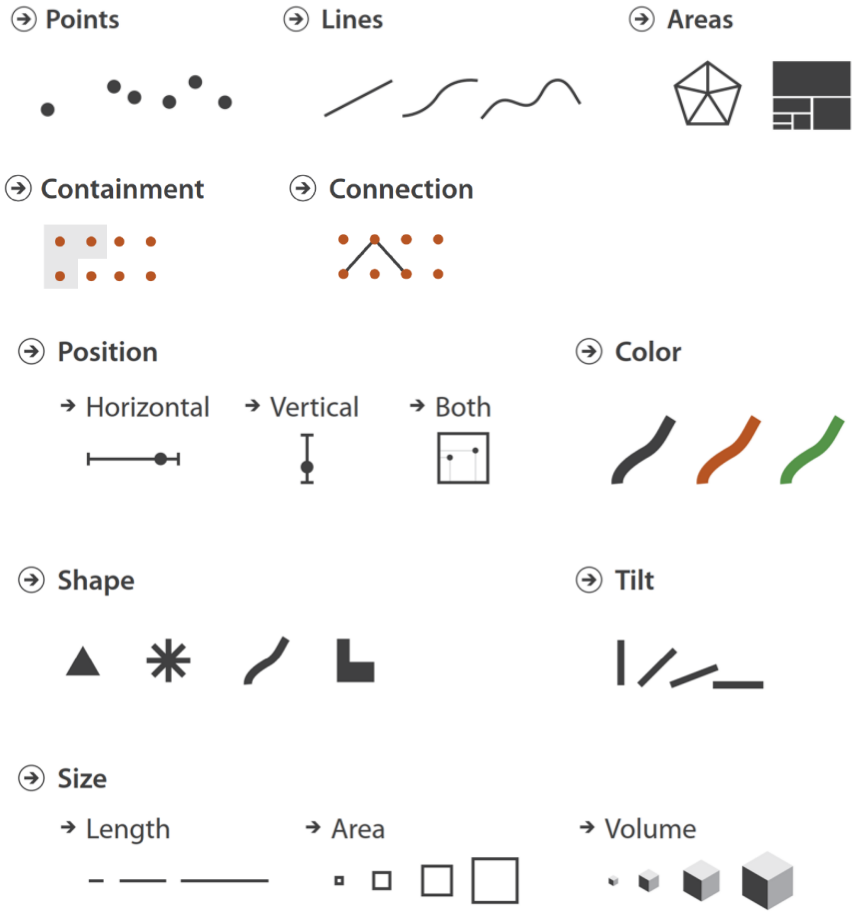
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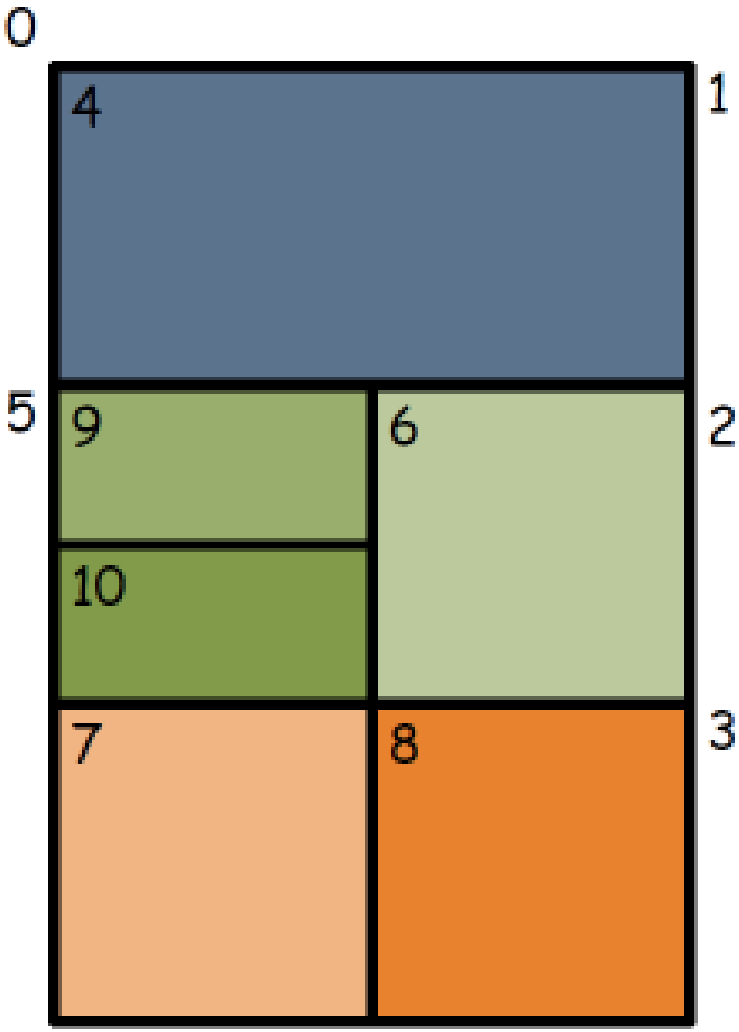
Example 9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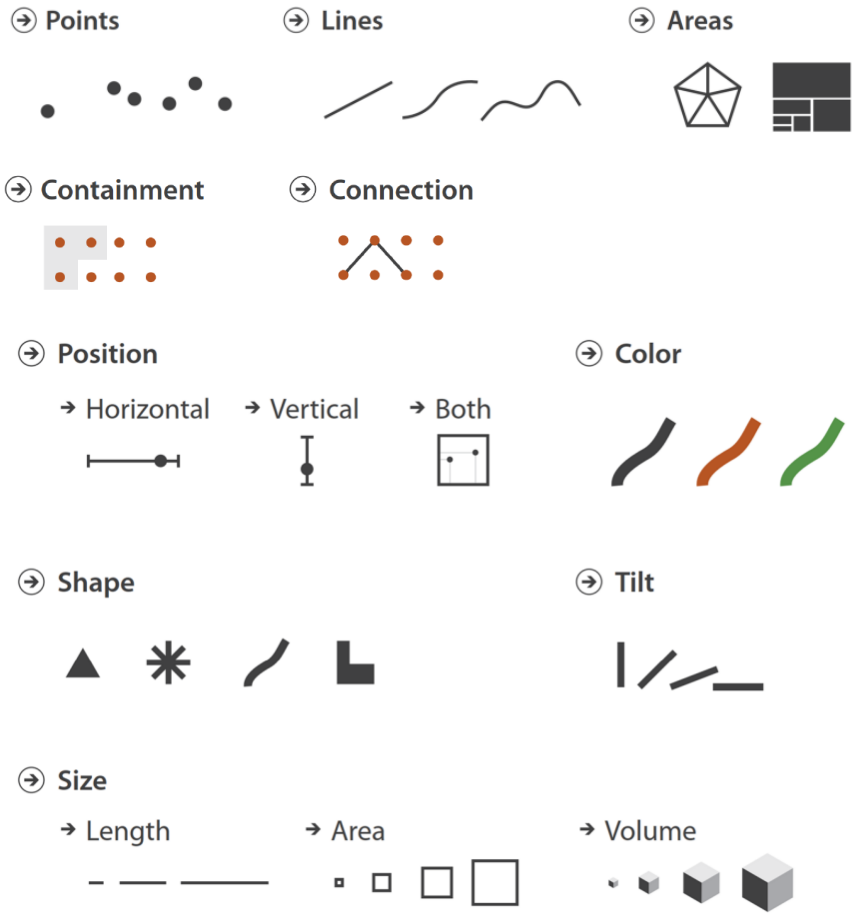
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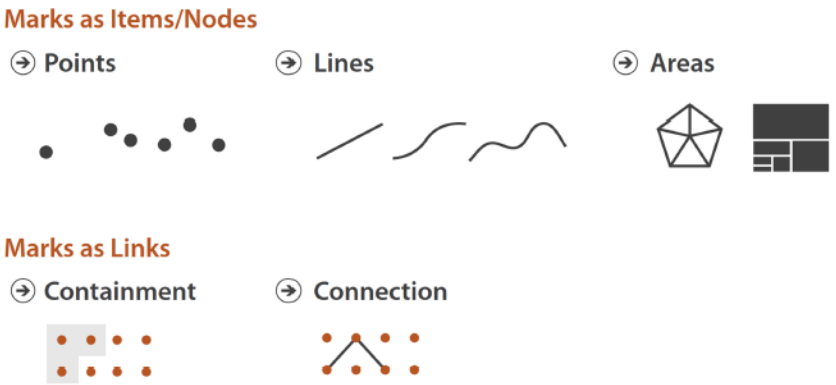
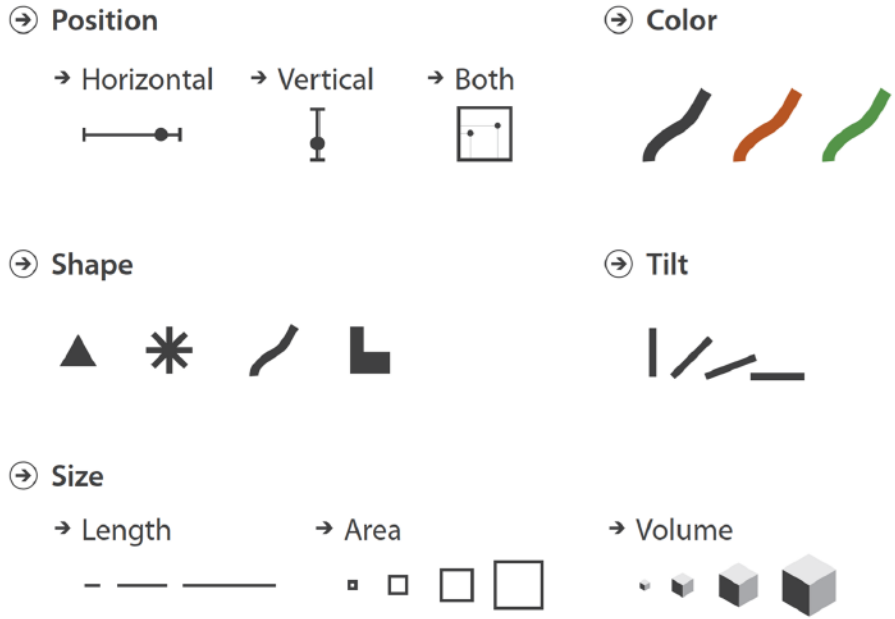
Summary



Note: these are all really important concepts when it comes time to coding your visualizations...!

Channels :



In-class activities

Work with your classmates, draw following plots on the paper

- Side-by-side boxplot to compare the GPA between two groups of students
- Density plot to view the distribution of GPA
- Line plot to show how a student's GPA changing over the time

and discuss

- What marks and channels it has used?
- For this type of the plot, what is the maximum number of attributes that it can represent?

Save your result for the later quiz submission!

Design from sketch

There are a lot of reason we may need to design the data visualization from sketch...

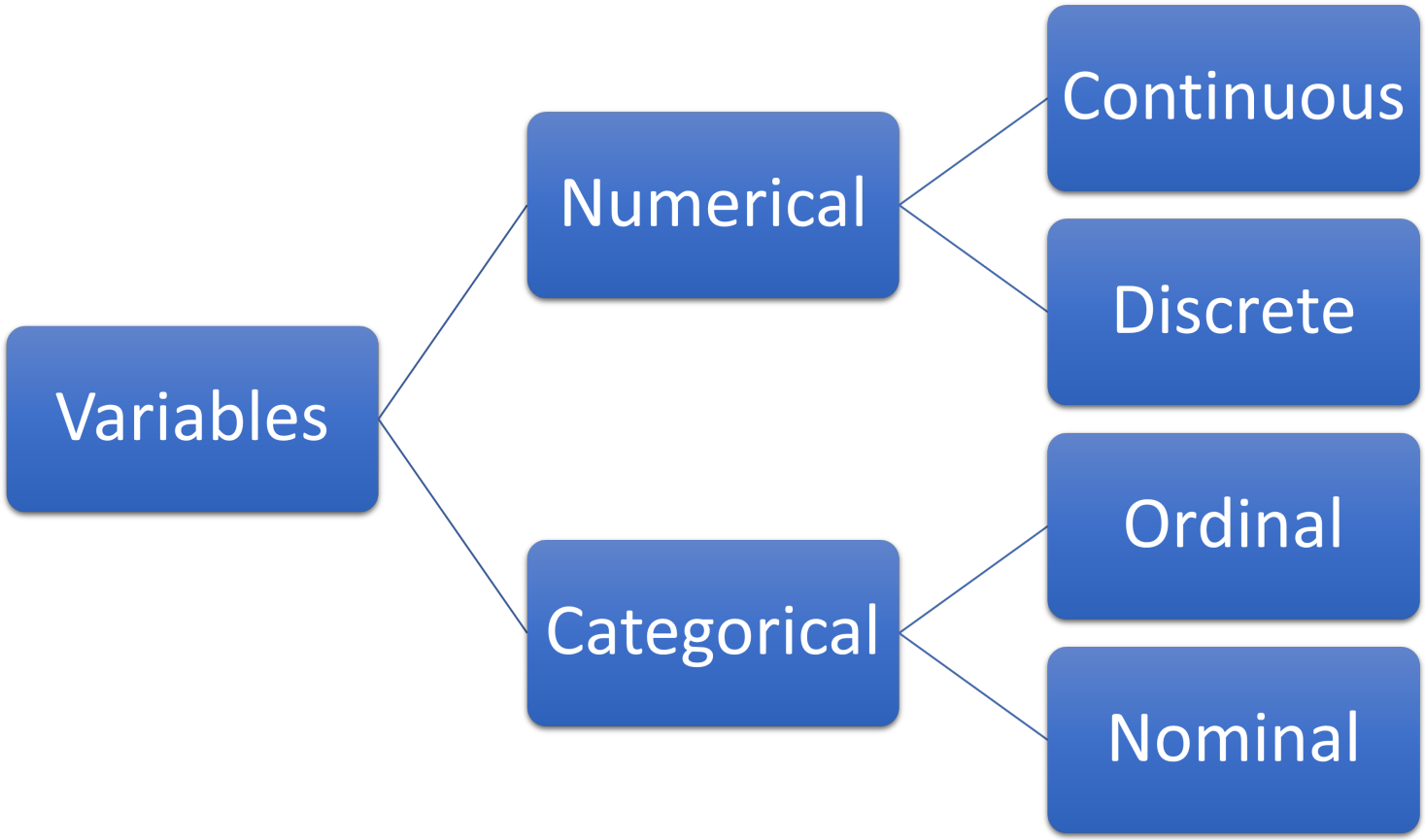
but,

How do I pick which marks or channels to use?

Expressiveness and Effectiveness

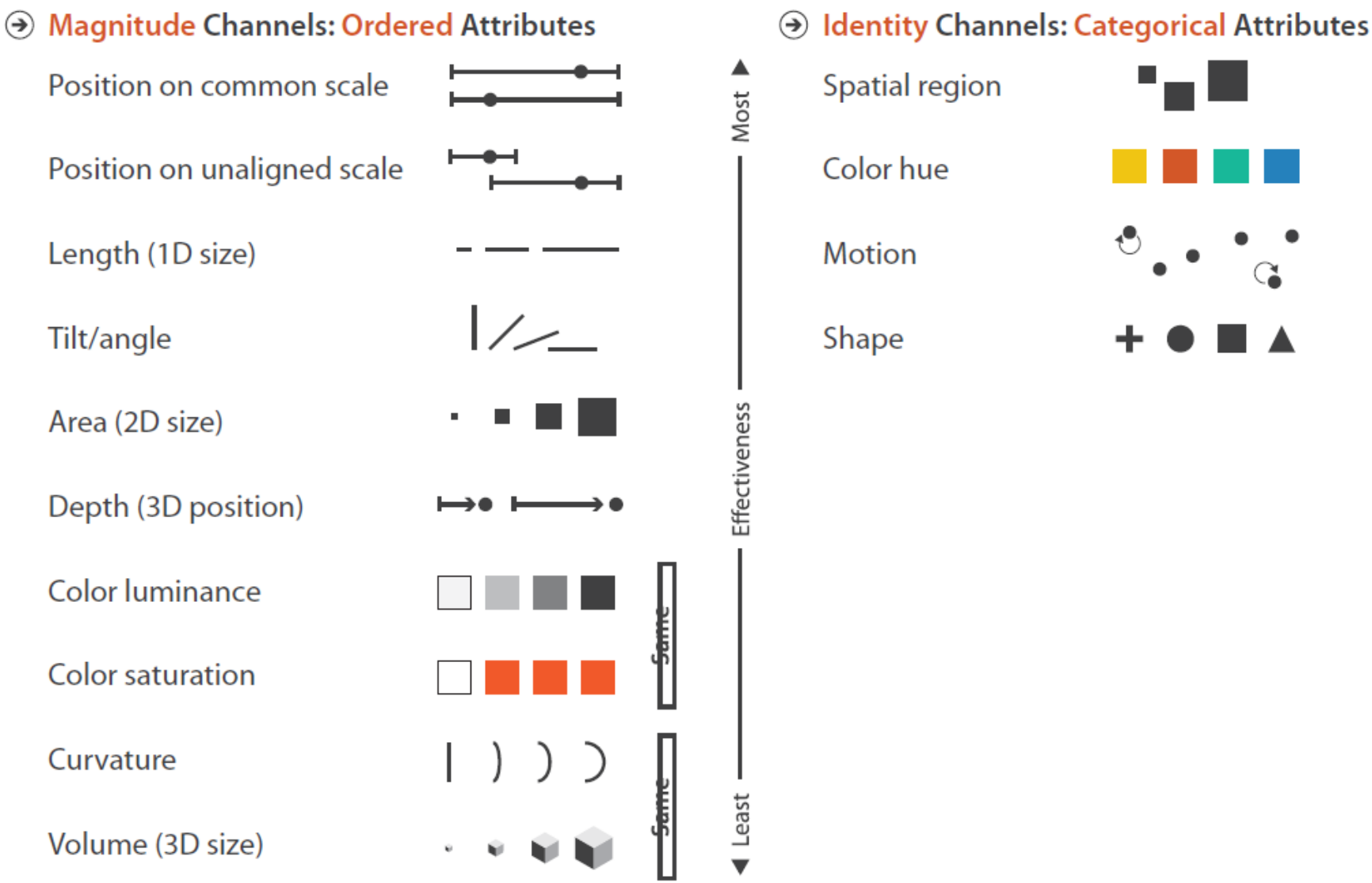
- Expressiveness: dictates that the visual encoding should express all of, and only, the information in the dataset attributes.
  - eg: ordered data should be shown in a way that our perceptual system intrinsically senses as ordered.
- Effectiveness: the most important attributes should be encoded with the most effective channels in order to be most noticeable.

A little bit about Data type



The first three are **Ordered** while the last one is **Unordered or Categorical**

Channel Rank



Compare the use of marks and channels

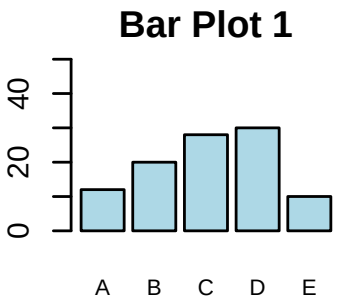
Cleveland & McGill, 1984

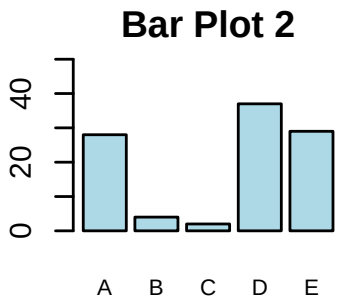
We are going to replicate this study all together! Grab a paper or something you can record with.

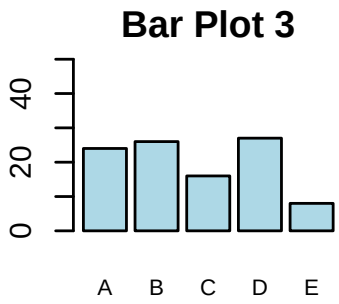
Now I am going to give you a series of figures.

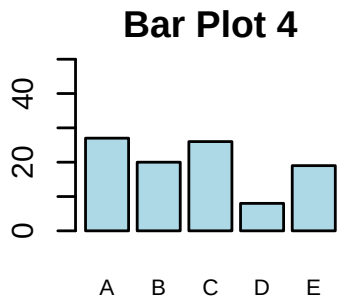
Task 1: For each figure, estimate which segment/bar is the maximum, and what is its percentage/value?

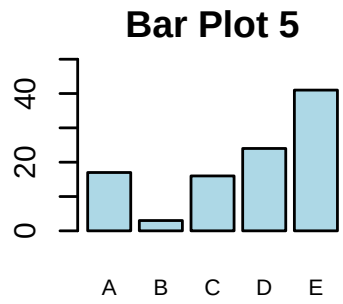
Task 1



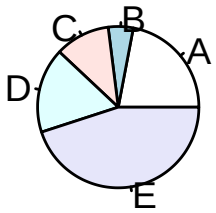




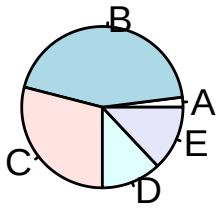




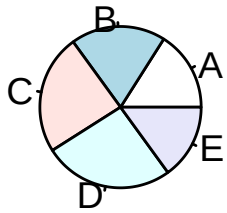
Pie Chart 1



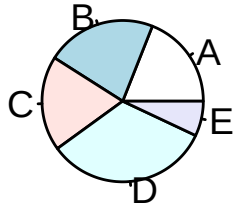
Pie Chart 2



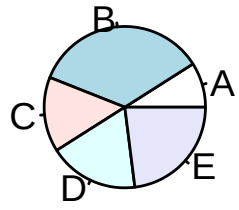
Pie Chart 3



Pie Chart 4



Pie Chart 5



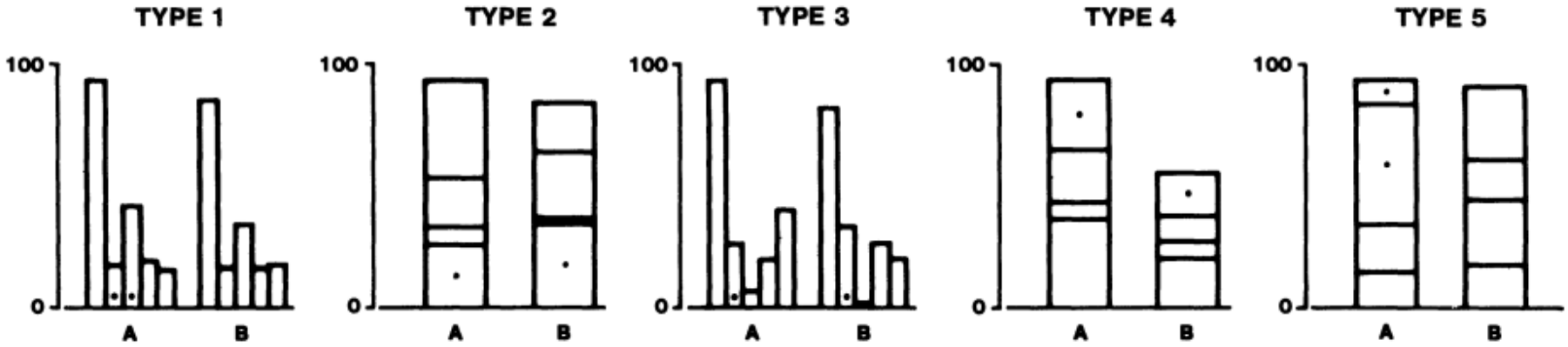
Here is the answers

- Bar plot
  - Plot 1: D, 30
  - Plot 2: D, 37
  - Plot 3: D, 27
  - Plot 4: A, 27
  - Plot 5: E, 41
- Pie chart
  - Plot 1: E, 45
  - Plot 2: B, 44
  - Plot 3: D, 26
  - Plot 4: D, 33
  - Plot 5: B, 35

Calculate your MSE and compare your result with your peers!

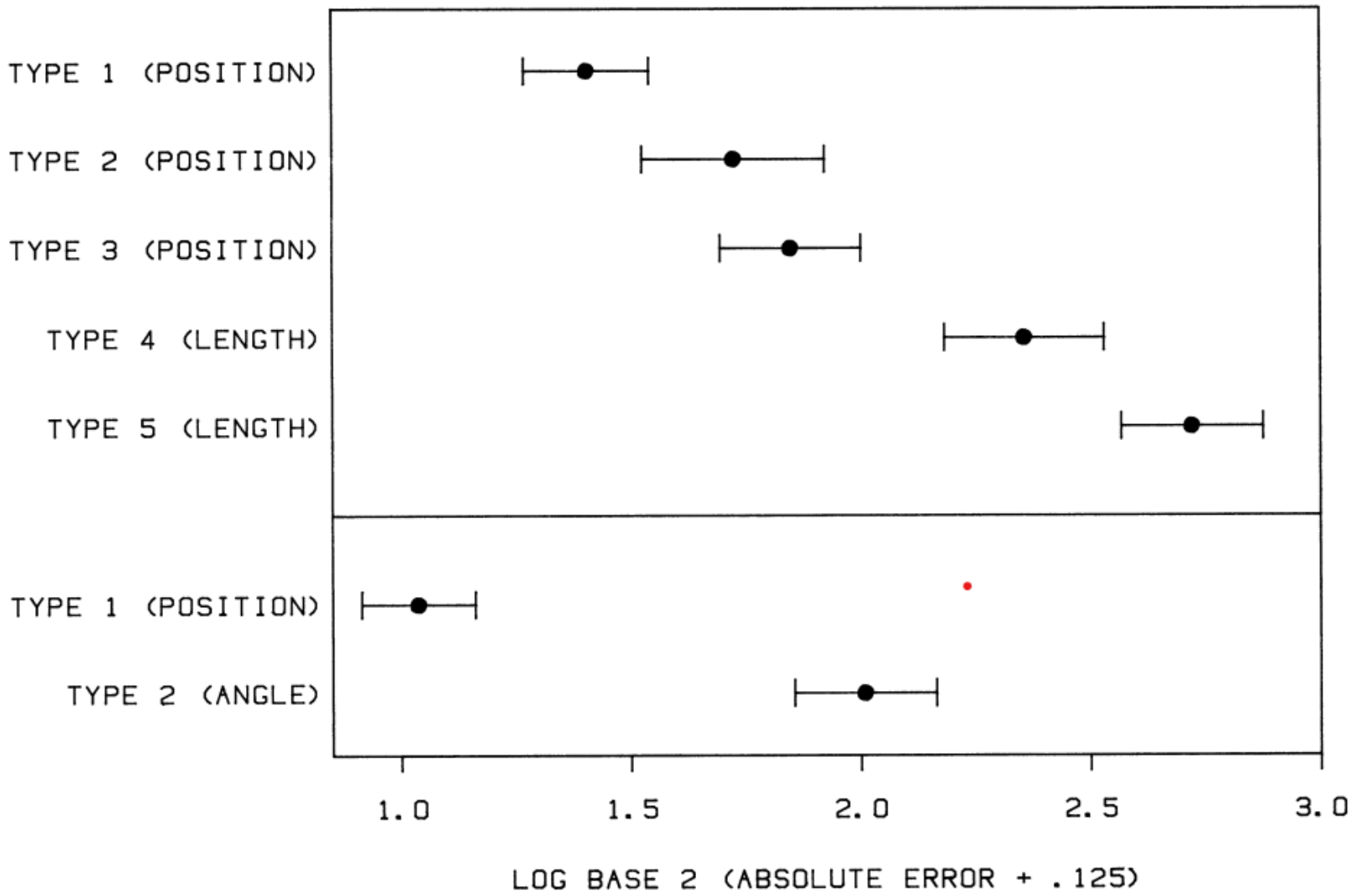
Task 2

TASK : Compare two dotted segments. Which has larger value and what is its value?

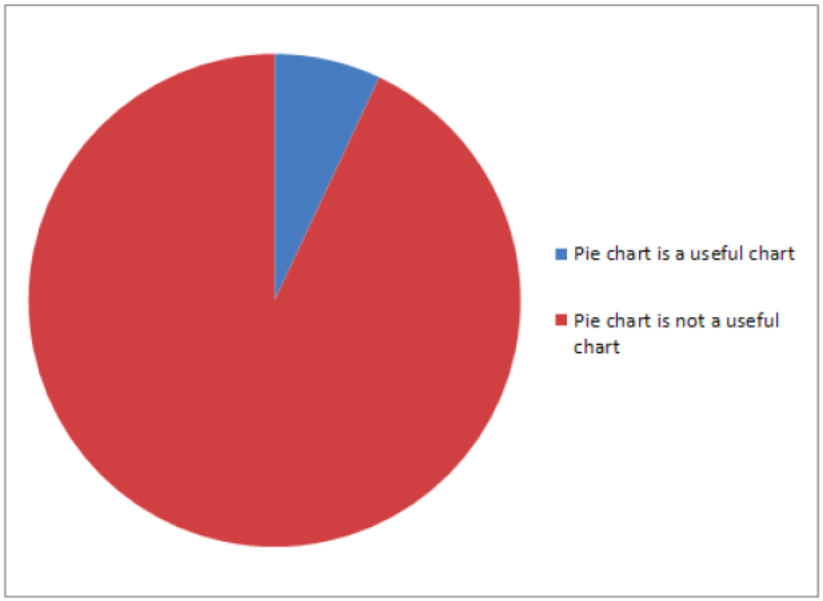


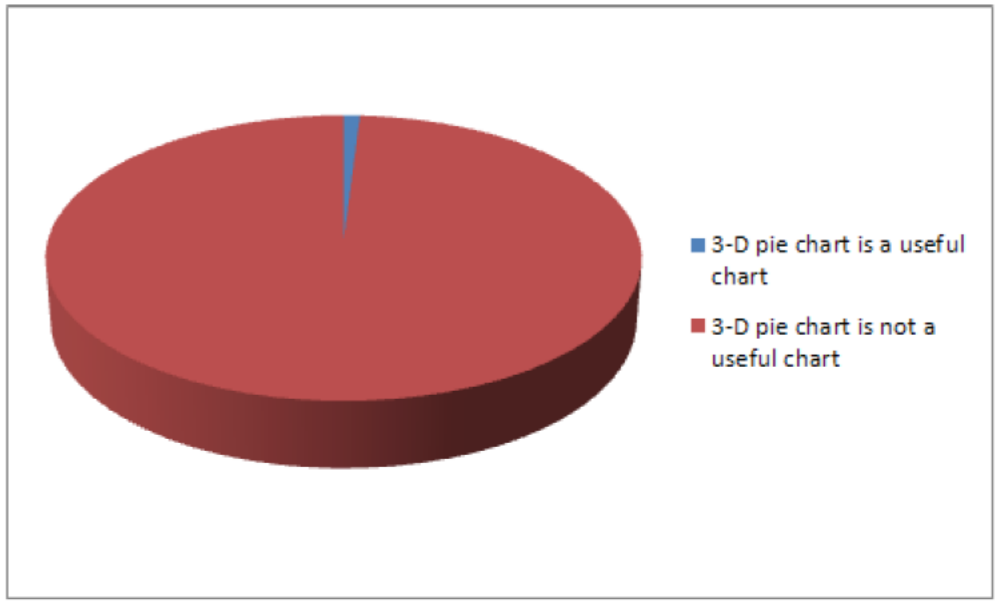
Which is easy and which is hard? How they are different in the channels?

Compare Position and Length



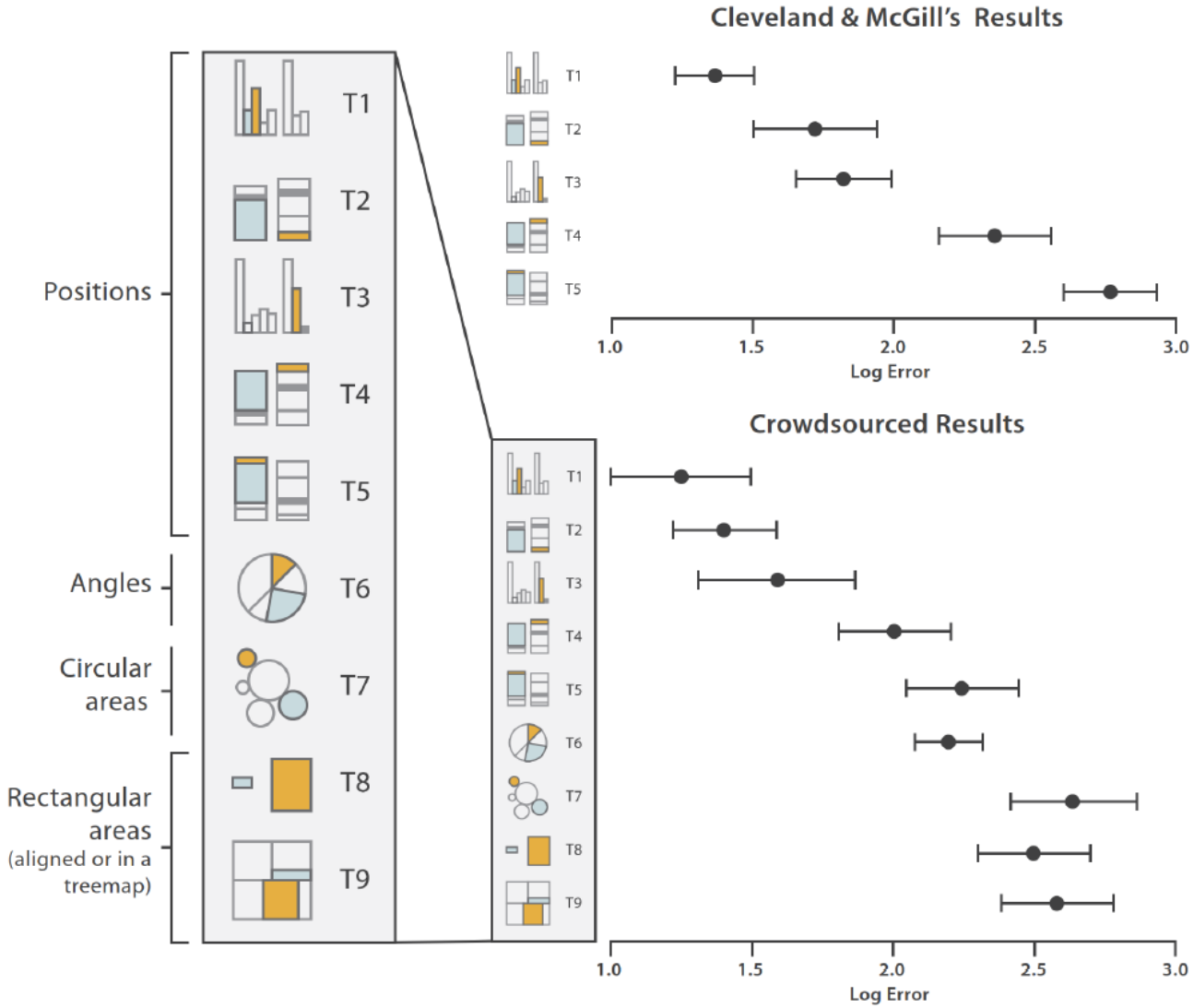
Do not use Pie chart...





https://www.washingtonpost.com/news/wonk/wp/2013/06/17/the-usefulness-of-pie-charts-in-two-pie-charts/

Another study



Heer & Bostock, 2010

In-class activities

Recall in the end of the Python review lecture, we have asked you to make three data visualizations for the Titanic data. Now, revisit the data visualizations you have made.

- For each visualization, what are the marks and channels?
- Is there any other options of marks or channels that you can use? (No need to make new figures, just go through the options we have in this lecture)
- Can you add more attributes into your visualization? If yes, how to use new channels to represent the new attributes.