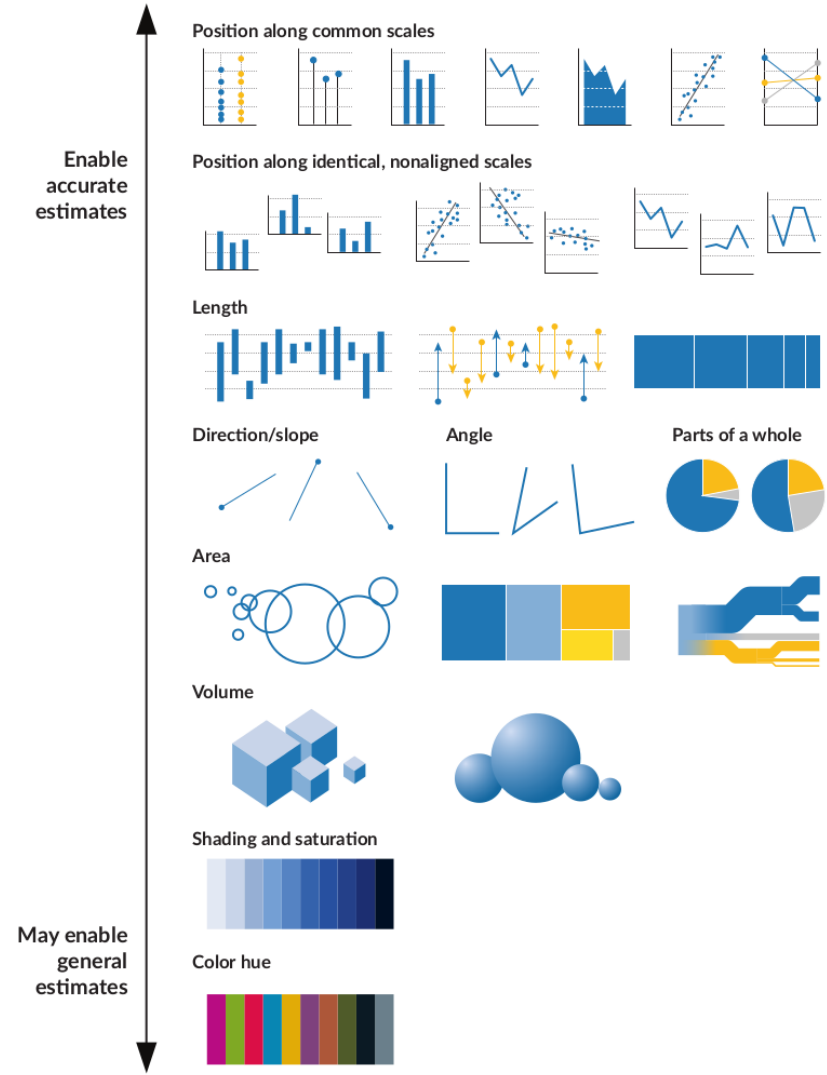
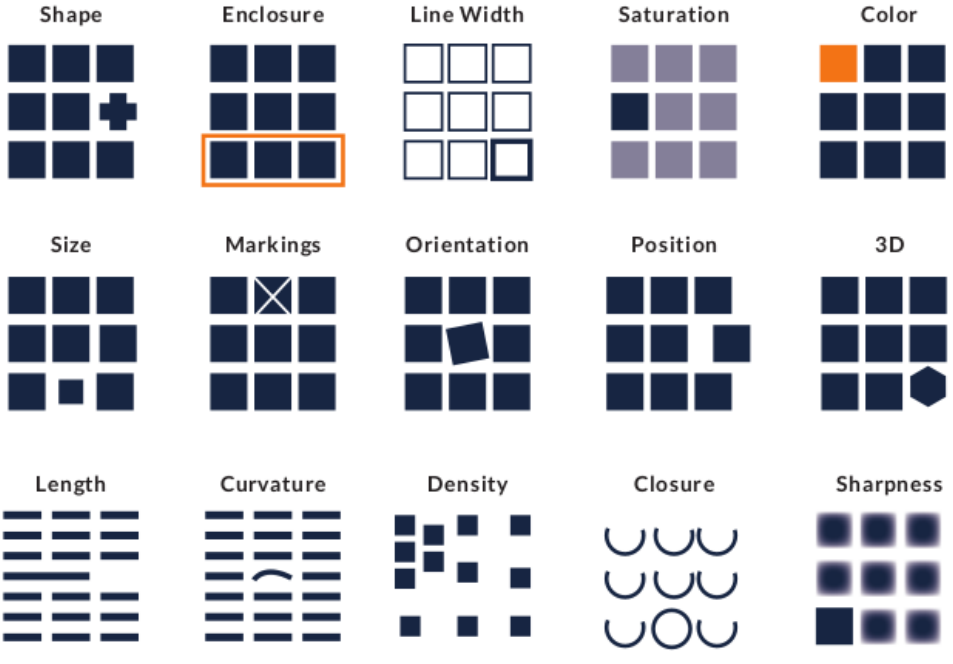
# Some Common Plot Types and Uses

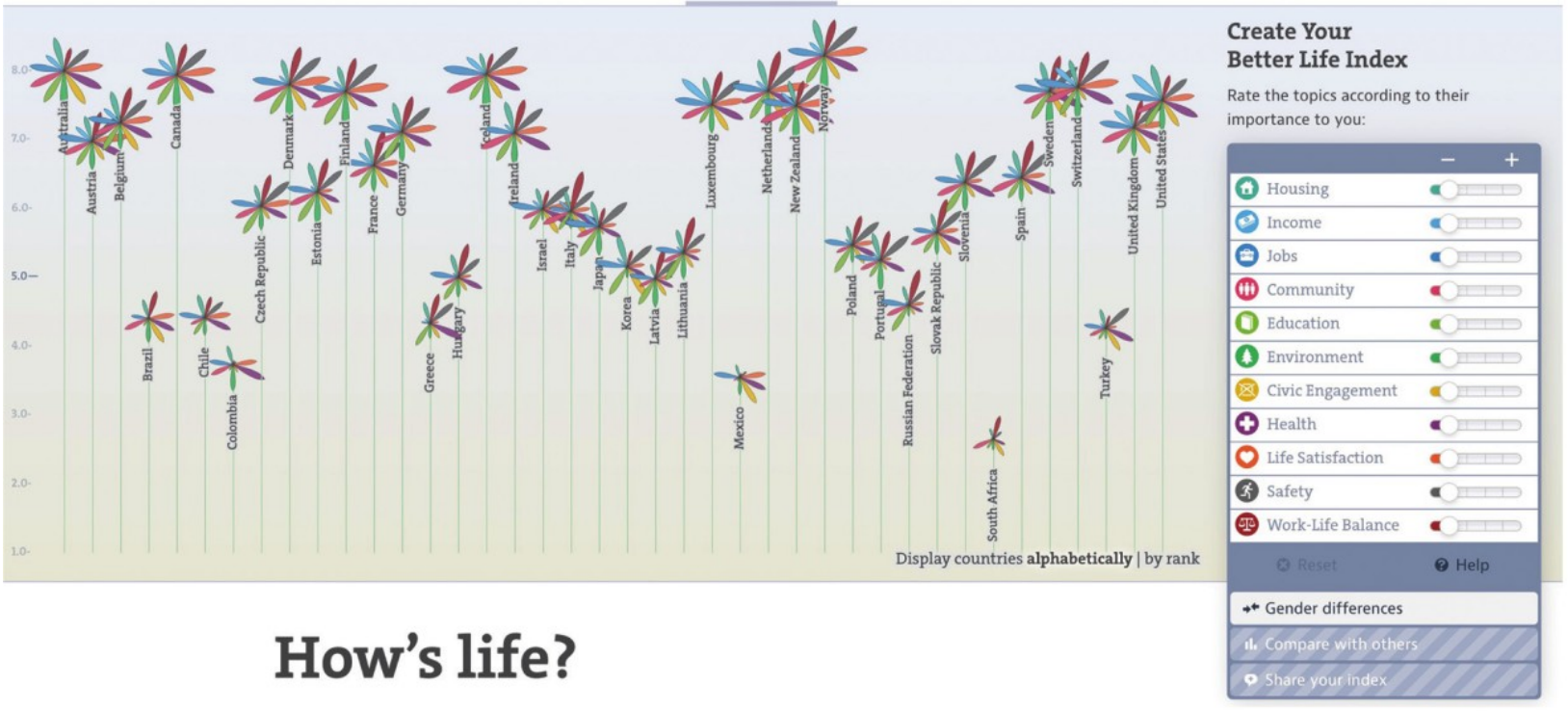
- **Line**
  - Temporal or other sequential relationship between data points
  - Captures evolution of a process
- **Bar**
  - Comparing categorical data
  - No relationship implied by x-axis position
  - Can “stack” for internal grouping
- **Pie**
  - Emphasizes relative proportions of categorical division
- **Scatter**
  - Still captures relationship on the x-axis but sampling order doesn’t matter, x-values are experimentally independent of each other
- **Data Table**
  - Comparing/Analyzing individual values but not the entire series
  - Most precision required, with summary/statistics presented




Perceptual ranking diagram. What kind of data visualization you choose to create will depend on your goals and your audience's needs, experiences, and expertise. This image is based on Alberto Cairo (2016) from research by Cleveland and McGill (1984), Heer, Bostock, and Ogievetsky (2010), and others.



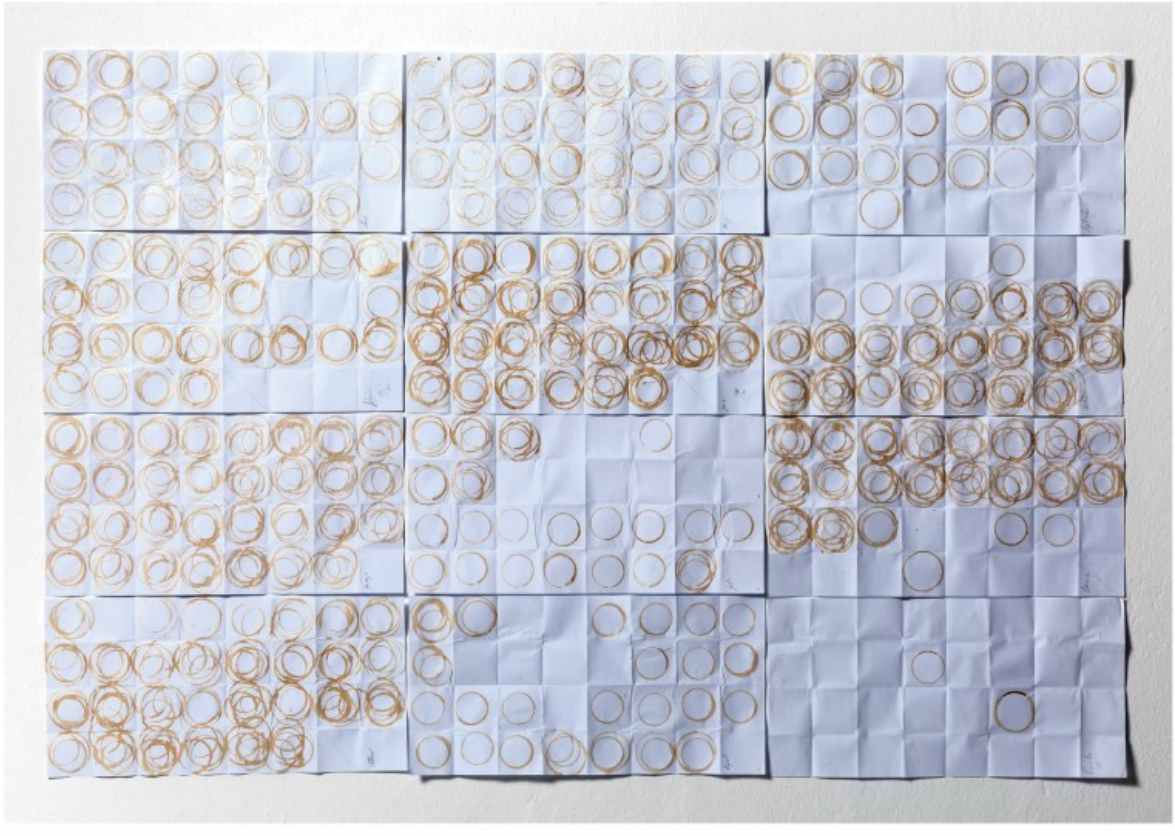

Examples of preattentive attributes that we can use in our visualizations to direct our reader's attention.




# How's life?

This graphic from an interactive visualization from the Organisation of Economic Co-Operation and Development (OECD) enables users to explore the different metrics and definitions of what it means to have a "better life." A more standard chart type, like a bar chart, might enable easier comparisons, but would it be as much fun?

Source: Organisation for Economic Co-Operation and Development

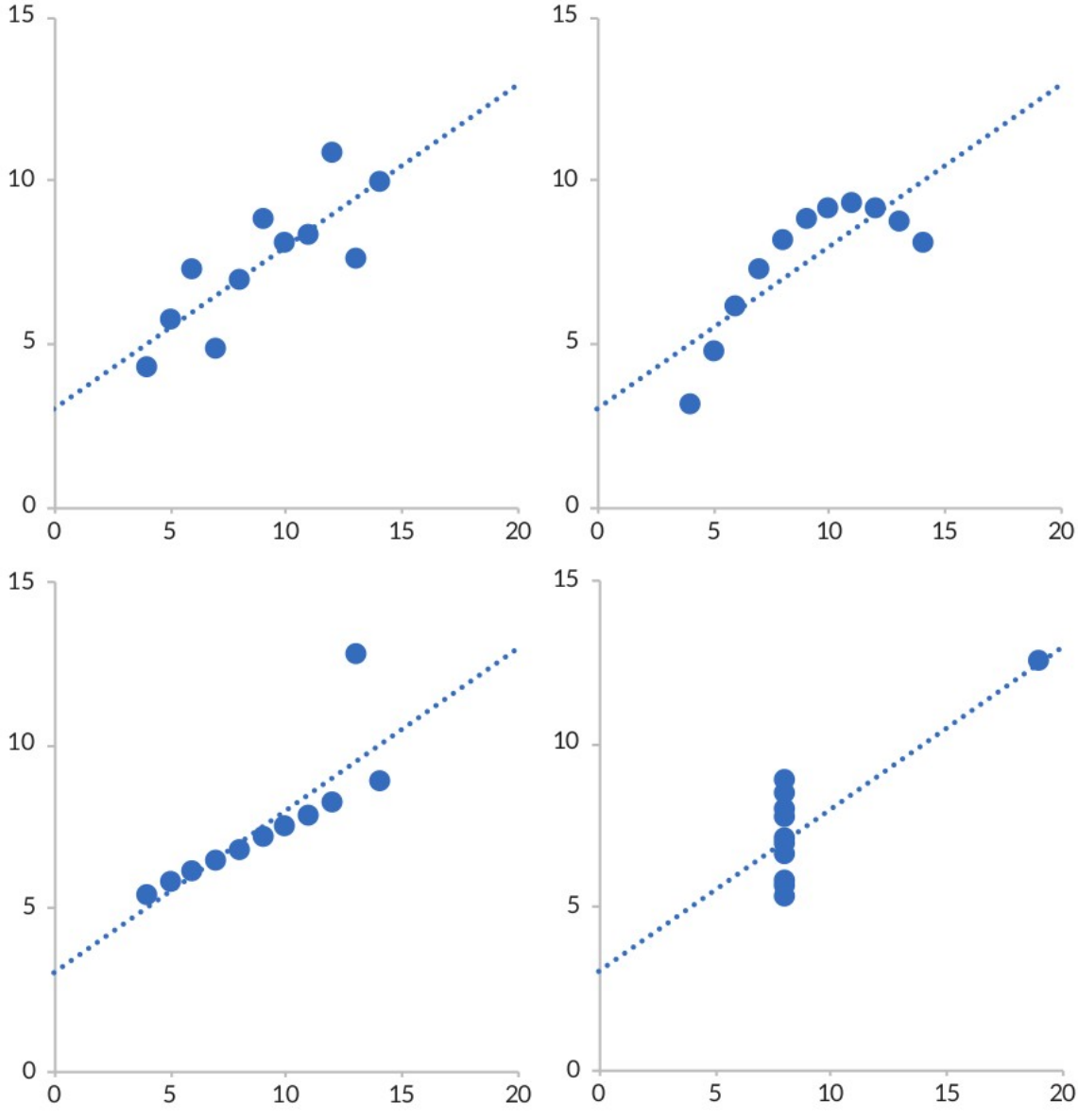


Artist and journalist Jaime Serra Palou plotted his coffee consumption every day for a year by using stains from his coffee cup.

| Data set | | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 |
|---|---|---|---|---|---|---|---|---|---|
| Variable | | x | y | x | y | x | y | x | y |
| Obs. No. | 1 : | 10 | 8.0 | 10 | 9.1 | 10 | 7.5 | 8 | 6.6 |
| | 2 : | 8 | 7.0 | 8 | 8.1 | 8 | 6.8 | 8 | 5.8 |
| | 3 : | 13 | 7.6 | 13 | 8.7 | 13 | 12.7 | 8 | 7.7 |
| | 4 : | 9 | 8.8 | 9 | 8.8 | 9 | 7.1 | 8 | 8.8 |
| | 5 : | 11 | 8.3 | 11 | 9.3 | 11 | 7.8 | 8 | 8.5 |
| | 6 : | 14 | 10.0 | 14 | 8.1 | 14 | 8.8 | 8 | 7.0 |
| | 7 : | 6 | 7.2 | 6 | 6.1 | 6 | 6.1 | 8 | 5.3 |
| | 8 : | 4 | 4.3 | 4 | 3.1 | 4 | 5.4 | 19 | 12.5 |
| | 9 : | 12 | 10.8 | 12 | 9.1 | 12 | 8.2 | 8 | 5.6 |
| | 10 : | 7 | 4.8 | 7 | 7.3 | 7 | 6.4 | 8 | 7.9 |
| | 11 : | 5 | 5.7 | 5 | 4.7 | 5 | 5.7 | 8 | 6.9 |
| Mean | | 9.0 | 7.5 | 9.0 | 7.5 | 9.0 | 7.5 | 9.0 | 7.5 |
| Variance | | 11.0 | 4.1 | 11.0 | 4.1 | 11.0 | 4.1 | 11.0 | 4.1 |
| Correlation | | 0.816 | | 0.816 | | 0.816 | | 0.817 | |
| Regression line | | y = 3 + 0.5x | | y = 3 + 0.5x | | y = 3 + 0.5x | | y = 3 + 0.5x | |

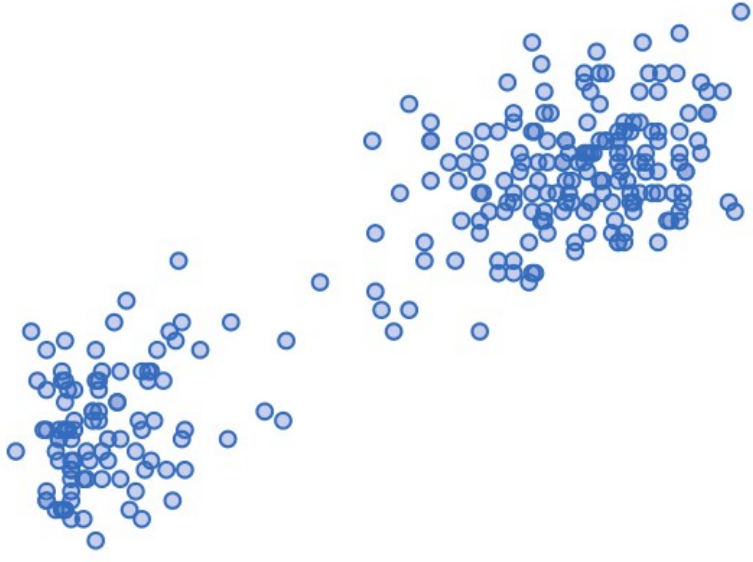
Source: Francis Anscombe

Known as Anscombe's Quartet, this example demonstrates how difficult it is for us to pull out basic patterns and summary statistics.


15
10
5
0
0
5
10
15
20

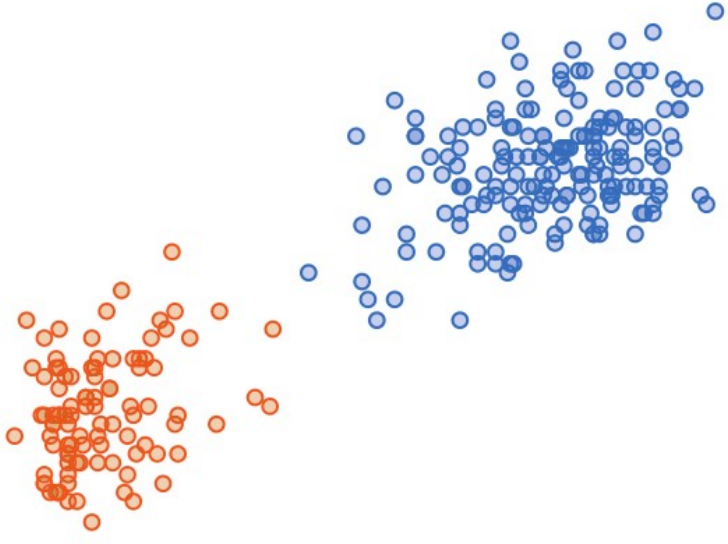
## PROXIMITY

We perceive objects that are close to one another as belonging to a group. There are lots of graphical elements that we can group together: labels with points, bars with each other, or, like this graph, clusters of points in a scatterplot in which we can see two groups or clusters, one in the top-right and the other closer to the bottom-left.



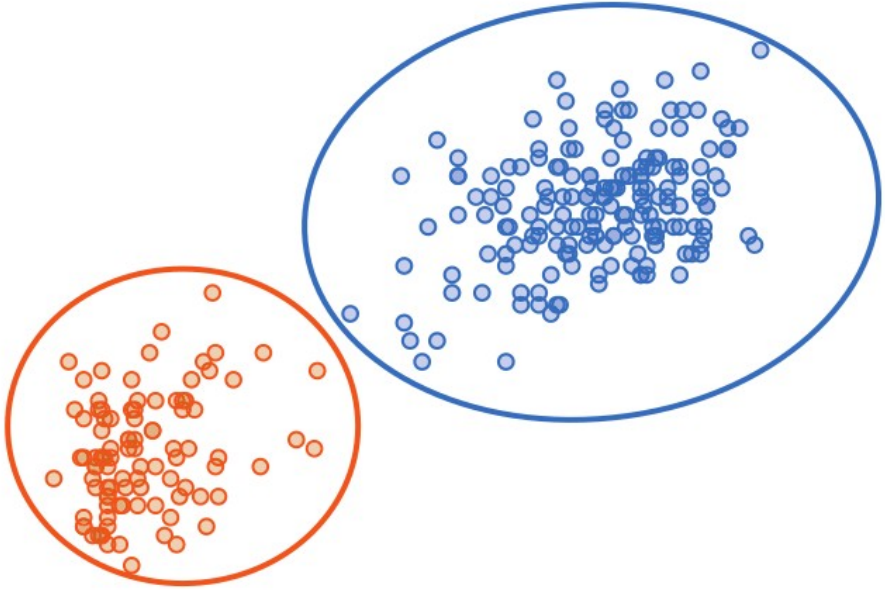
## SIMILARITY

Our brains group objects that share the same color, shape, or direction. Adding color to the above scatterplot reinforces the two groups.



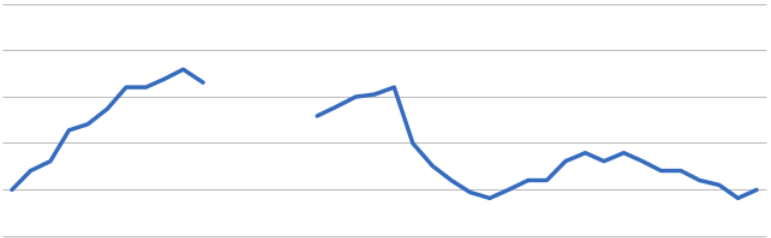
## ENCLOSURE

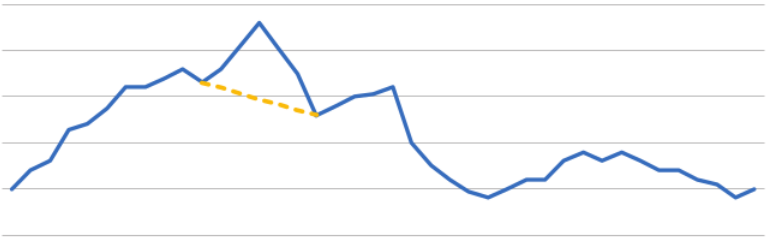
Bounded objects are perceived as a group. Here, in addition to using color, we can enclose the two groups with circles or other shapes.



## CLOSURE

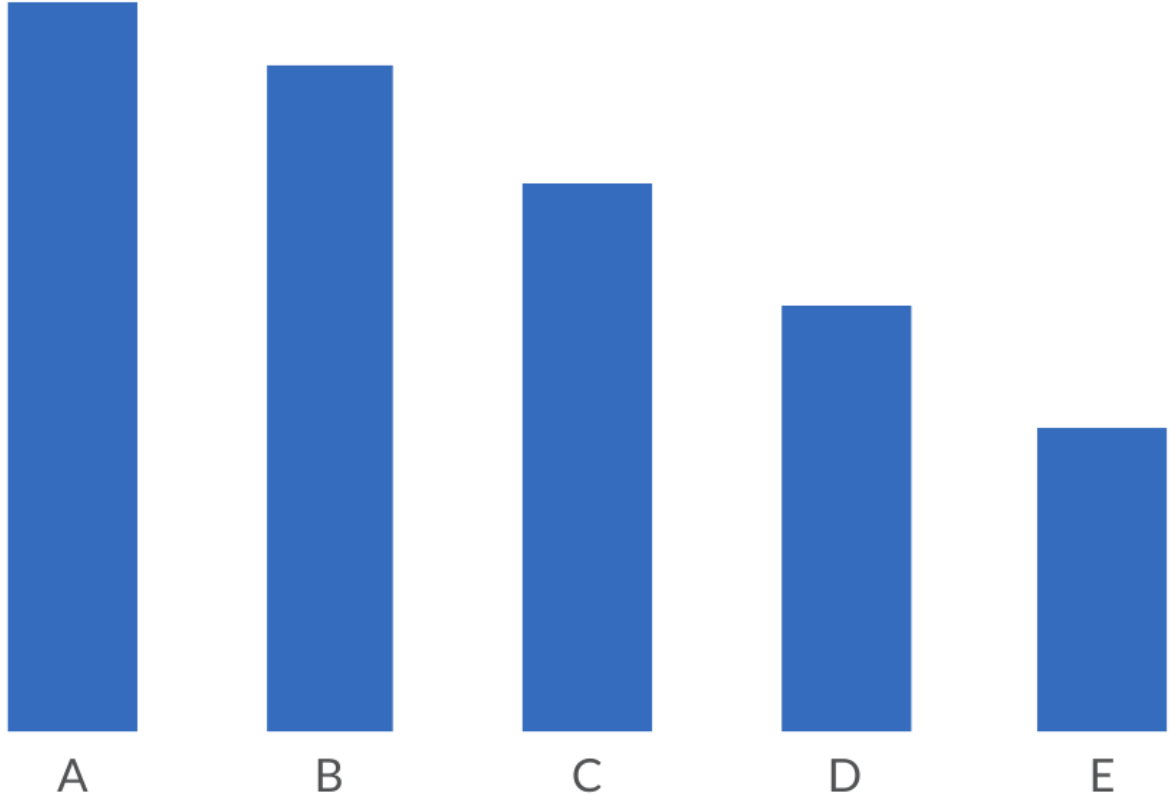
Our brains tend to ignore gaps and complete structures with open areas. In its basic form, we don't have a problem viewing a simple graph that has a horizontal axis and a vertical axis as a single object because the two lines are enough for us to define the closed space. In a line chart with missing data, for example, we tend to mentally close the gap in the most direct way possible, even if there might be something different going on in that missing area. For example, in the line graph on the left, we mentally close the gap between the two segments with a straight line even though the missing data might yield a pattern that moves up and then down.





## CONTINUITY

Here, objects that are aligned together or continue one another are perceived as a group. Hence, our eyes seek a smooth path when following a sequence of shapes. You don't need the horizontal axis line in this bar chart, for example, because the bars are aligned along a consistent path between the labels and the bottoms of the bars.



## CONNECTION

According to this principle, we perceive connected objects as members of the same group. Take this series of dots: At first, we perceive it as a single series, a mass of blue dots. Adding color makes it clear there are two different series. Connecting the dots makes it clear how the two initially track each other but then diverge.

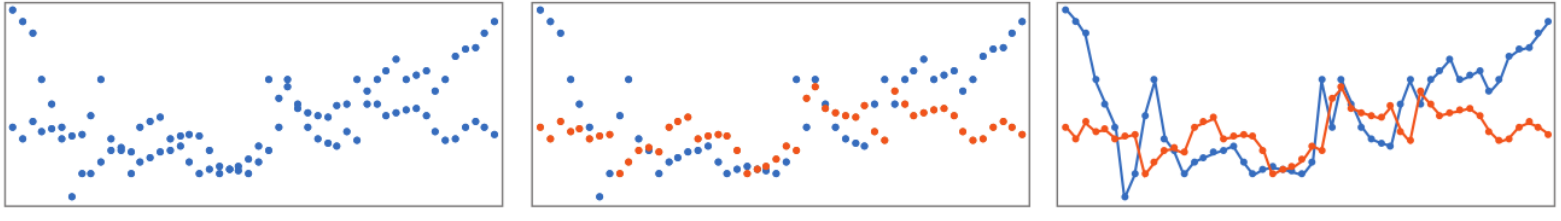


**Table 1. Our sales grew to $600 million this year**

| | Q1 | Q2 | Q3 | Q4 |
|---|---|---|---|---|
| Bob | 26 | 35 | 72 | 84 |
| Ellie | 22 | 15 | 61 | 35 |
| Gerrie | 19 | 20 | 71 | 55 |
| Jack | 22 | 95 | 13 | 64 |
| Jon | 83 | 62 | 46 | 48 |
| Karen | 30 | 65 | 98 | 82 |
| Ken | 38 | 28 | 45 | 71 |
| Lauren | 98 | 81 | 41 | 63 |
| Steve | 16 | 50 | 23 | 41 |
| Valerie | 46 | 24 | 30 | 57 |
| **Total** | **$400** | **$475** | **$500** | **$600** |

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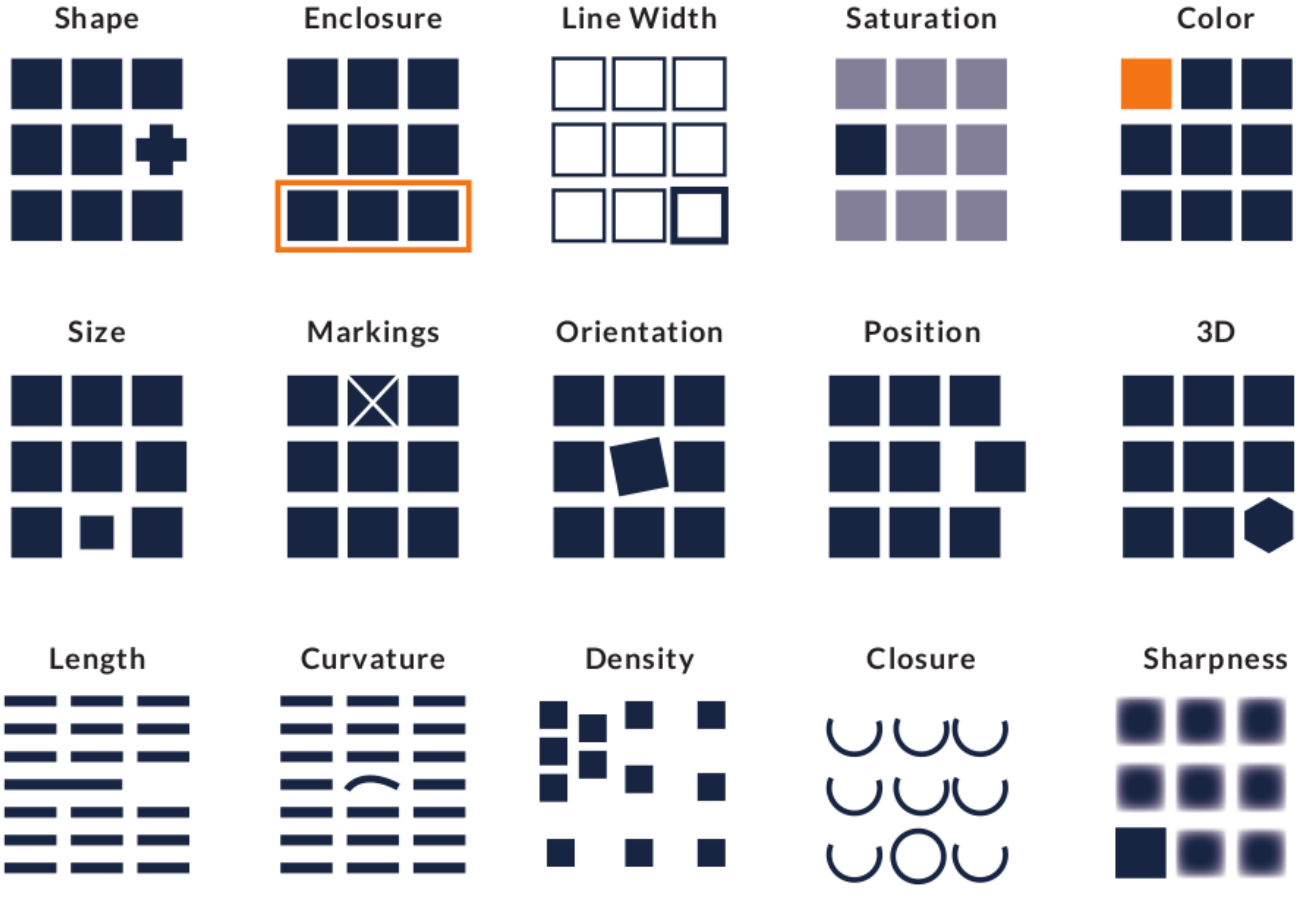
Preattentive attributes here direct our attention to the large numbers immediately.

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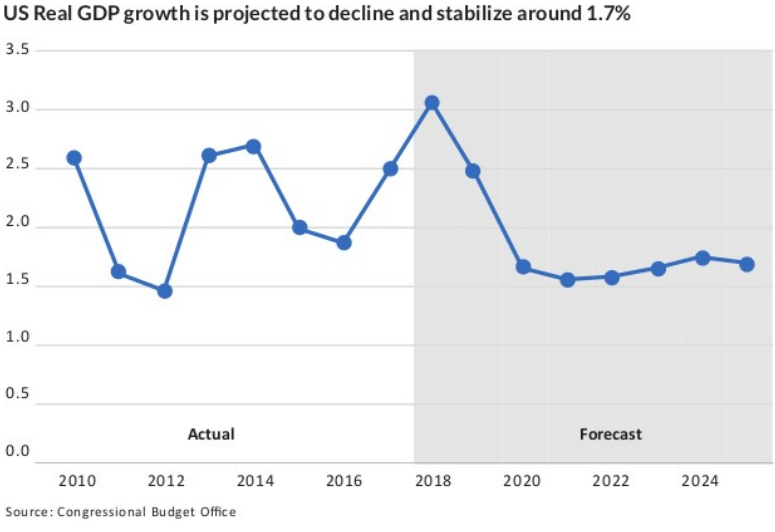


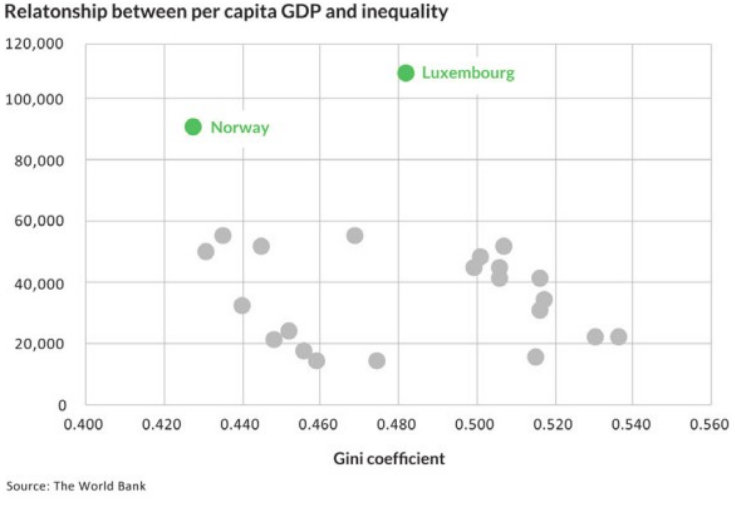


Applying simple preattentive attributes to these graphs directs your eye to the “Forecast” area of the graph on the left and to the two highlighted countries in the graph on the right.