Lecture 3

DD 324:
Data Visualisation

Human Visual Perception

28s Jan 2025 · Gyan Lakhwani · gyanlakhwani@gmail.com · Department of Design, DTU

Exercise

Data Visualisation Tools

gyanl.com

Data Visualization

About Syllabus

Exercise - Data Visualisation Tools

Activity Details

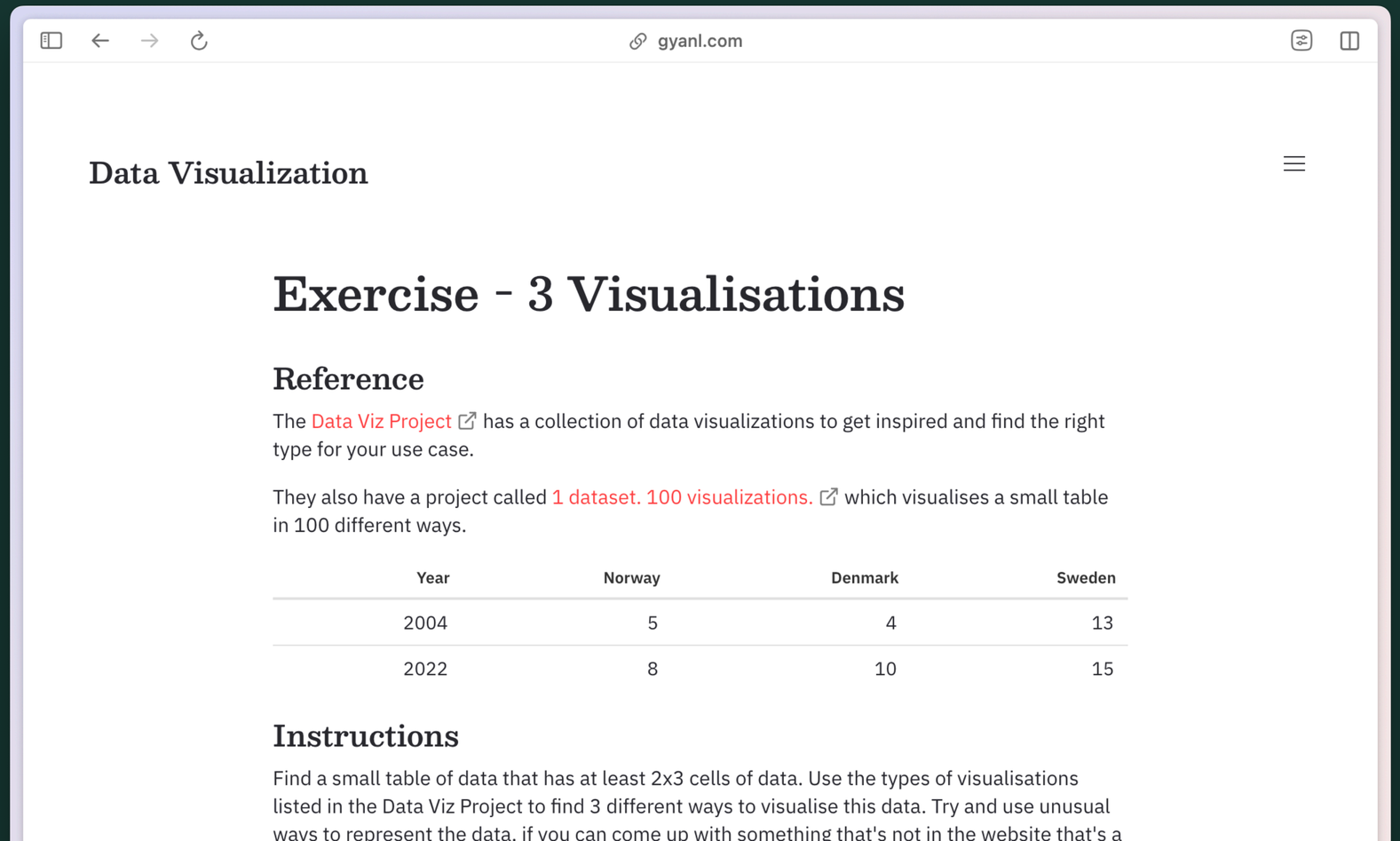
This page lists a number of Data Visualisation tools. Pick one of these tools using the signup sheet shared on the class group and prepare a 5 minute presentation on it. You can cover what it does, how to prepare your data, some examples of things you made with it. You can do this by yourself or in teams of 2.

Some of these tools will require some technical knowledge. If you know some programming or are willing to learn, go ahead and try out some tools like D3.js, Leaflet.js or Rshiny. Most other tools do not require programming knowledge, and this course will not focus on the technical aspect of data visualisation.

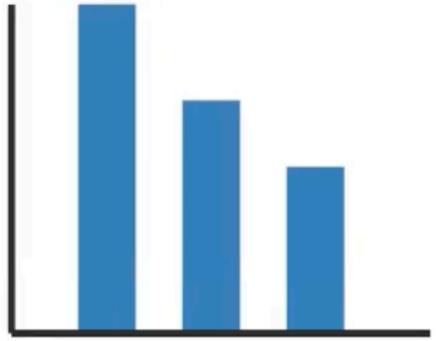
No-Code / Low-Code Tools

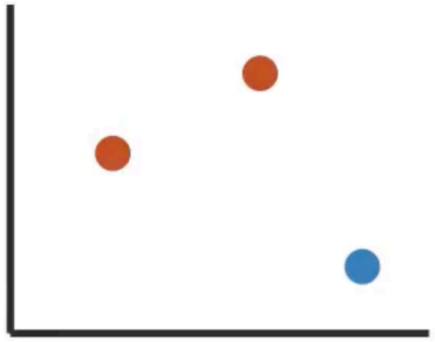
Exercise

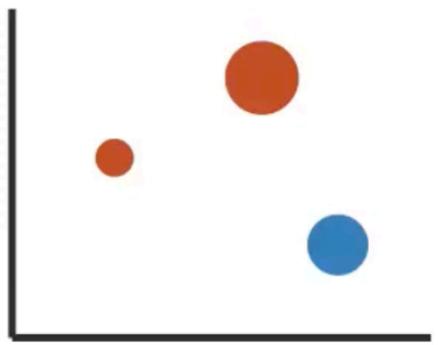
3 Visualisations



Recap







What's being represented here?

Tamara Munzner, Marks and Channels (Ch 5), Visualization Analysis & Design

Marks & Channels

Represent items or links

Change appearance of marks based on attributes

Marks

Represent items or links

0D - Points

1D - Lines

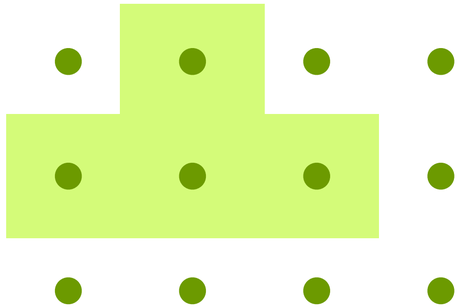
2D - Area

3D - Volume

Marks

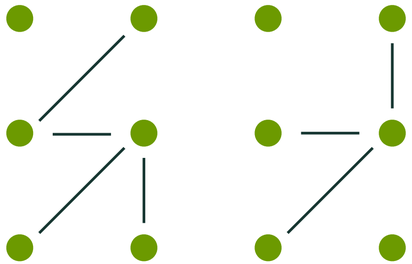
Represent items or links

Containment



Represent items or links

Connection



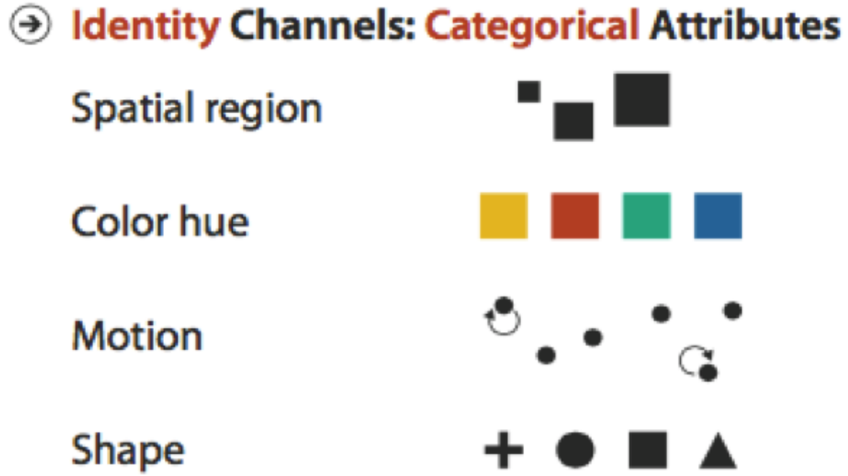
Channels

Change appearance of marks based on attributes

Nominal Ordinal Interval Ratio

Categorical

Identity Channels: Categorical Attributes



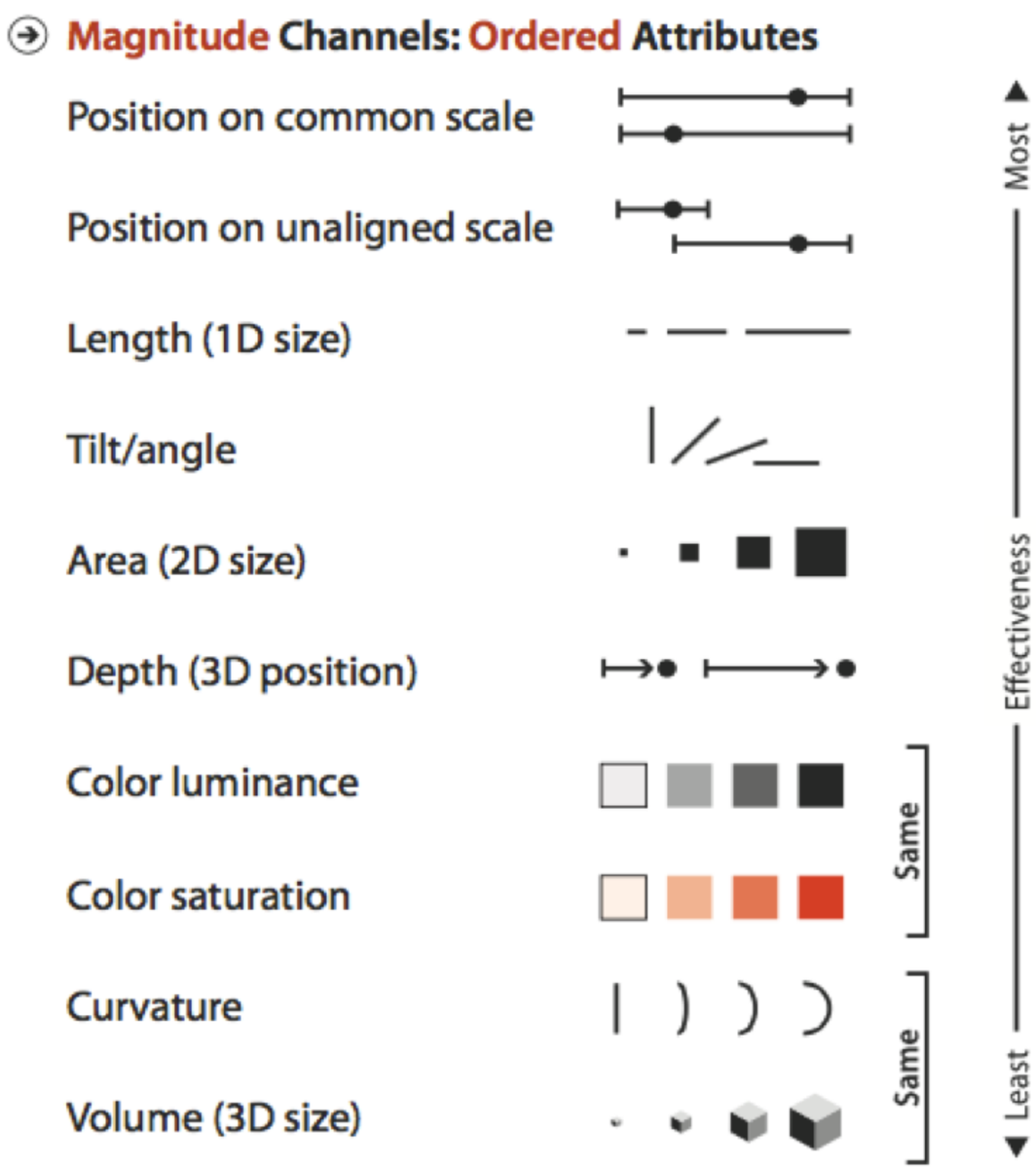
Most ▲ Effectiveness ▼ Least

Channels

Change appearance of marks based on attributes

Nominal Ordinal Interval Ratio

Magnitude



Area

More than 1 channel can be used at the same time

Area (2D size)

Area

Color Saturation

More than 1 channel can be used at the same time

Area (2D size)

Color saturation

Area

Color Saturation

Area and Color Saturation

More than 1 channel can be used at the same time

Area (2D size)

Color saturation

Lecture 4

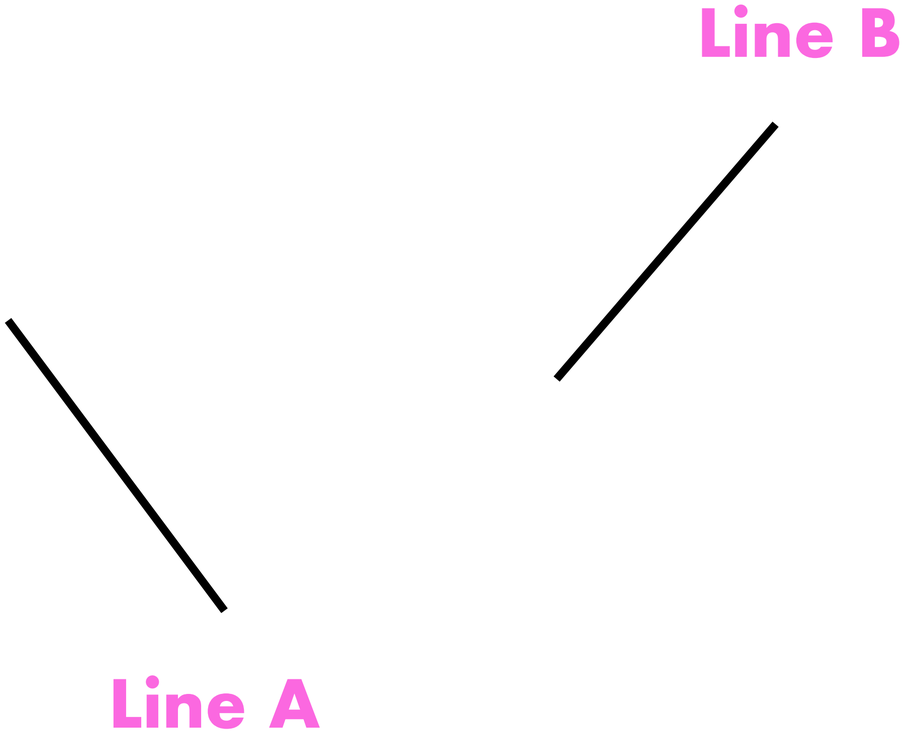
DD 324:
Data Visualisation

Human Visual Perception

14 Jan 2025 · Gyan Lakhwani · gyanlakhwani@gmail.com · Department of Design, DTU

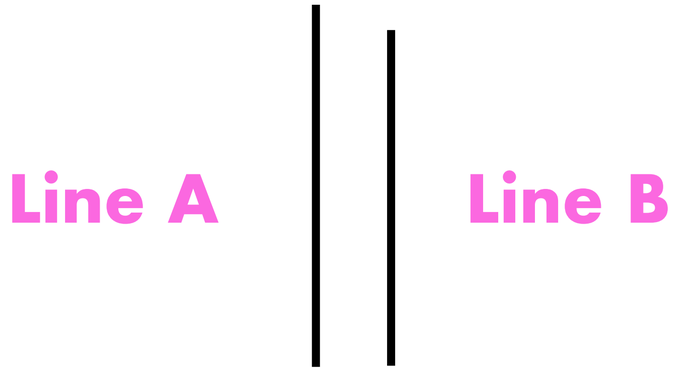
Visual Perception

Which line is bigger?



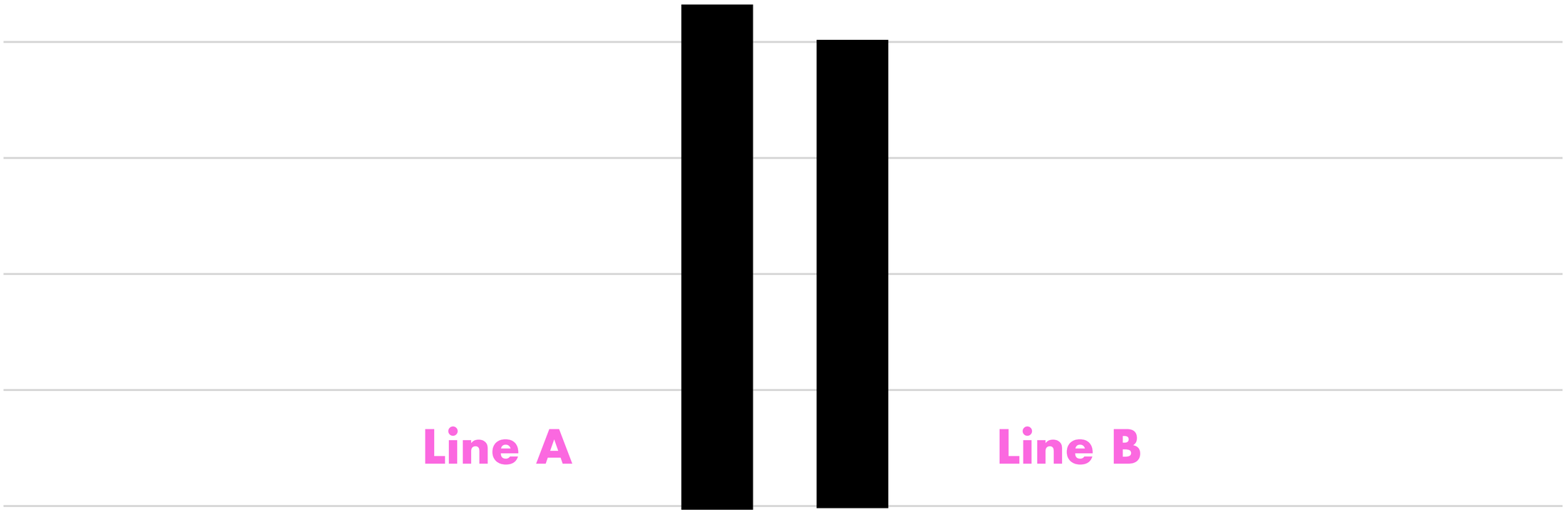
Visual Perception

Which line is bigger?



Visual Perception

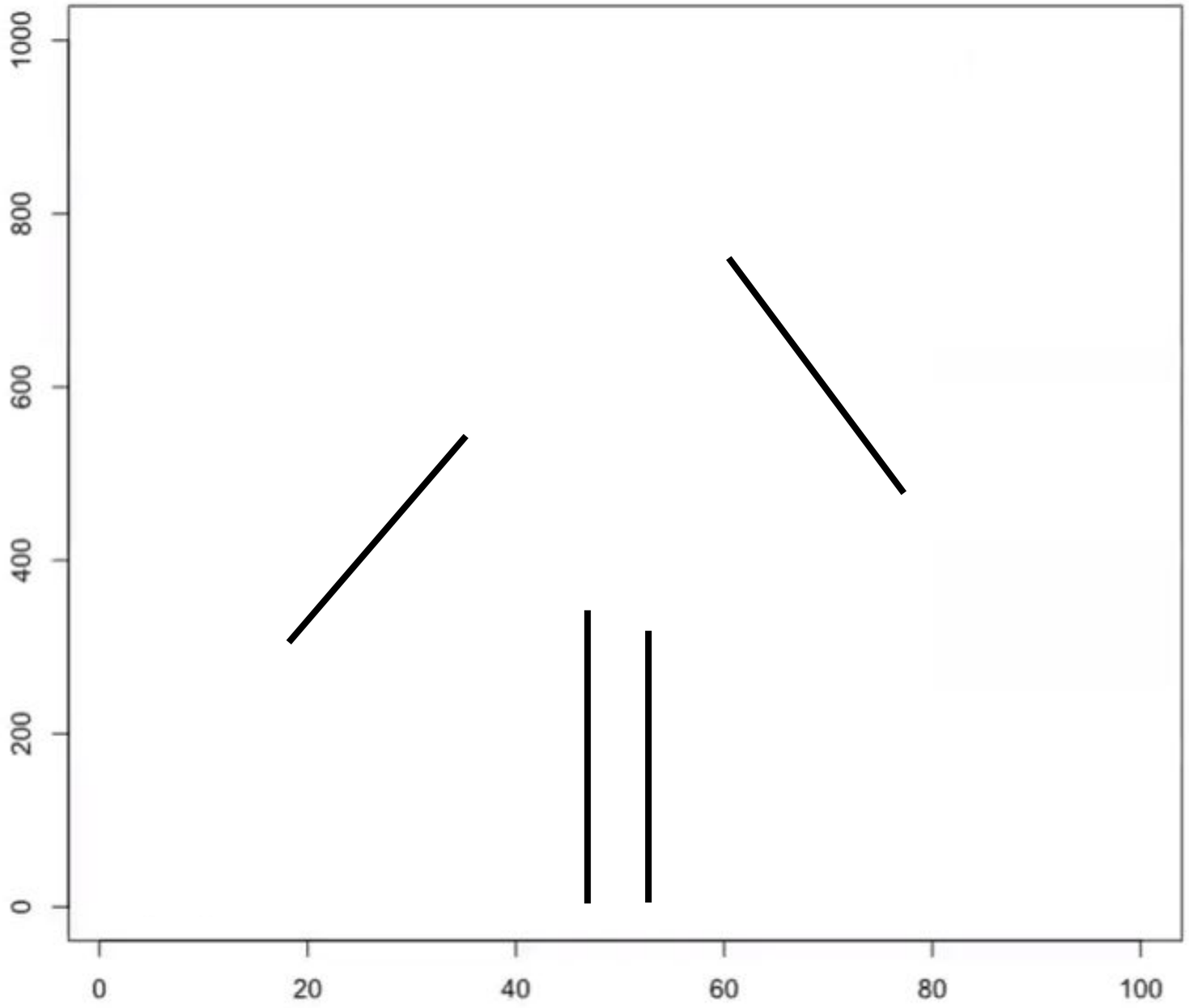
Which line is bigger?



Visual Perception

Which line is bigger?

It is easier to compare widths when 2 lines are compared on the same axis.



Visual Perception

Which area is bigger?

‘JK Rowling’ or ‘Others’?

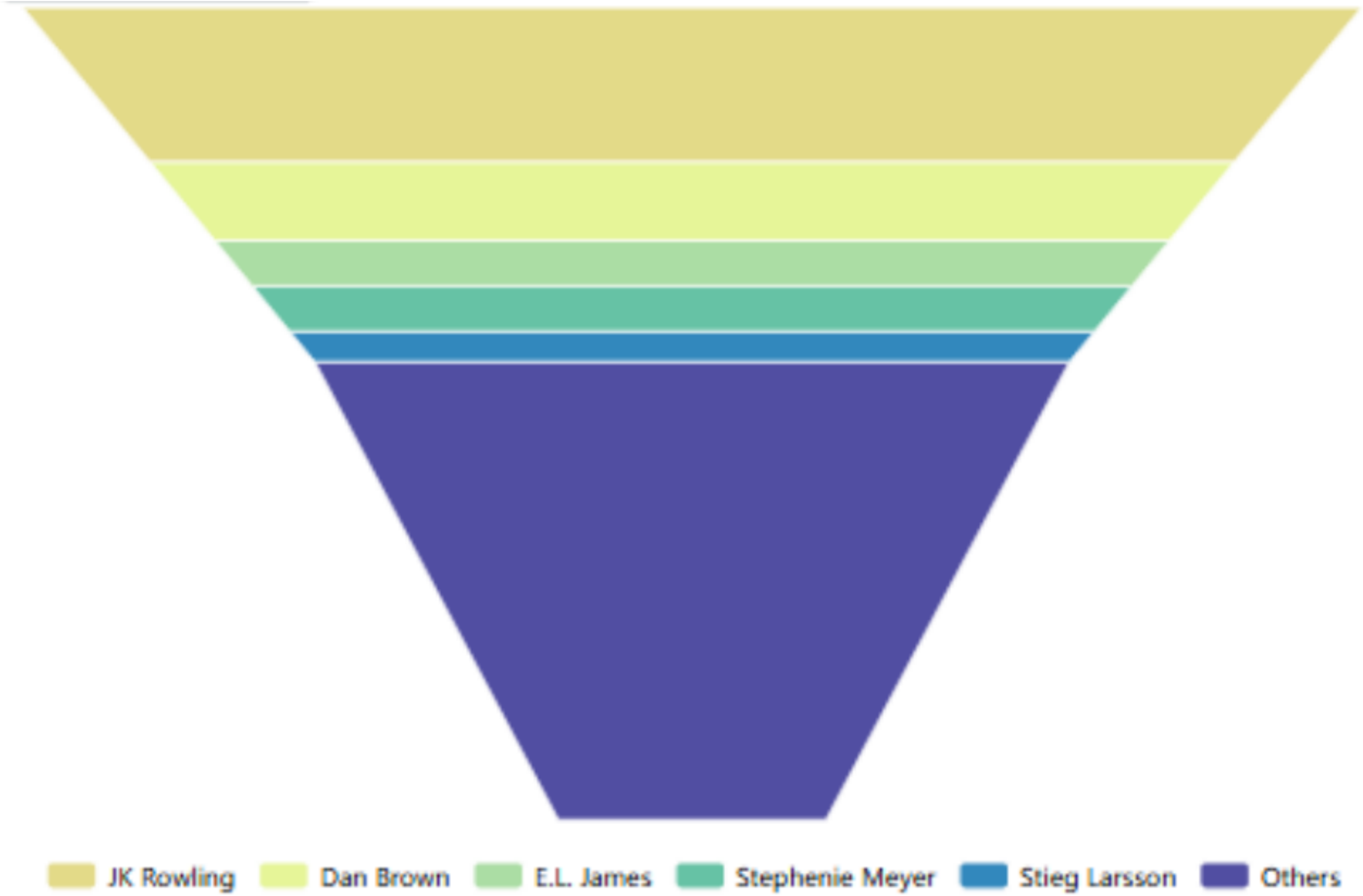
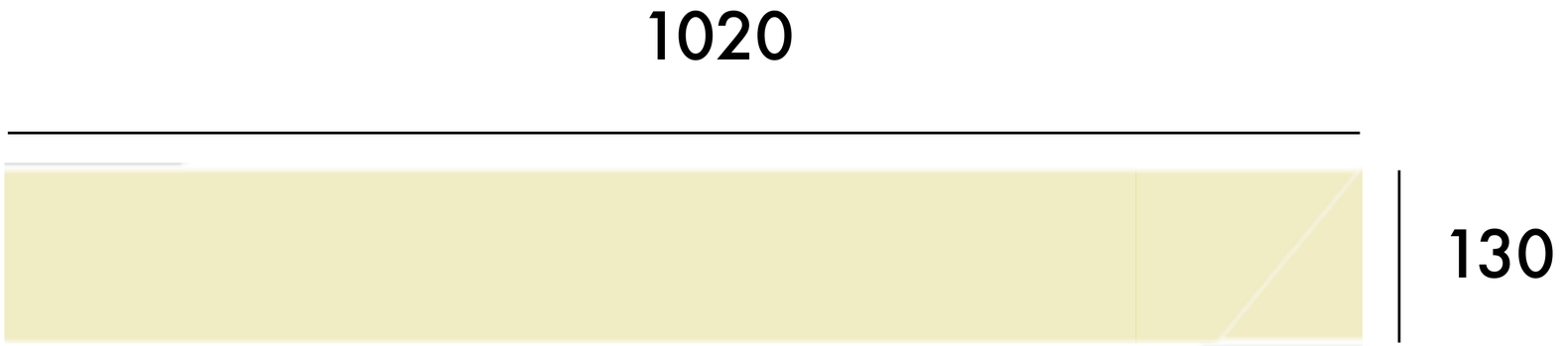


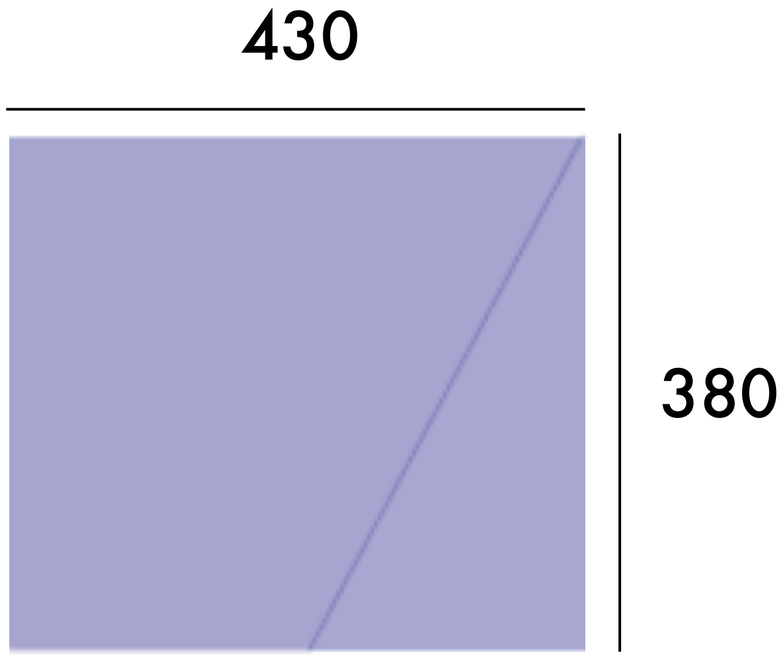
Chart by Isshita Bansal

Visual Perception

Which area is bigger?

‘JK Rowling’ or ‘Others’?


1020
130


430
380

1020

130

1,32,600
sq units

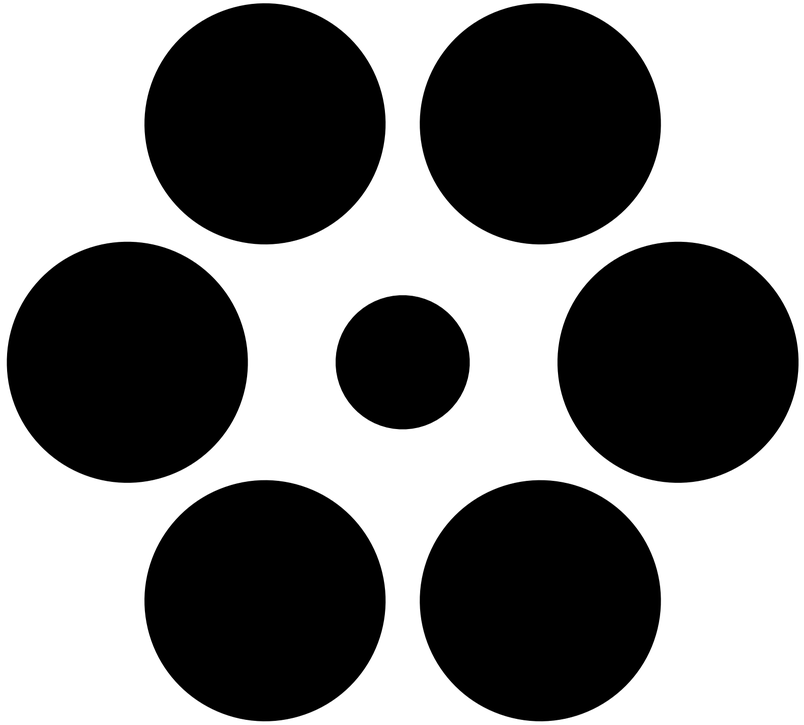
430

380

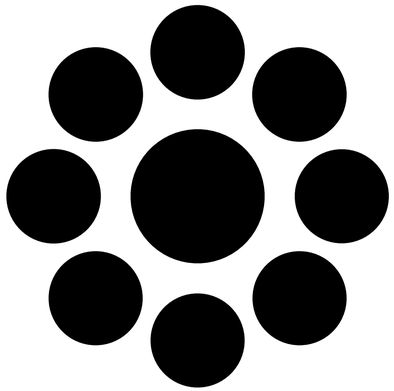
1,63,400
sq units

Visual Perception

Which inner circle is bigger?



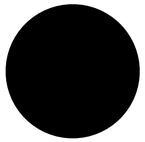
Circle A

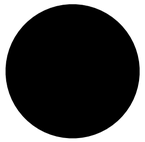


Circle B

Visual Perception

Which inner circle is bigger?





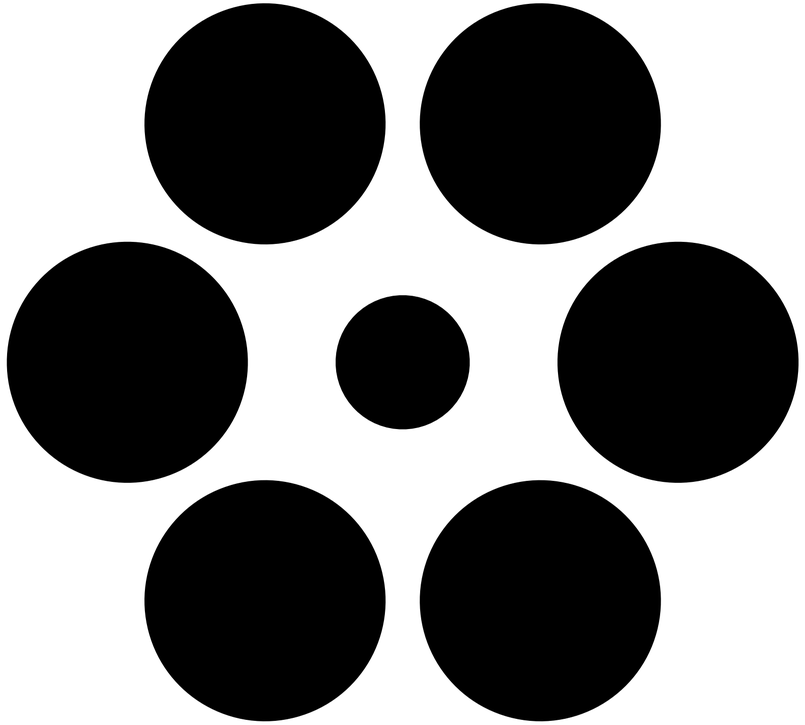
Circle A

Circle B

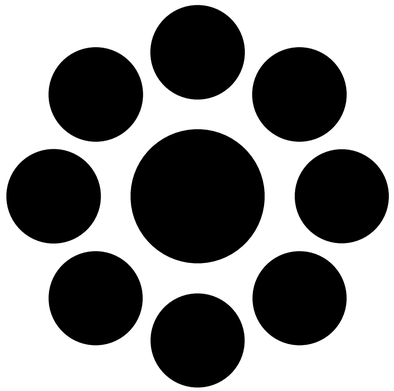
Visual Perception

Which inner circle is bigger?

Neighbouring objects can make an object feel smaller or larger by comparison.



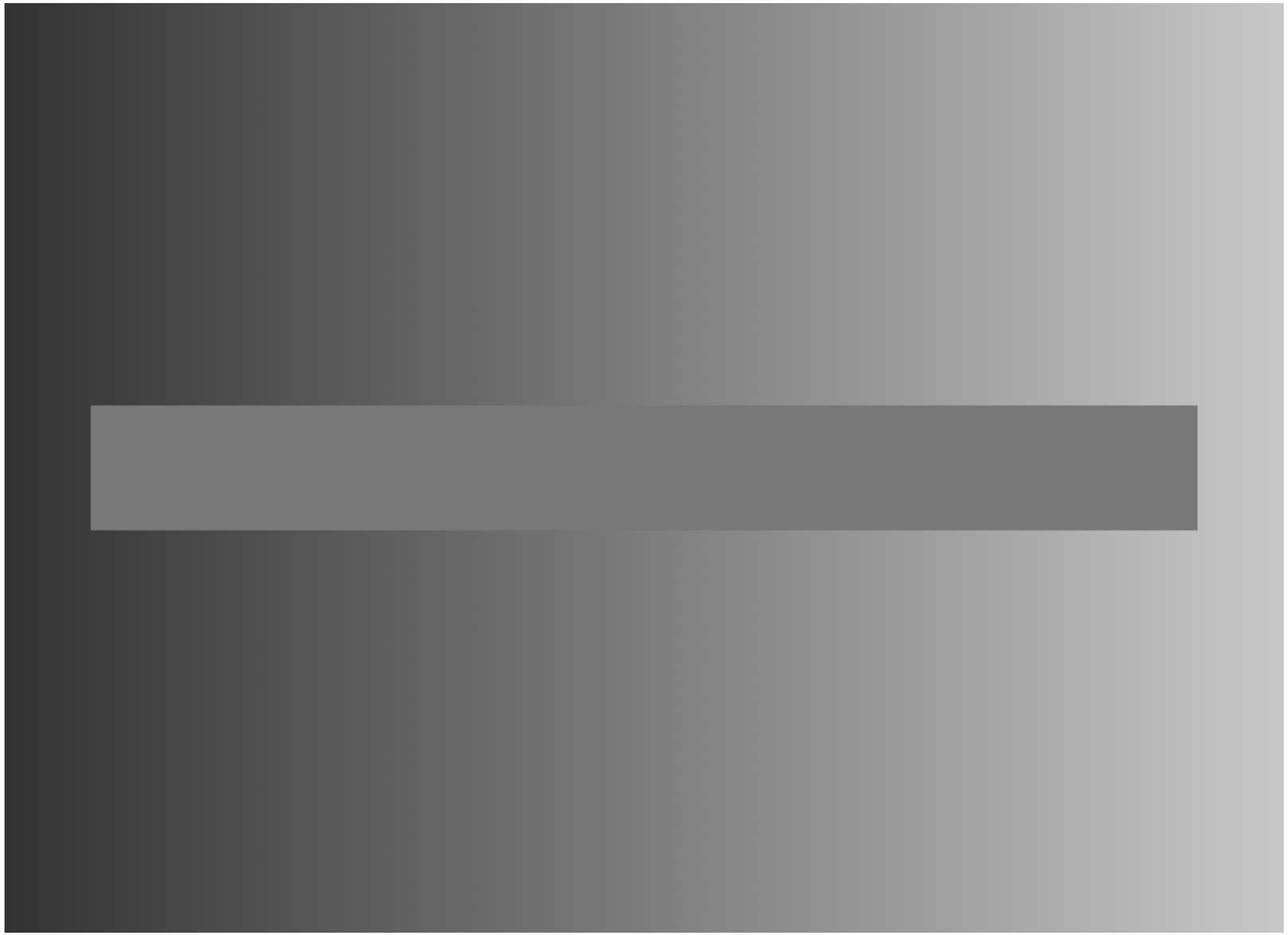
Circle A



Circle B

Visual Perception

Is the centre rectangle a gradient?



Visual Perception

Is the centre rectangle a gradient?

Visual Perception

Is the centre rectangle a gradient?

Visual Perception

Is the centre rectangle a gradient?

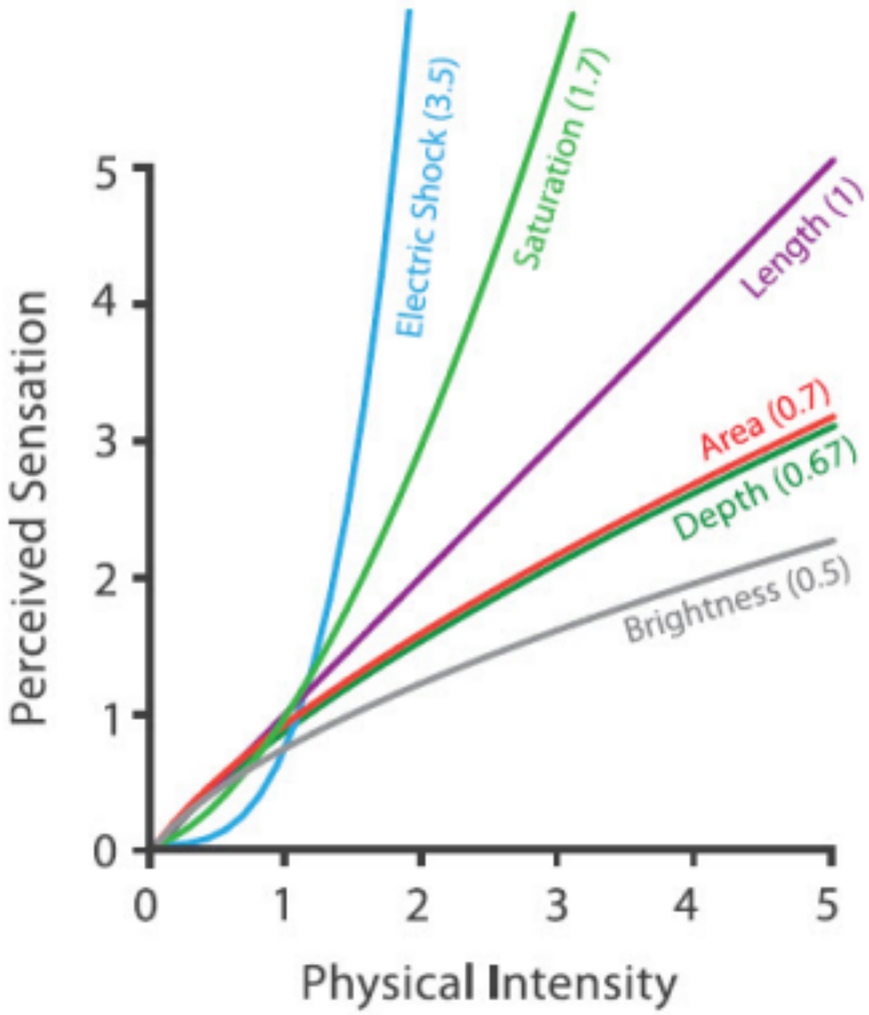
Visual Perception

Is the centre rectangle a gradient?

#787878

Visual Perception

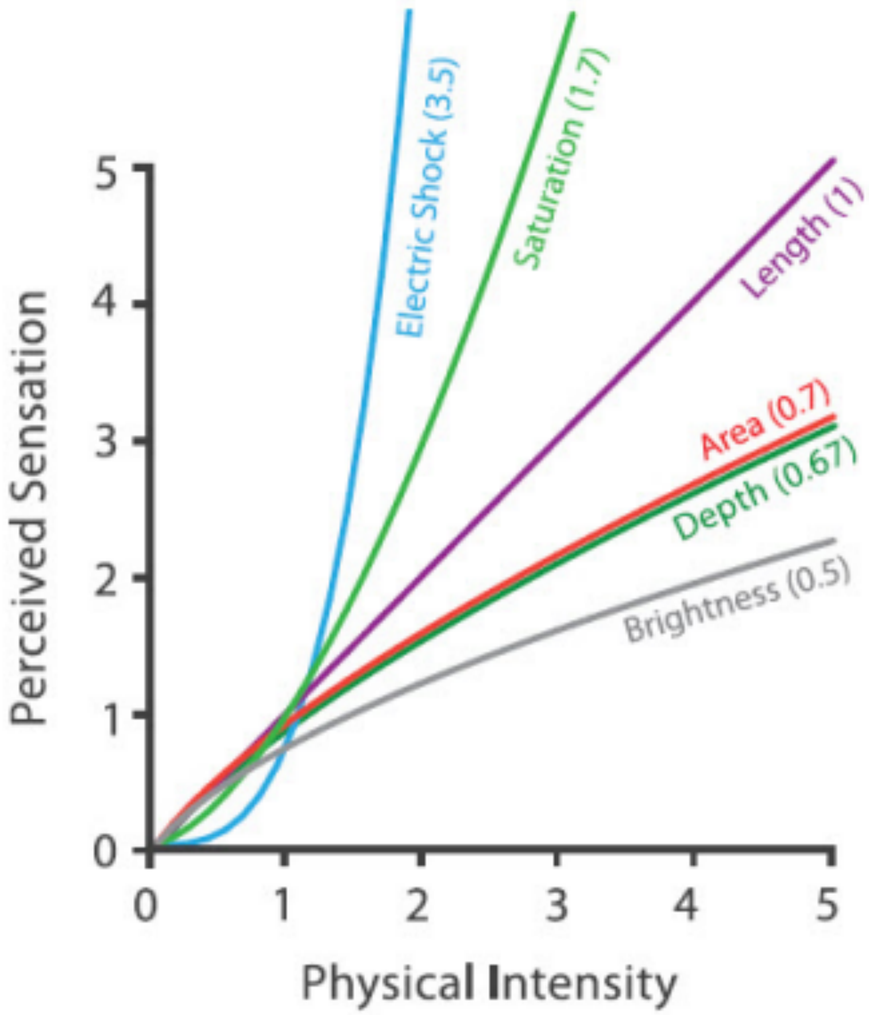
Steven's Psychophysical Power Law



Visual Perception

Steven's Psychophysical Power Law

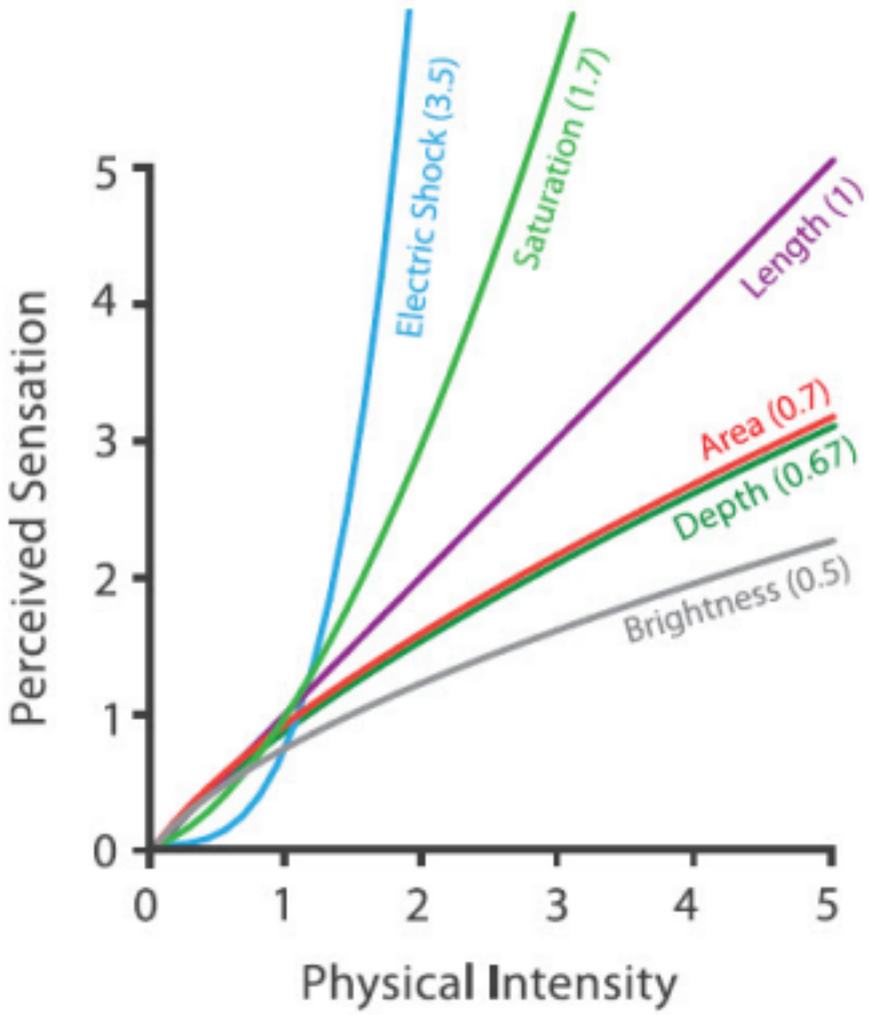
Humans perceive different stimulus differently.

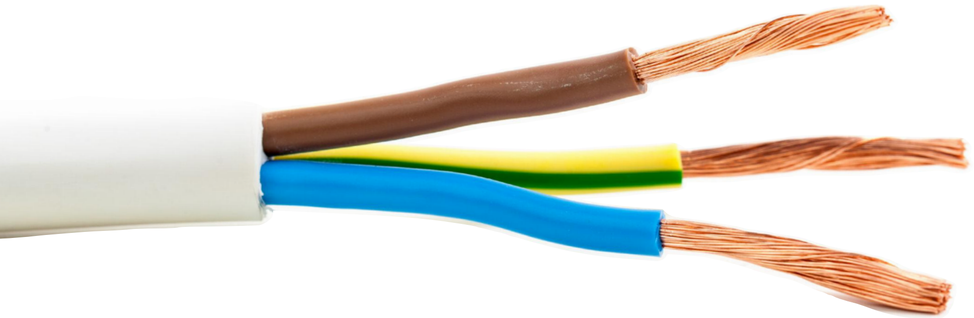


Visual Perception

Steven's Psychophysical Power Law

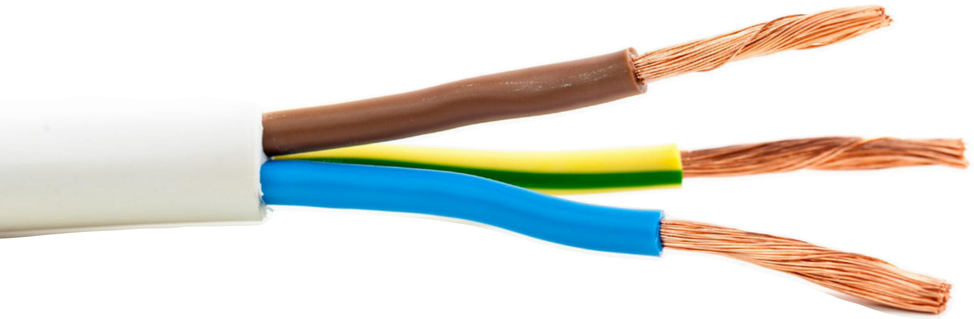
For eg, small increases in electric current are felt very sharply.





5 milli Amp

Ouch!

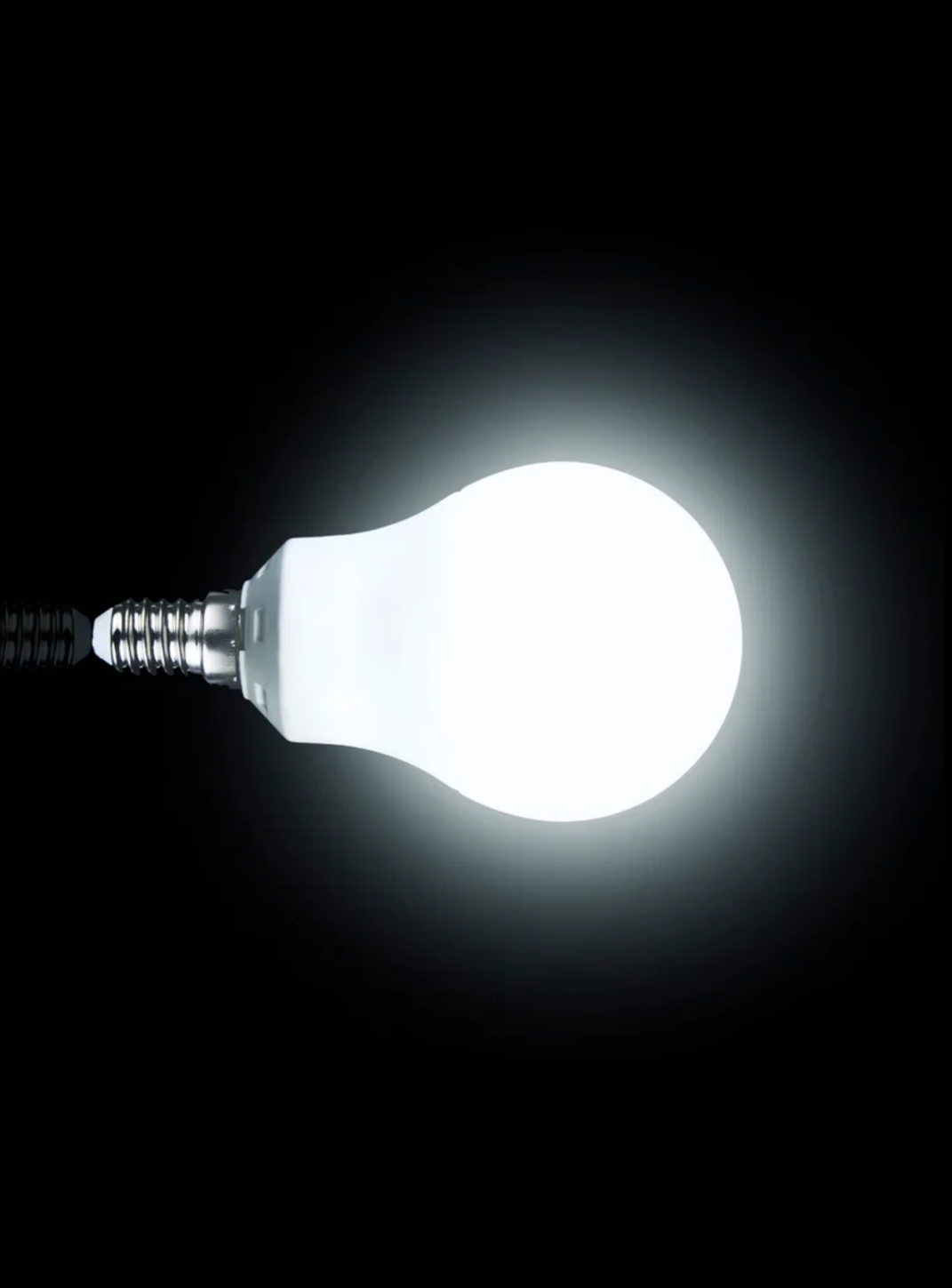


5 milli Amp

Ouch!

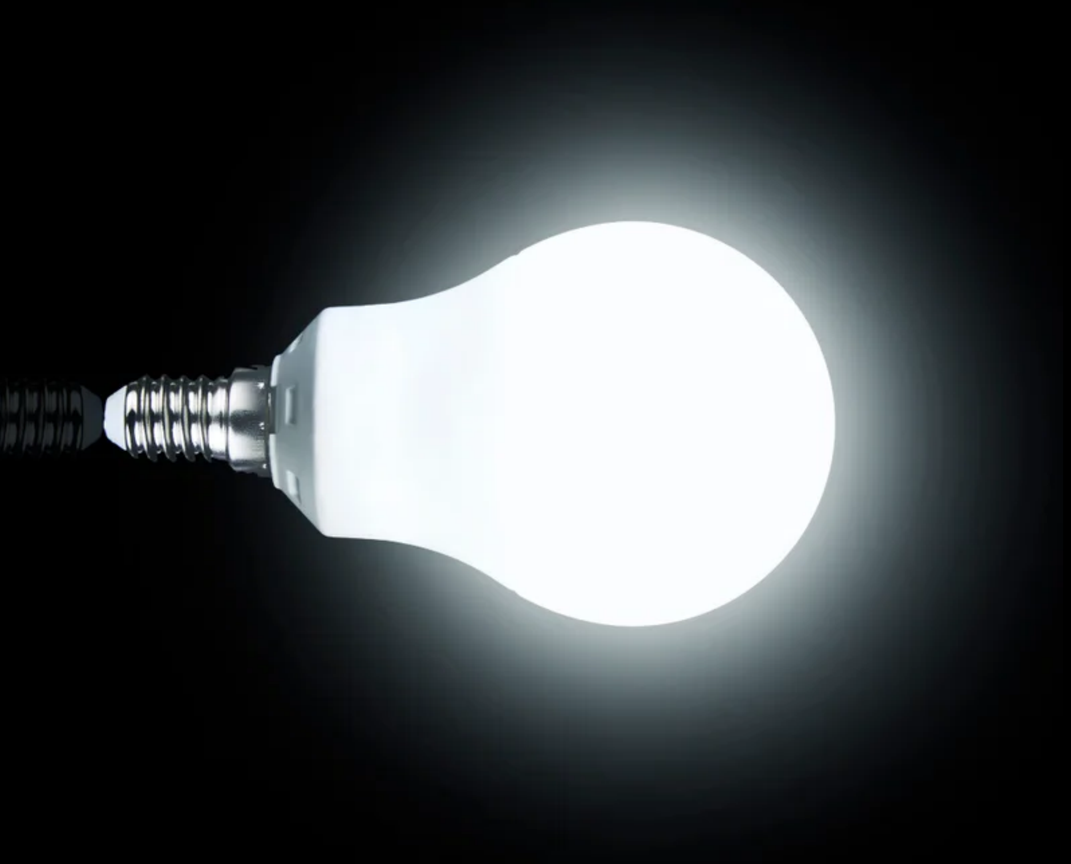
10 milli Amp

Can’t let go!



100 Lumens

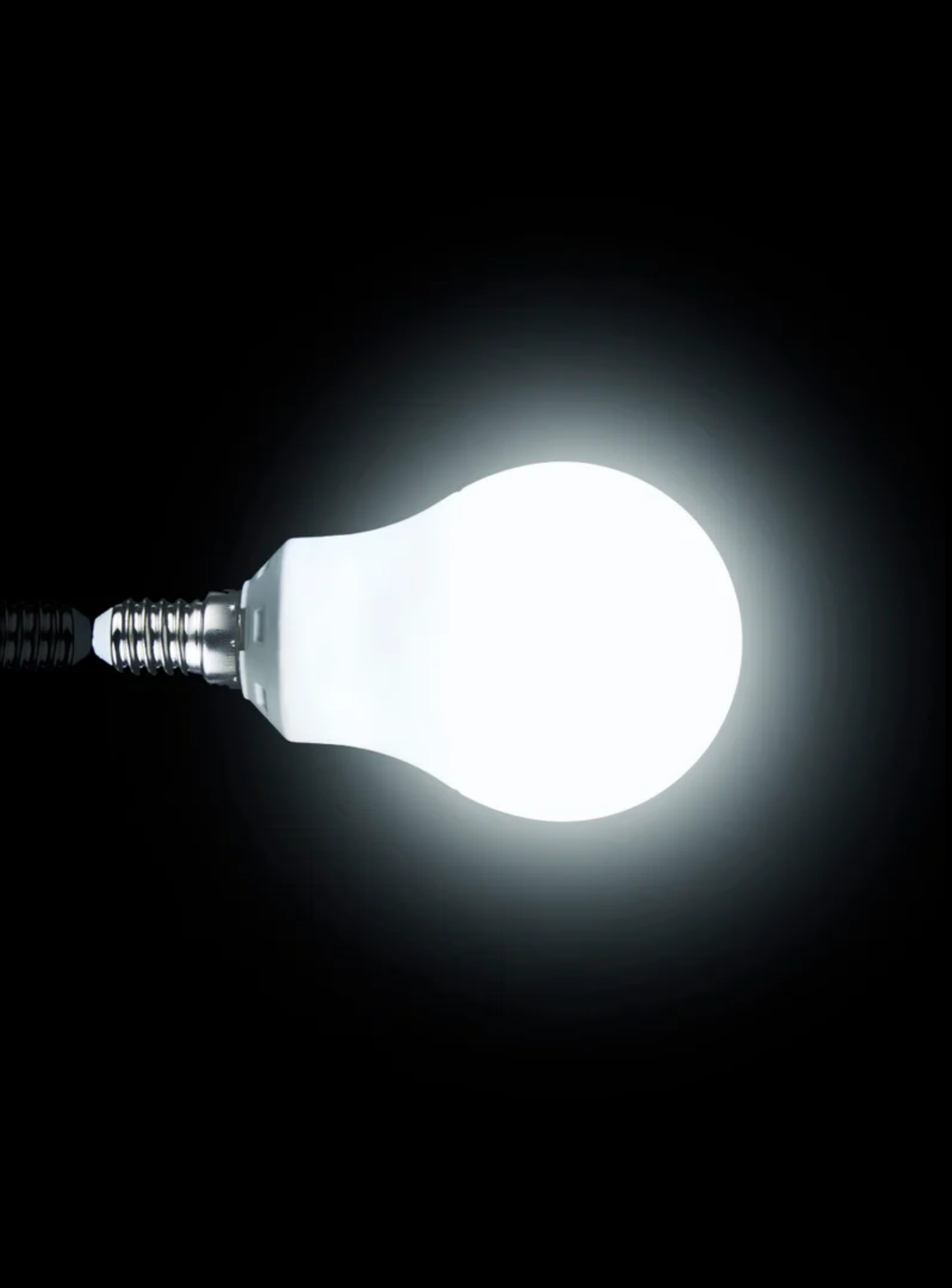
Bright



100 Lumens

Bright

200 Lumens



100 Lumens

Bright

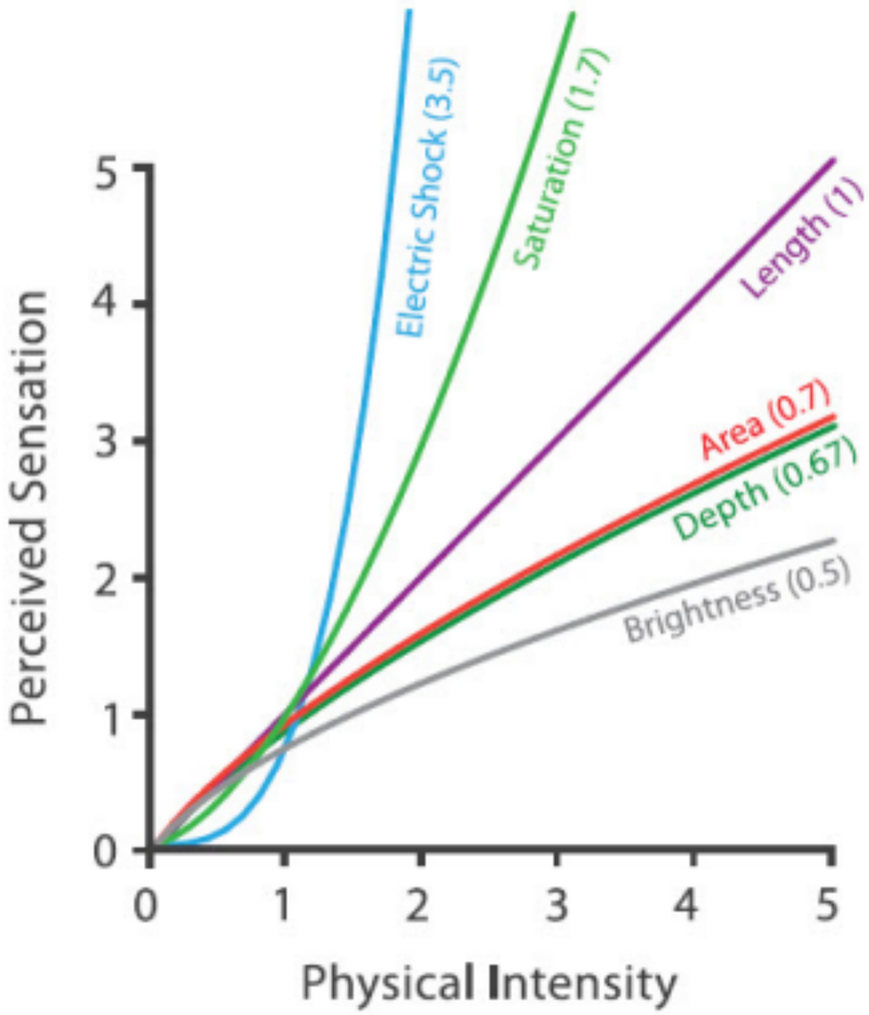
200 Lumens

Only a little brighter

Visual Perception

Steven's Psychophysical Power Law

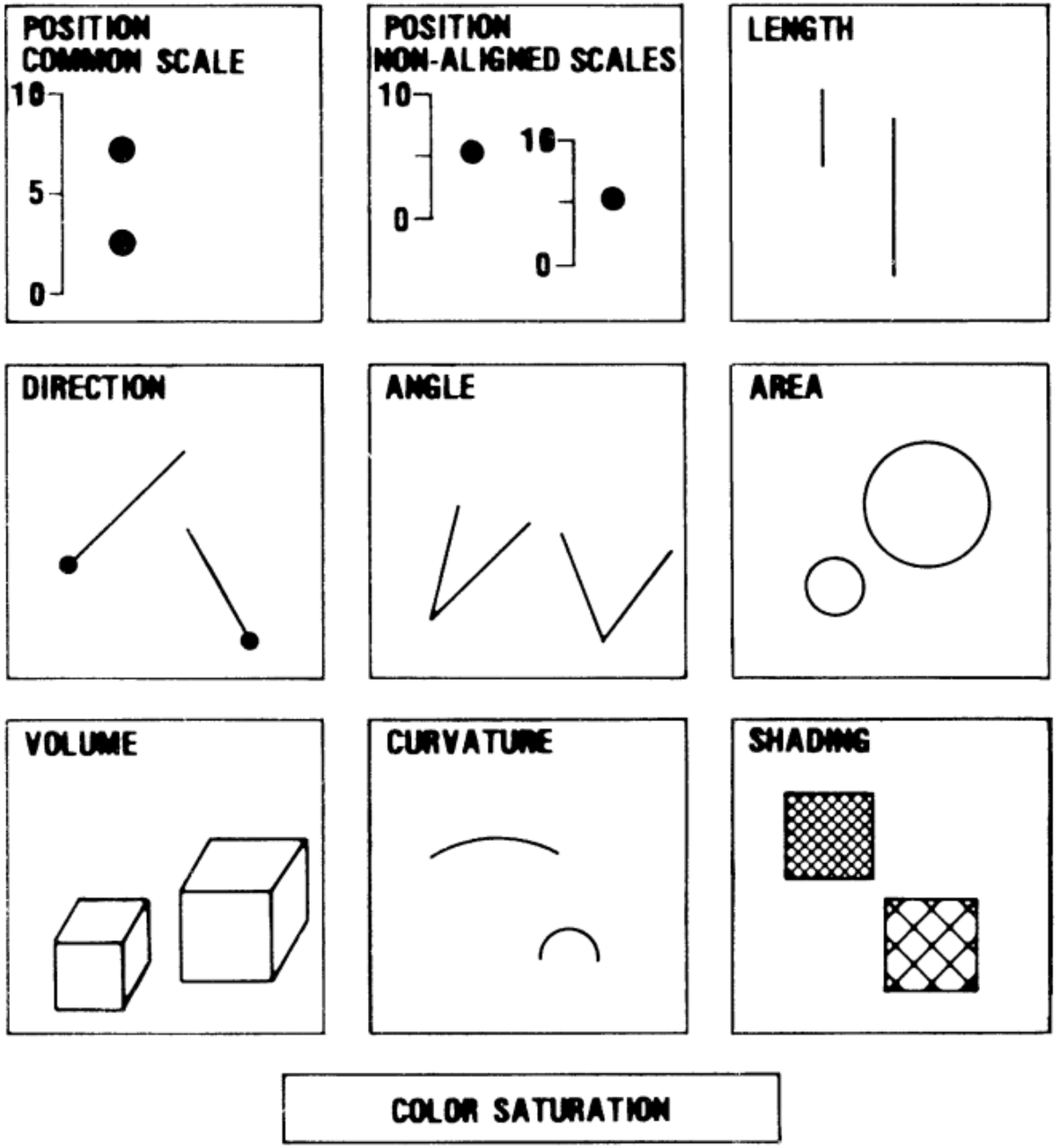
Difference in brightness is harder to tell apart for humans, and the least amount of brightness difference required for two sources to be identifiably different is also higher.



Graphical Perception: Theory, Experimentation, and Application to the Development of Graphical Methods

Author(s):
William S. Cleveland and Robert McGill

Source:
Journal of the American Statistical Association , Sep., 1984, Vol. 79, No. 387 (Sep., 1984), pp. 531-554



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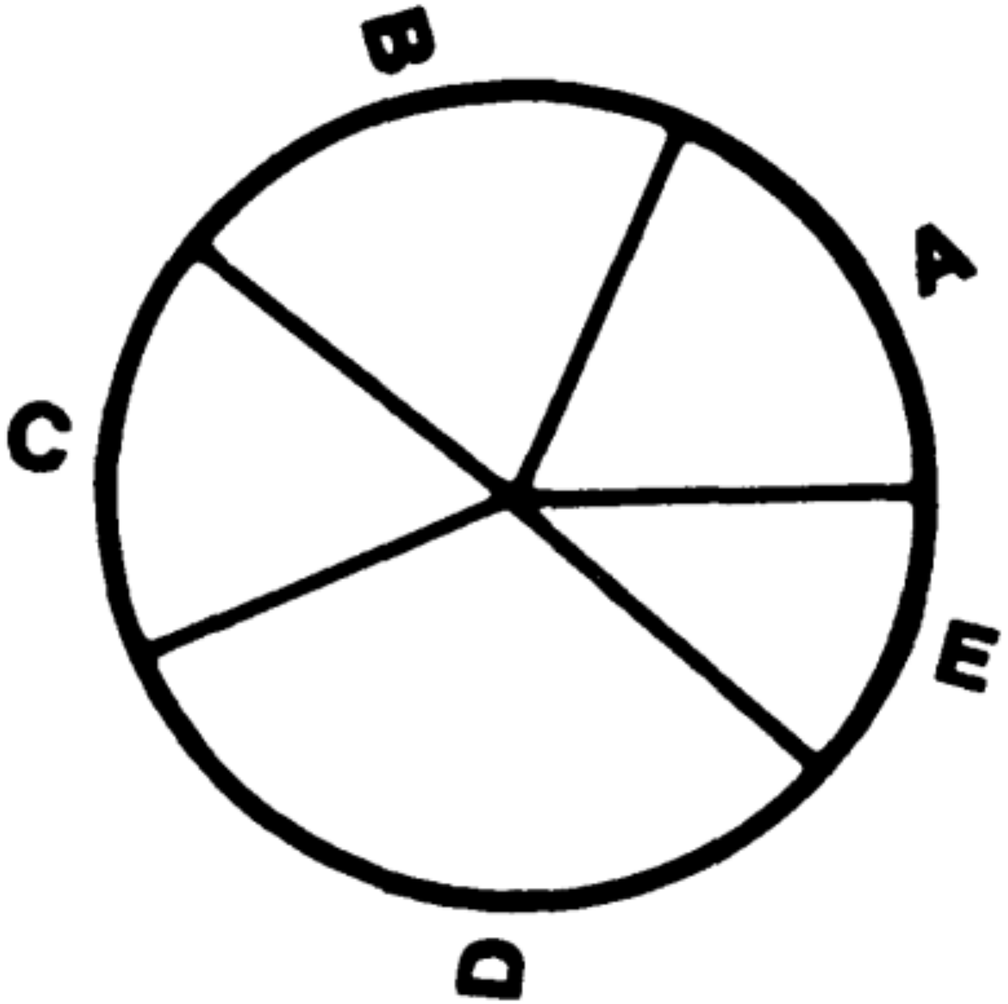

Is A bigger or C?

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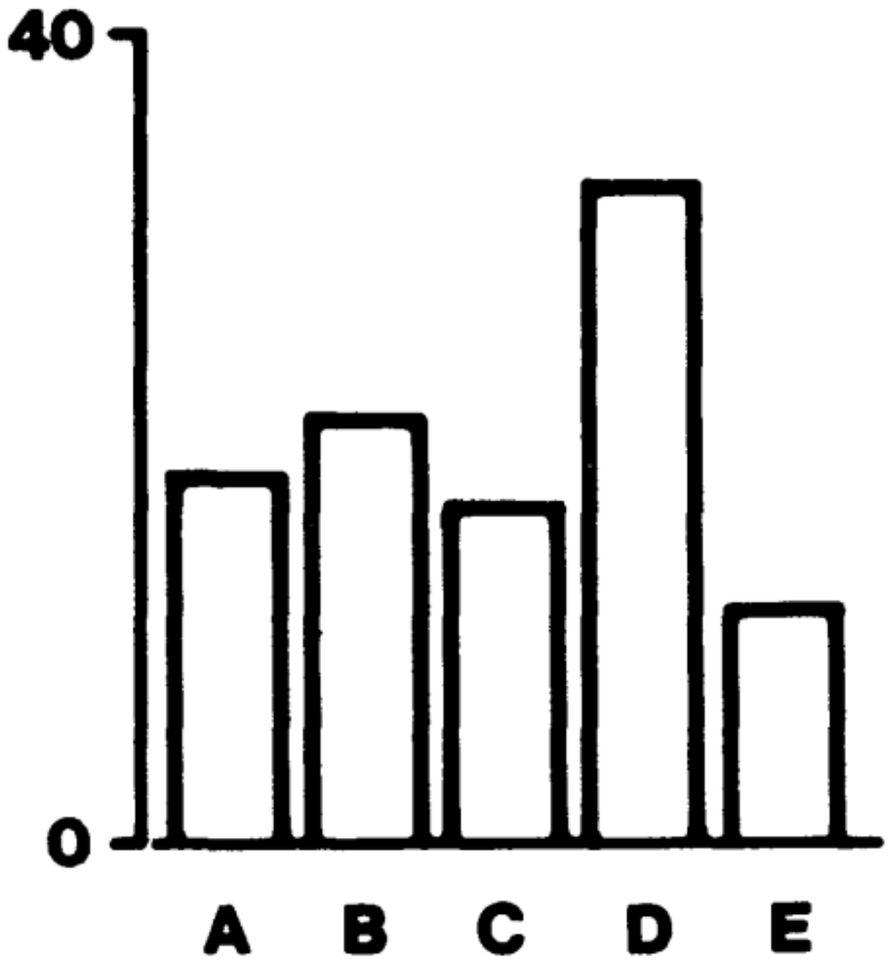

Is A bigger or C?

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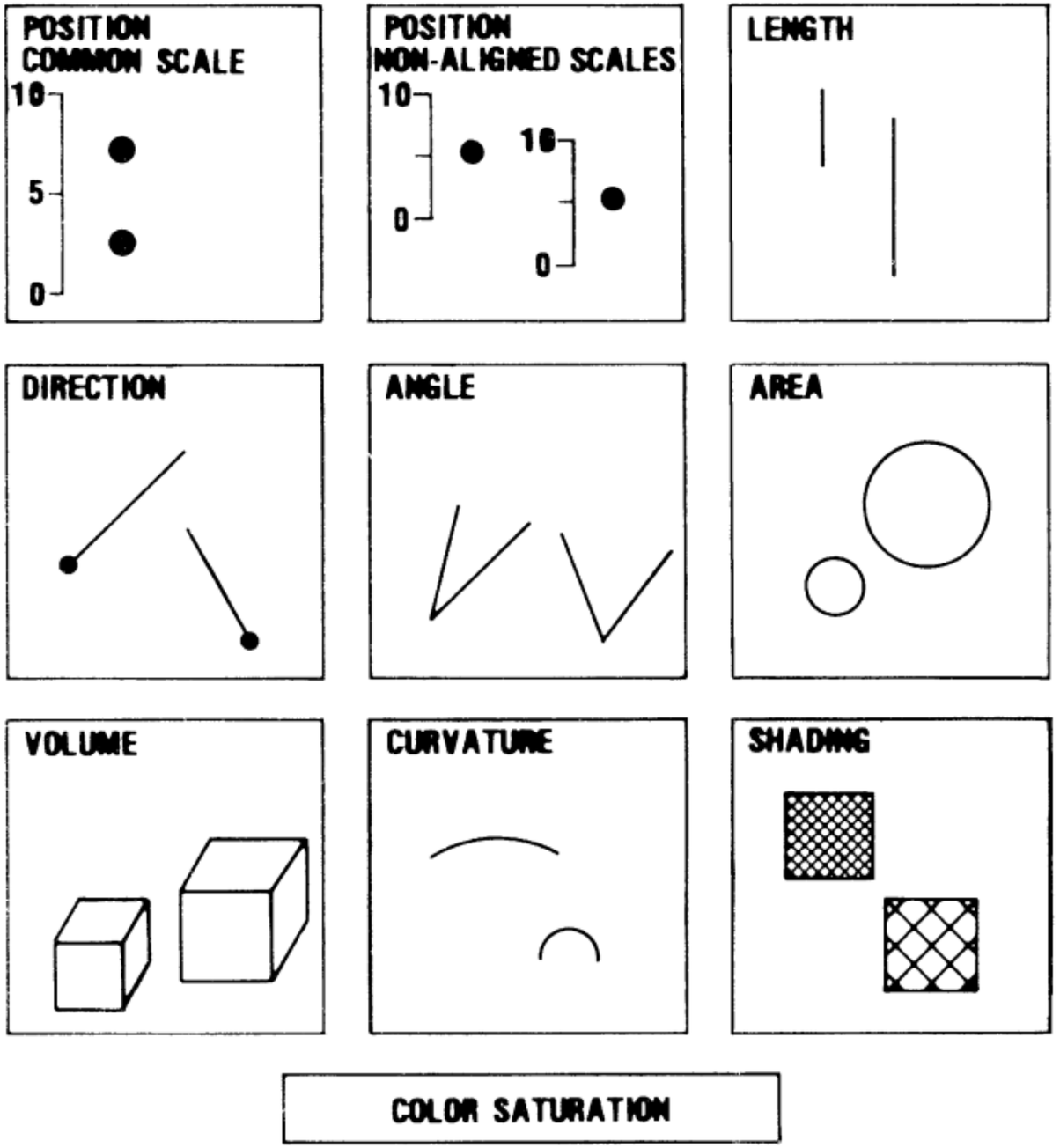


Takeaways

- Different encodings have a different “least noticeable difference”.
- You can pick encodings for functional or aesthetic reasons.
- There is usually a tradeoff and that is for you to decide. You can choose a technically worse encoding channel if it makes it easier to get the point across.

Visual Perception

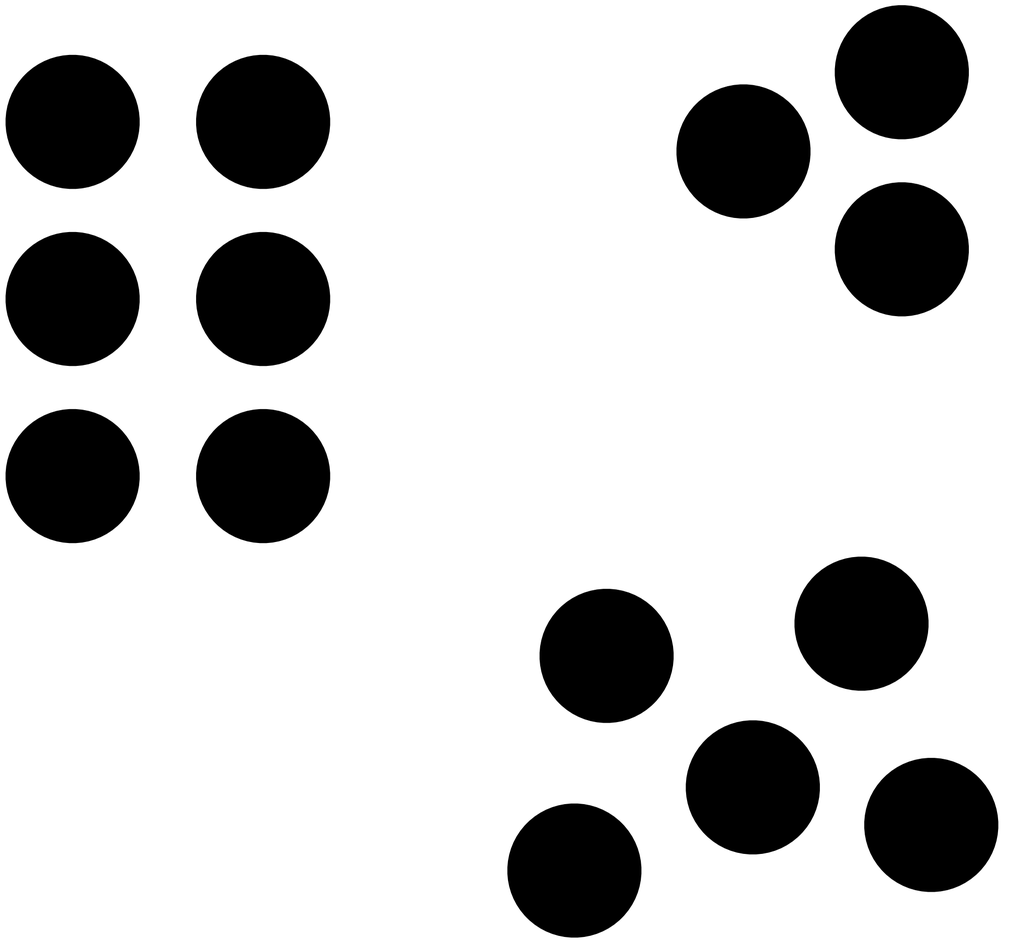
Gestalt Principles

Proximity

Gestalt Principles

Proximity

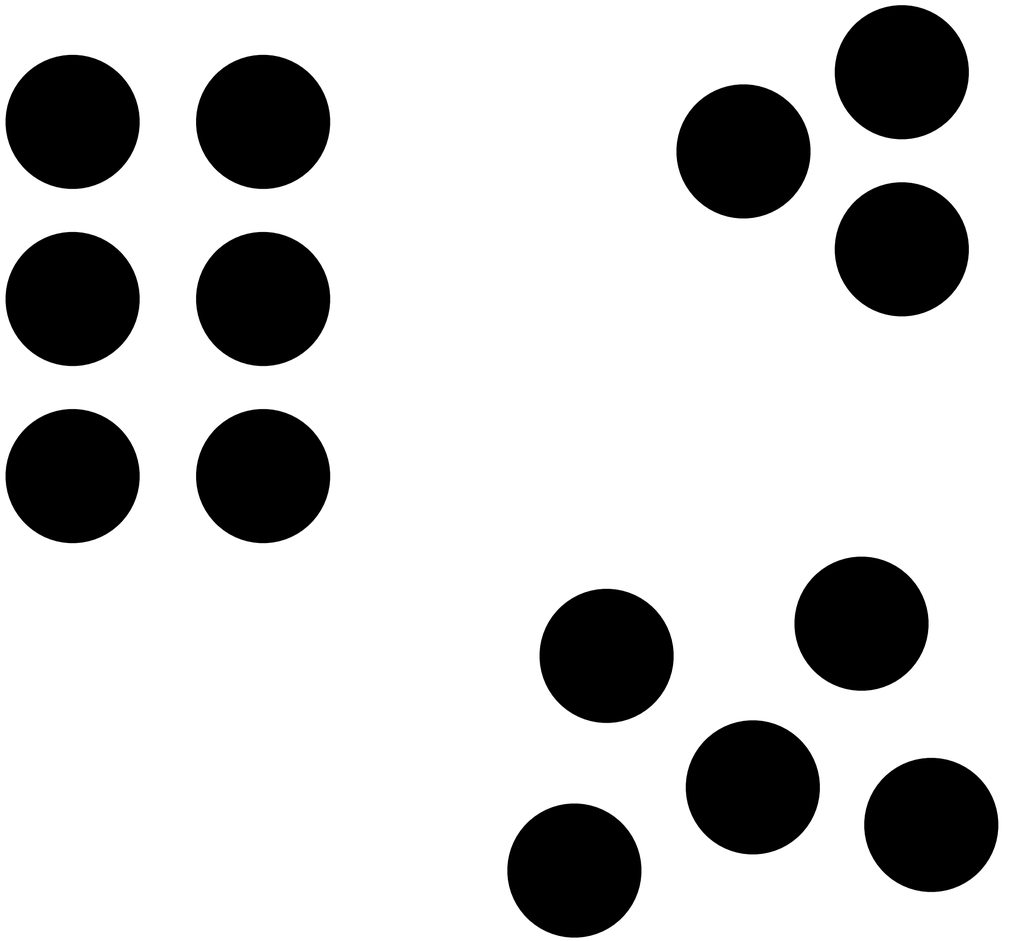
Objects that are close together are perceived as a group



Gestalt Principles

Proximity

- Titles
- Legends
- Related Charts
- Properties
  grouped together

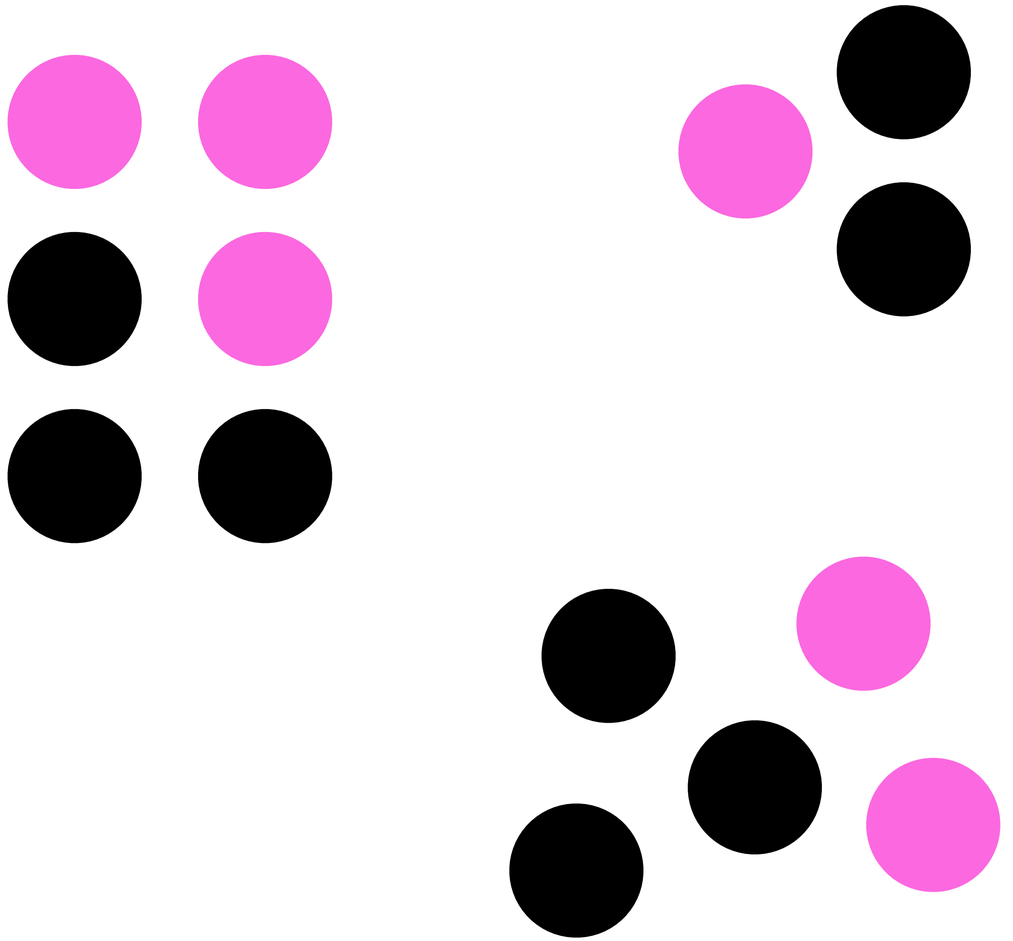


Similiarity

Gestalt Principles

Similiarity

Objects with the same visual properties are assumed to be similar and are grouped together.

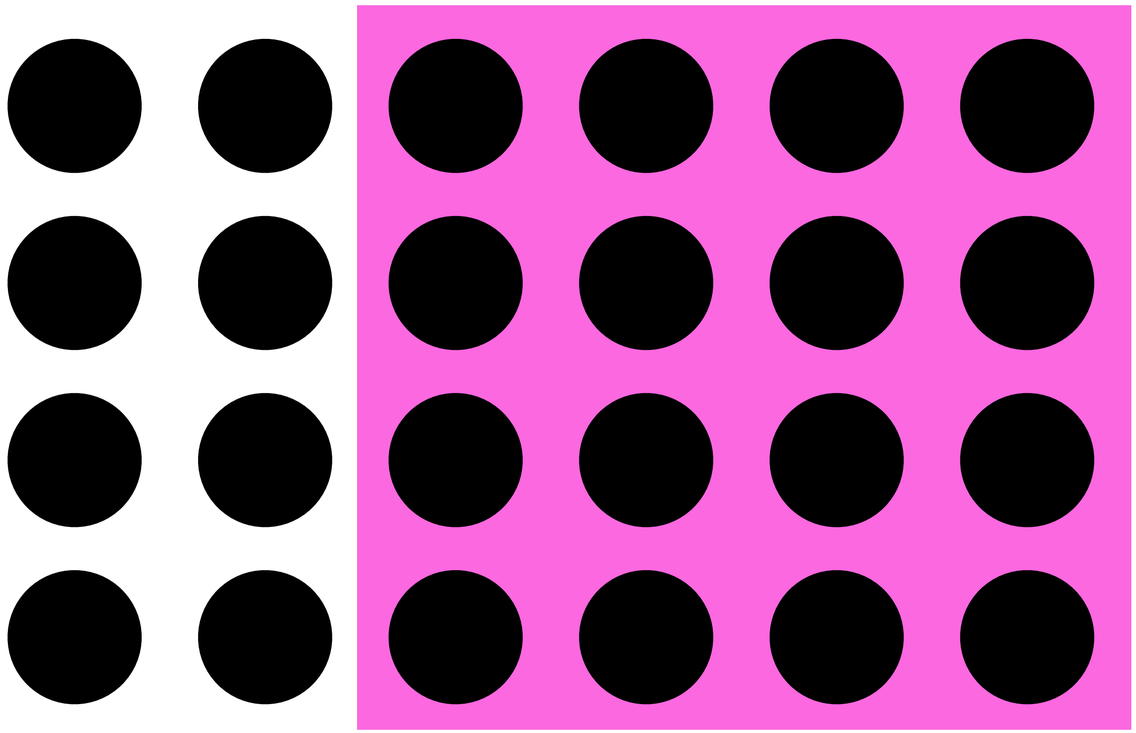


Enclosure

Gestalt Principles

Enclosure

Objects that appear to have a boundary around them (i.e., are found within the same common or enclosed region) are perceived as being related.

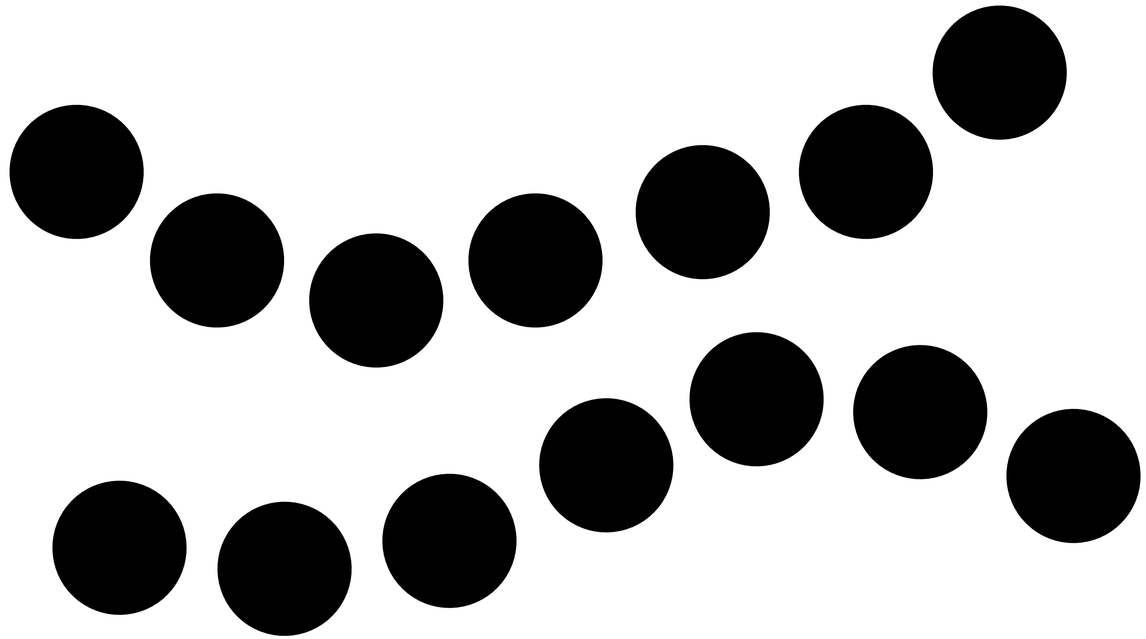


Continuity

Gestalt Principles

Continuity

Elements that are aligned (on the same line, curve, or plane) are perceived to be more closely related to each other than to other elements.

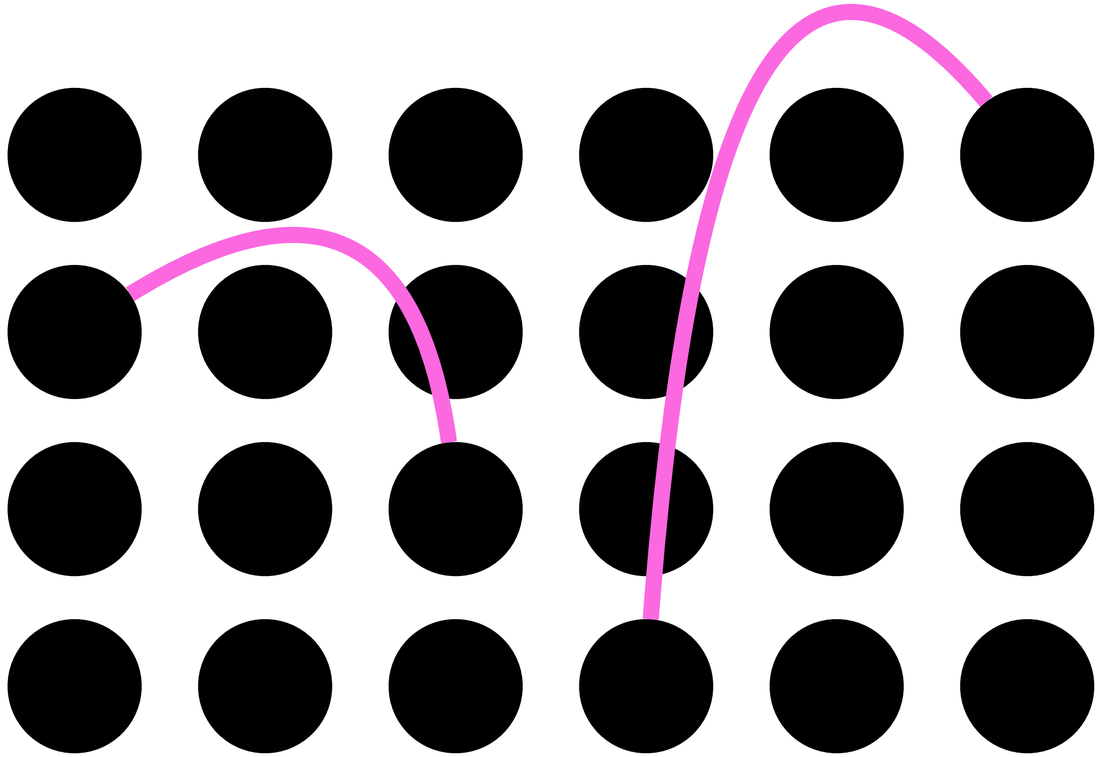


Connection

Gestalt Principles

Connection

Objects that are connected, such as by a line, are perceived as a group



Focal Point

Gestalt Principles

Focal Point

Whatever stands out visually is perceived as the most important. It will grabs our attention first, and holds it for the longest.

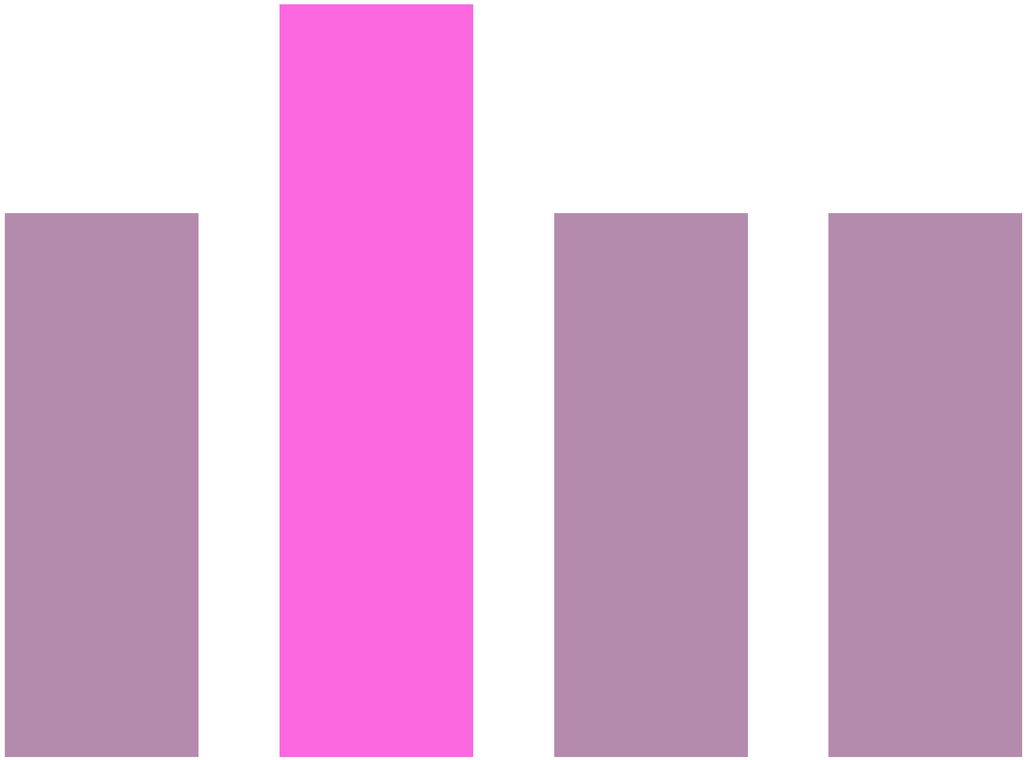


Figure and Ground

Closure

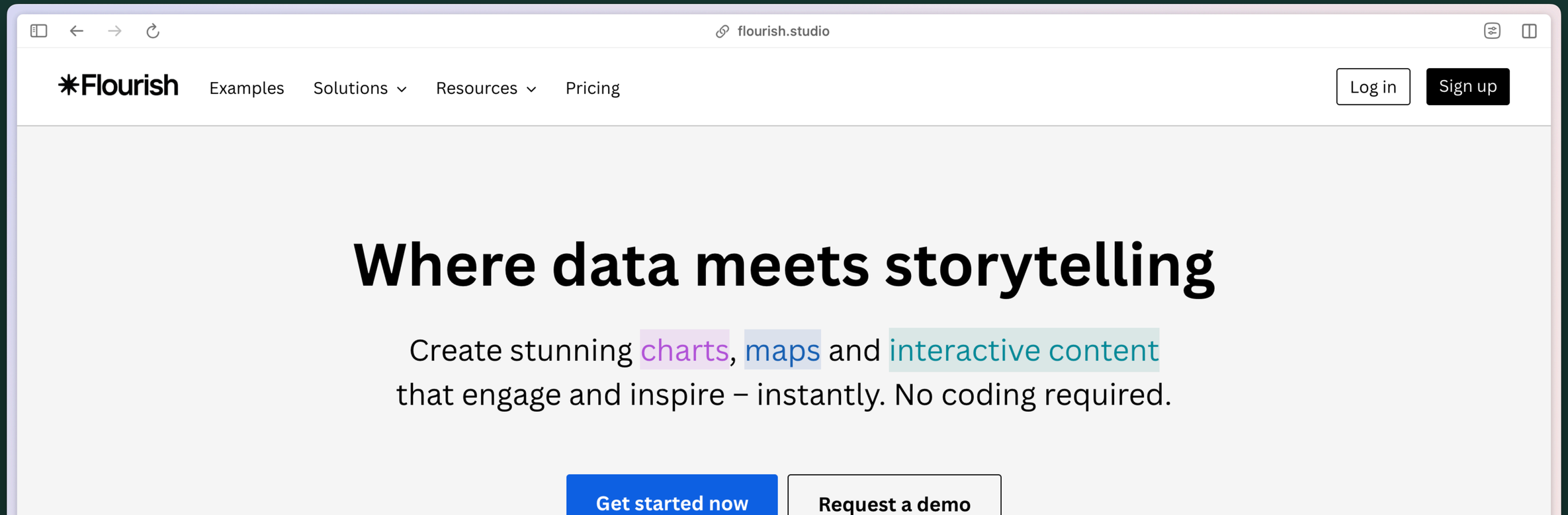
Gestalt Principles

How do we see?

- We don’t view in a fixed order
- We see first what stands out
- We see only a few things at once
- We seek meaning and make connections
- We rely on conventions and metaphors

Flourish

www.flourish.studio



Visual Perception and Encoding

- Using special properties of the visual system to help us think.
- Your visual system is good at specific tasks.
- All visualizations are made from a series of compromises.