

# Data Visualization & Design

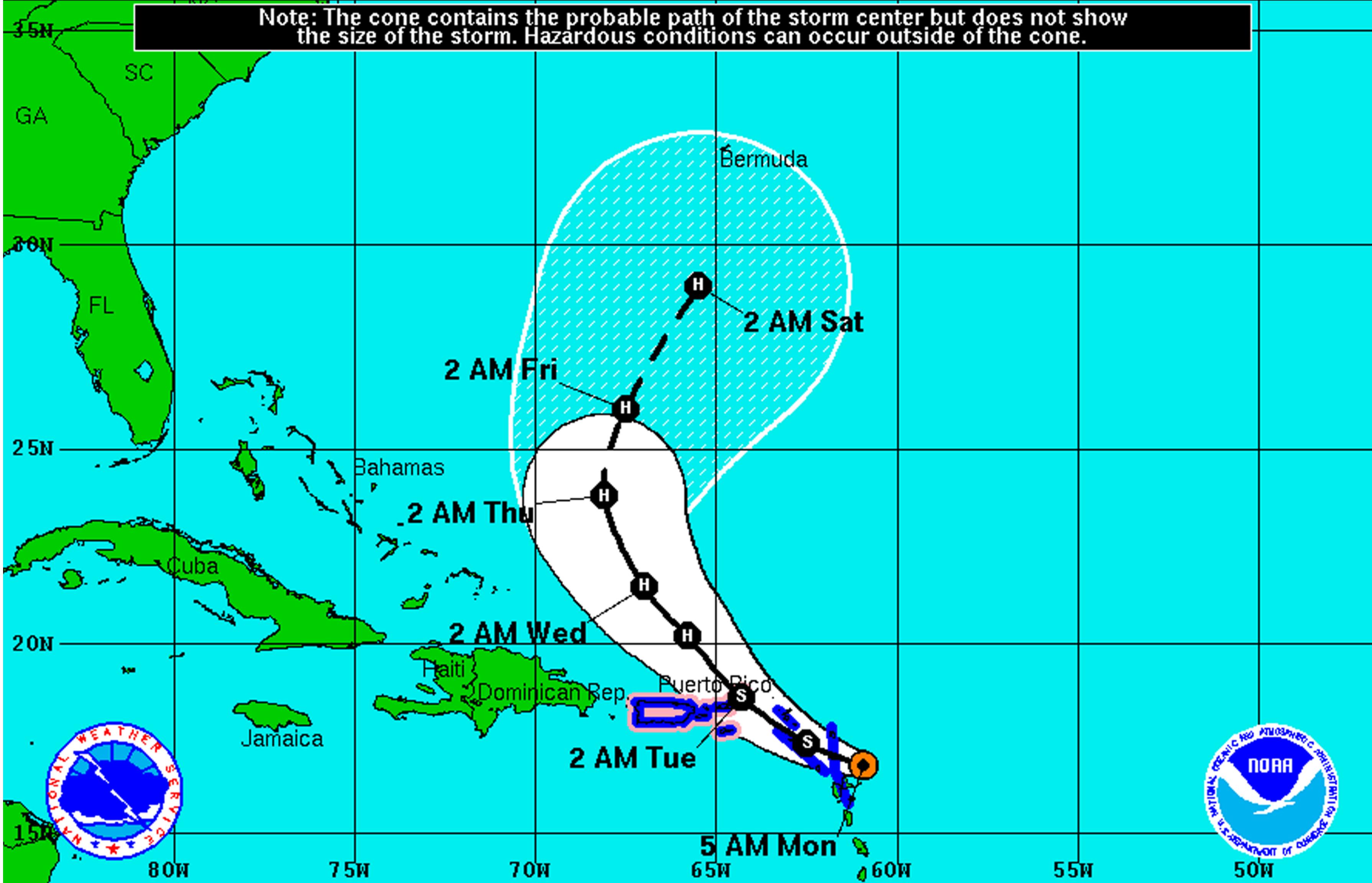
**Week 2**

# Announcements

CIESIN – Paola Kim Blanco  
[pblanco@ciesin.columbia.edu](mailto:pblanco@ciesin.columbia.edu)

Re: Millennium Villages visualization project

This week in **visualization**...



### Tropical Storm Gonzalo

Monday October 13, 2014

5 AM EDT Advisory 4

NWS National Hurricane Center

### Current Information:

Center Location 16.8 N 60.9 W  
Max Sustained Wind 60 mph  
Movement W at 10 mph

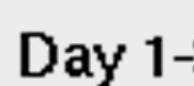
### Forecast Positions:

● Tropical Cyclone ○ Post-Tropical  
Sustained Winds: D < 39 mph  
S 39-73 mph H 74-110 mph M > 110 mph

### Potential Track Area:



Day 1-3



Day 4-5

### Watches:



Hurricane



Trop. Storm

### Warnings:

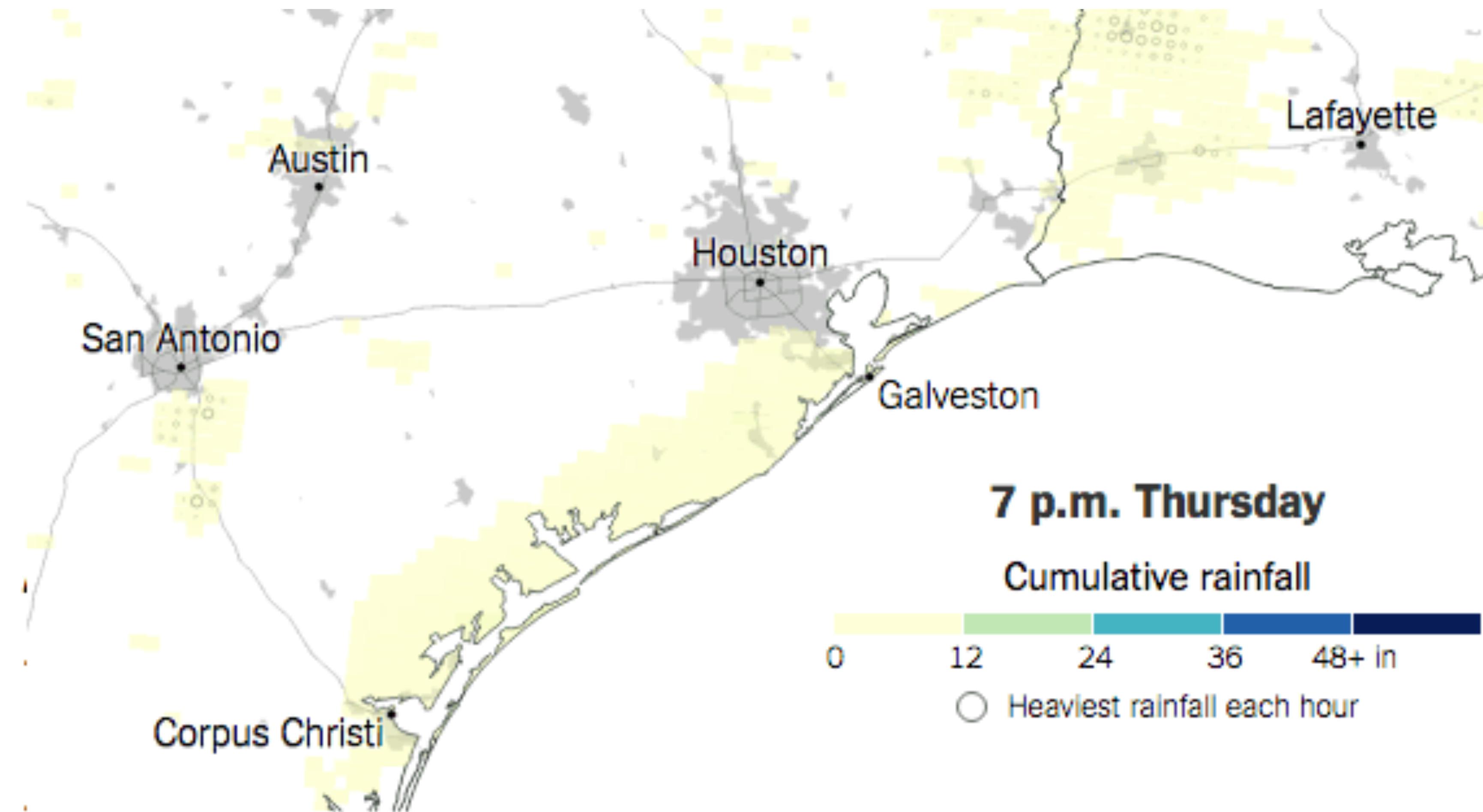


Hurricane



Trop. Storm

[Source](#)



[\*\*Source\*\*](#)

# Principles of design

**Attention** is your most valuable resource.  
Your **medium** is human perception.

Good design makes perception **easy**.

## **Affordance –**

The physical characteristics of an object or environment influence its function.

ex. A door with a handle “affords” pulling.



## **Entry point —**

A point of physical or attentional entry into a design.

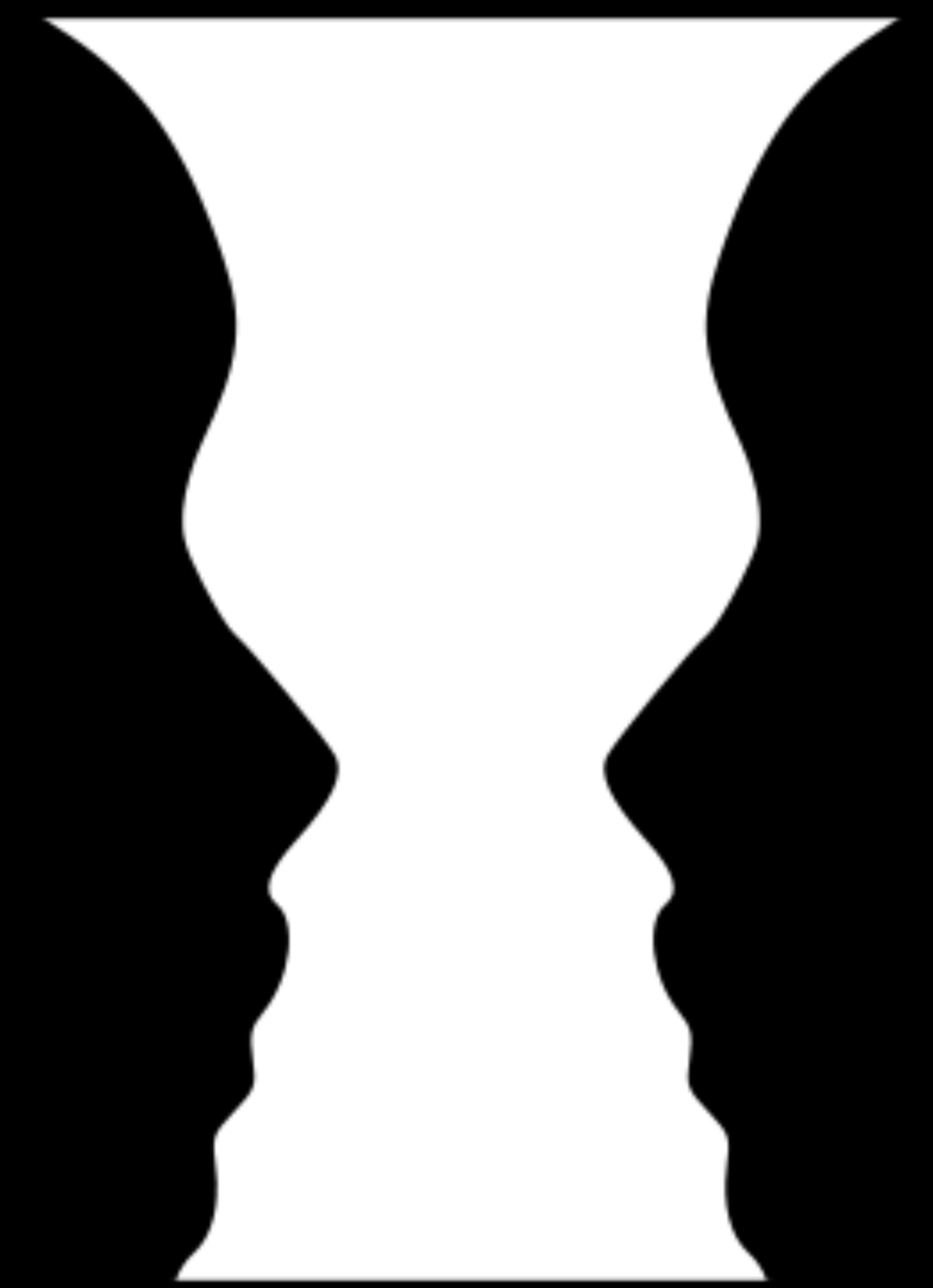
ex. Store entrances that reduce the barrier to entry (lures).



## **Figure-ground relationship —**

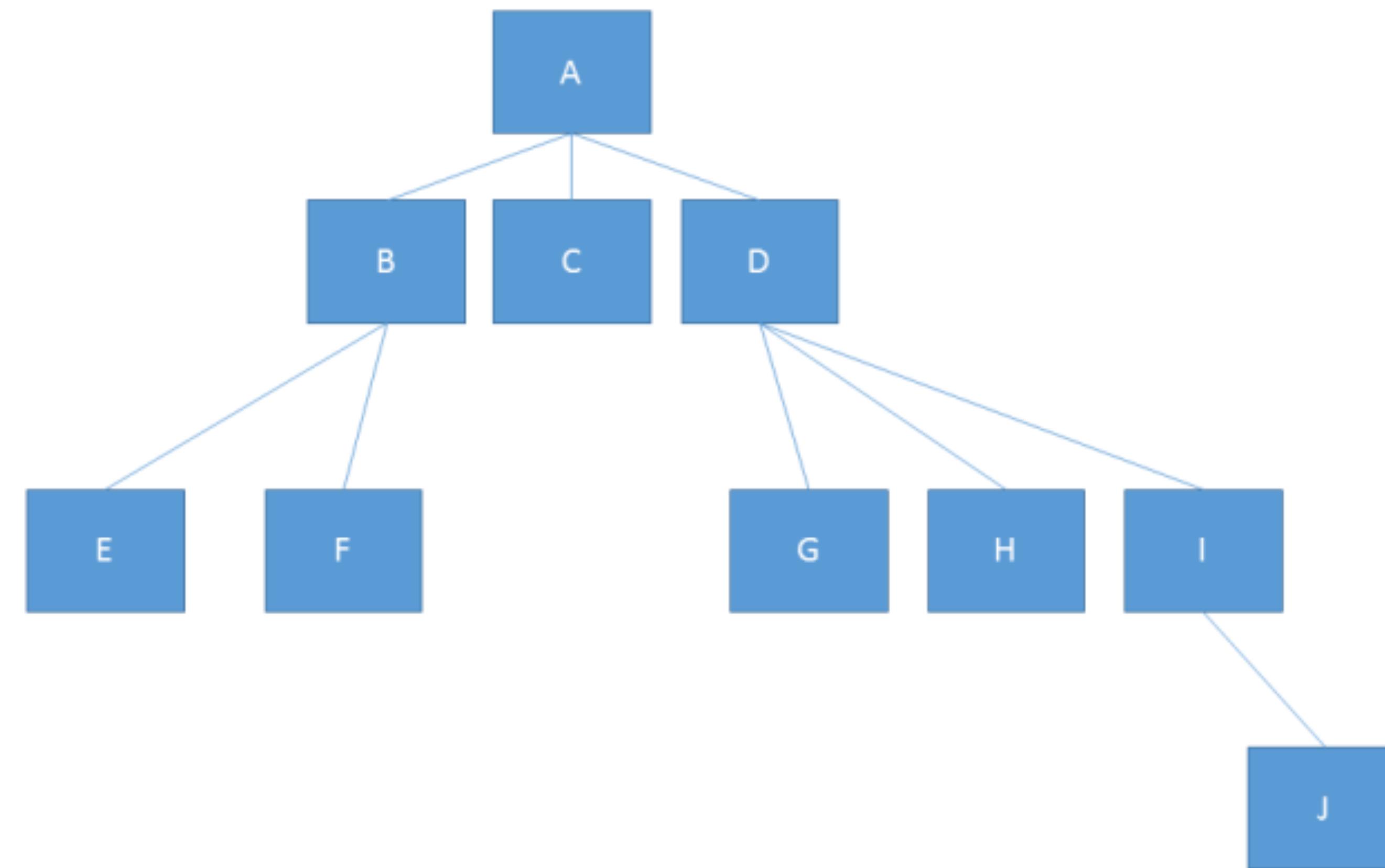
Elements are perceived as either figures (objects of focus) or ground (the rest of the perceptual field).

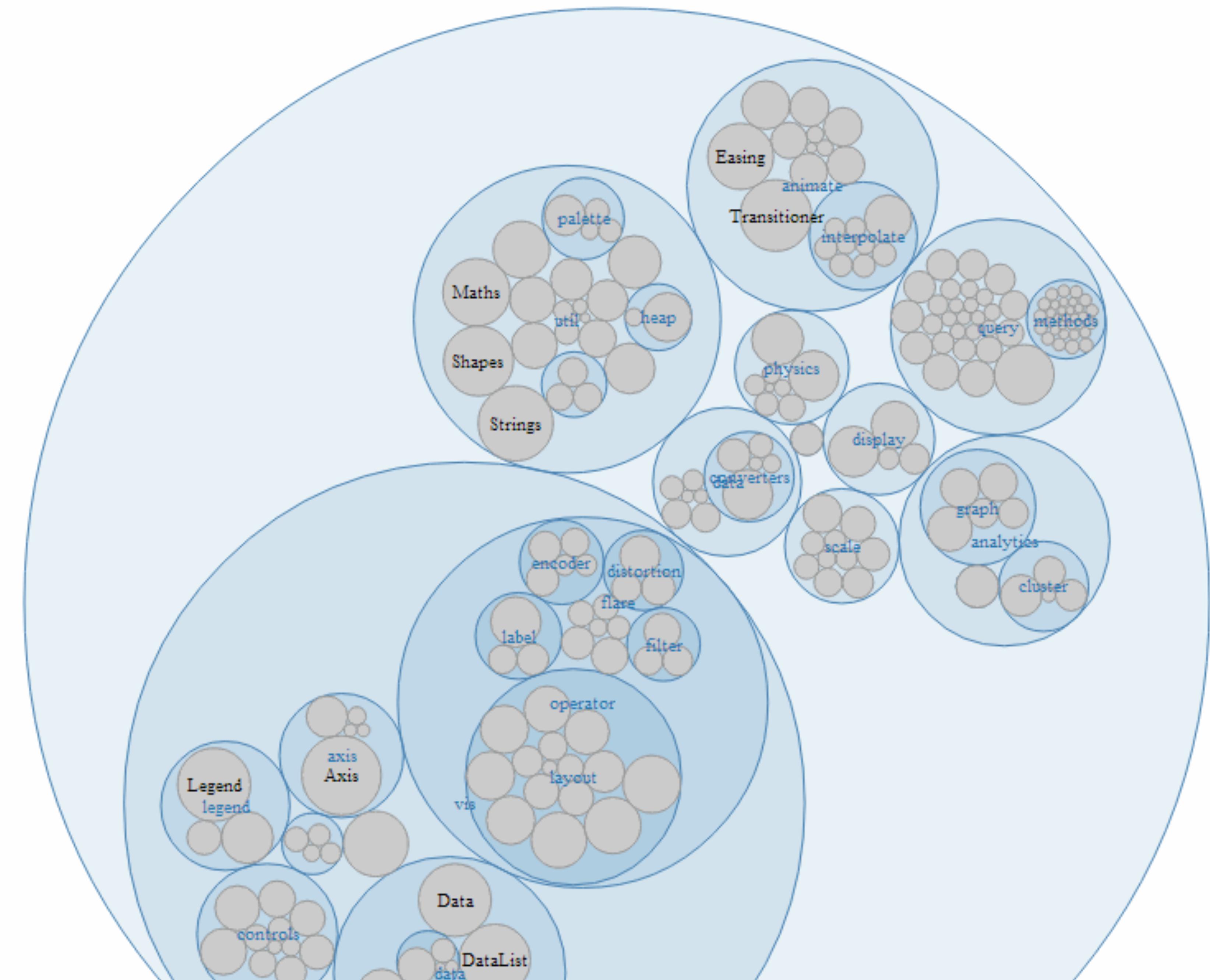
ex. On a simple map, land is the object of focus, and water is the background.



## **Hierarchy –**

Hierarchical organization is the simplest structure for visualizing and understanding complexity.





## **Highlighting** –

A technique for bringing attention to an area of text or image.

ex. **Bold**, *italics*, or underline.

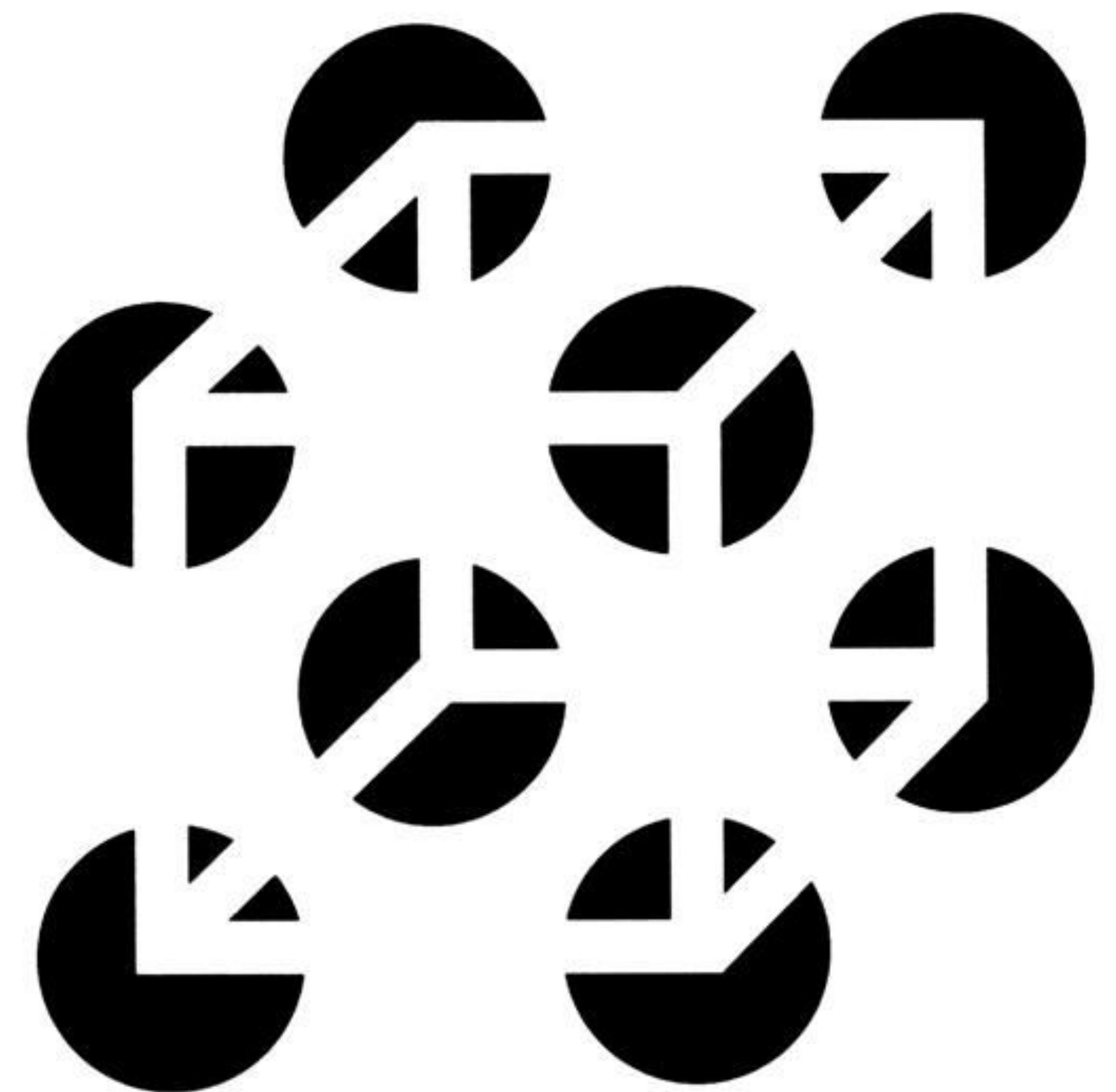
# Gestalt principles

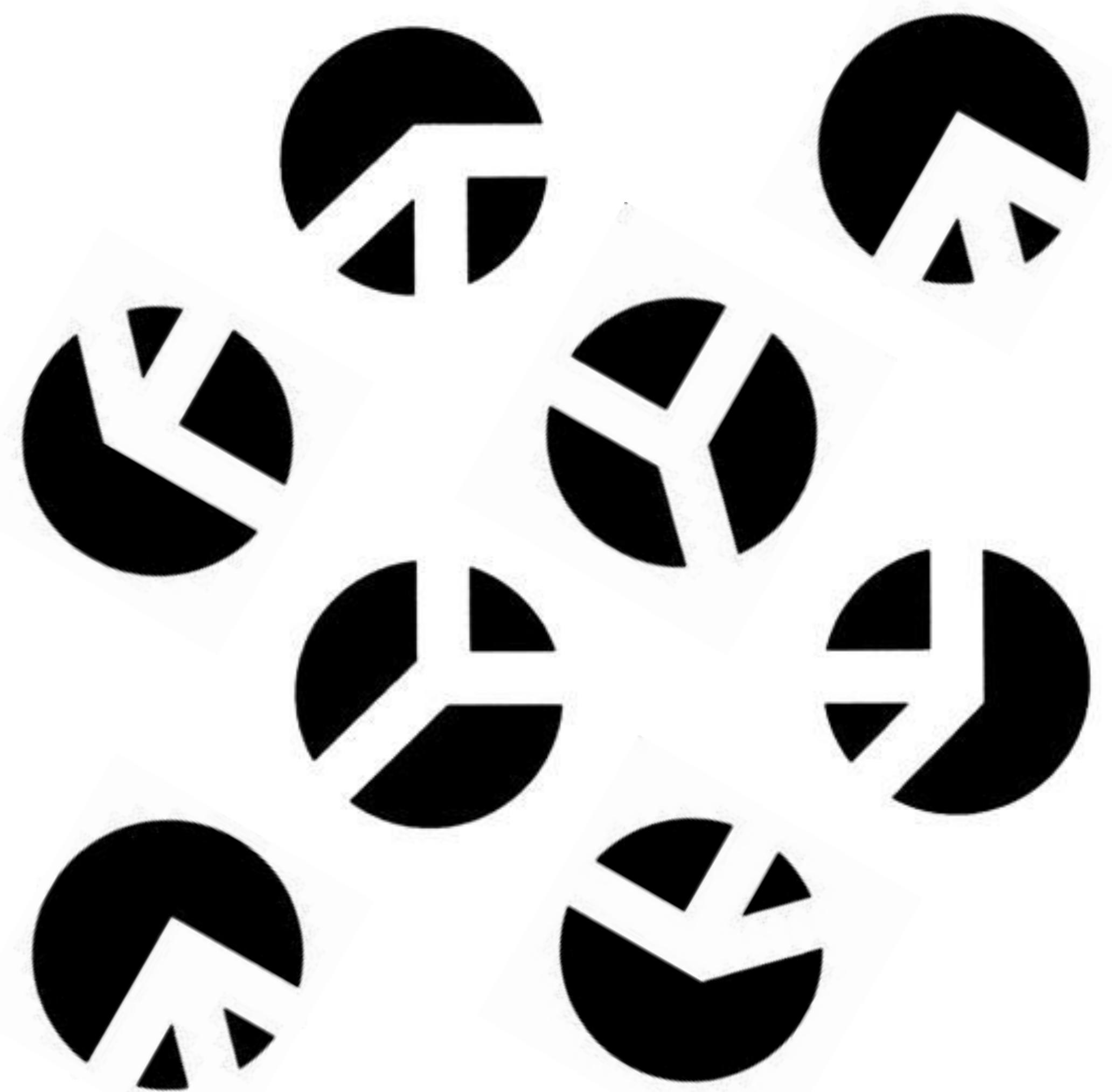
Good visualization relies on  
**simplicity.**

- **Guiding** the viewer's attention
- **Readability at a distance** (“squint test”)
- **Clearing clutter** from the primary visual message

## **Gestalt principles —**

A set of principles in psychology created to account for the observation that humans naturally perceive visual elements as ***organized patterns and objects.***





Gestalt theories can be broken down into two underlying principles:

- 1. Mosaic, or ‘bundle’ hypothesis**
- 2. Association hypothesis**

## **1. Mosaic, or ‘bundle’ hypothesis –**

Every complex consists of elementary contents or pieces

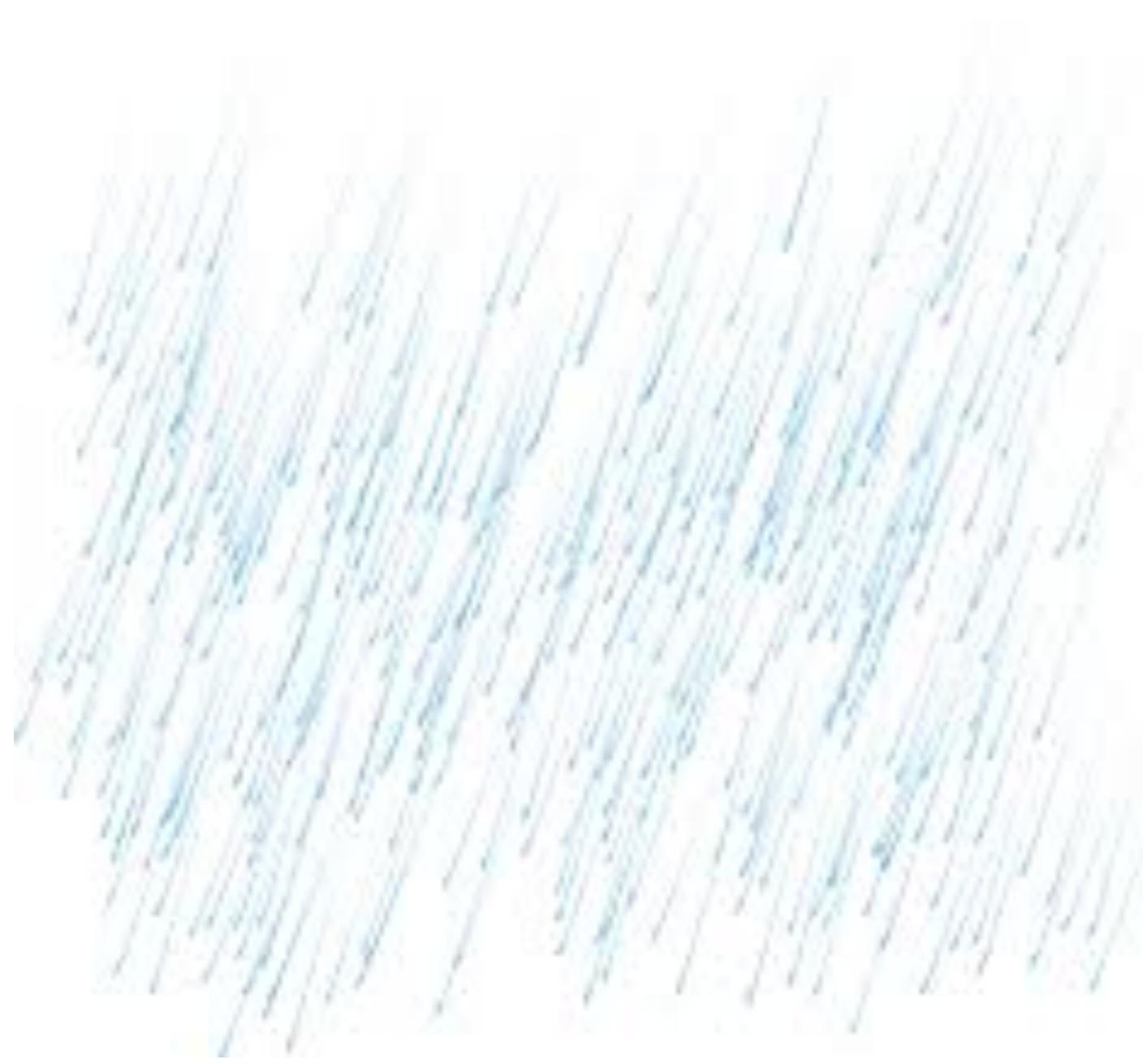


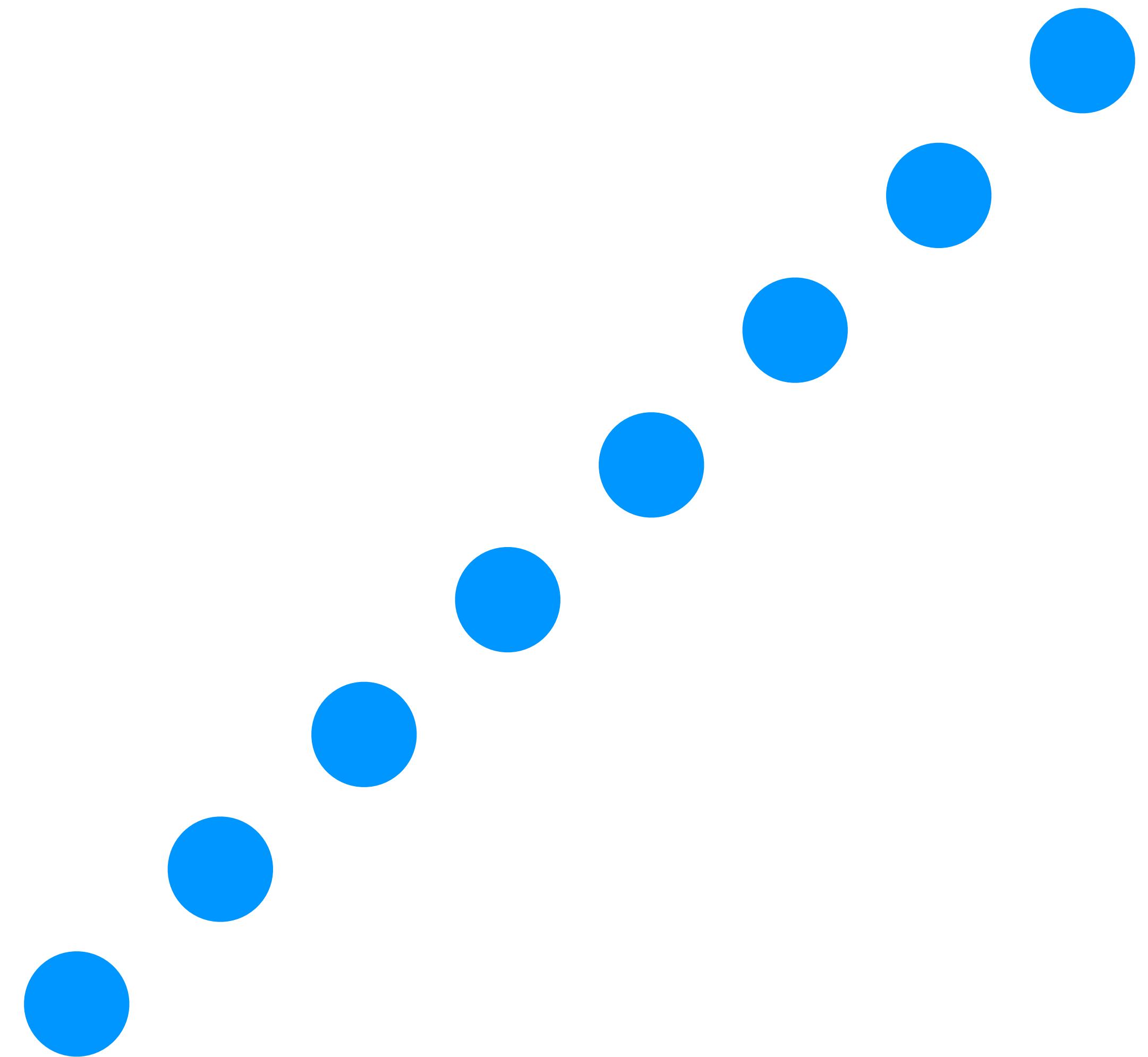


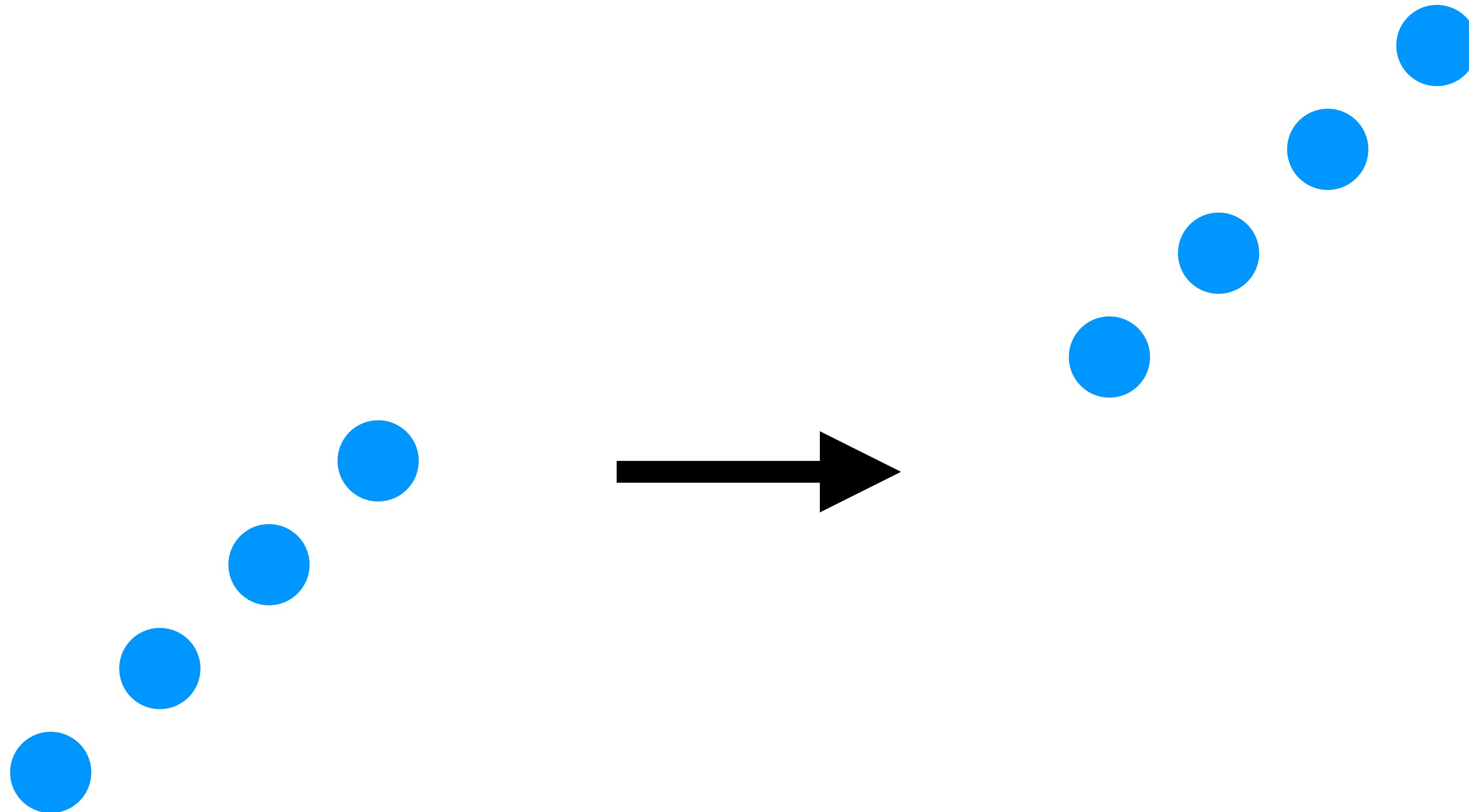
## **2. Association hypothesis –**

If any object or scenario is frequently experienced alongside another, there is a tendency for one to “call up” the other







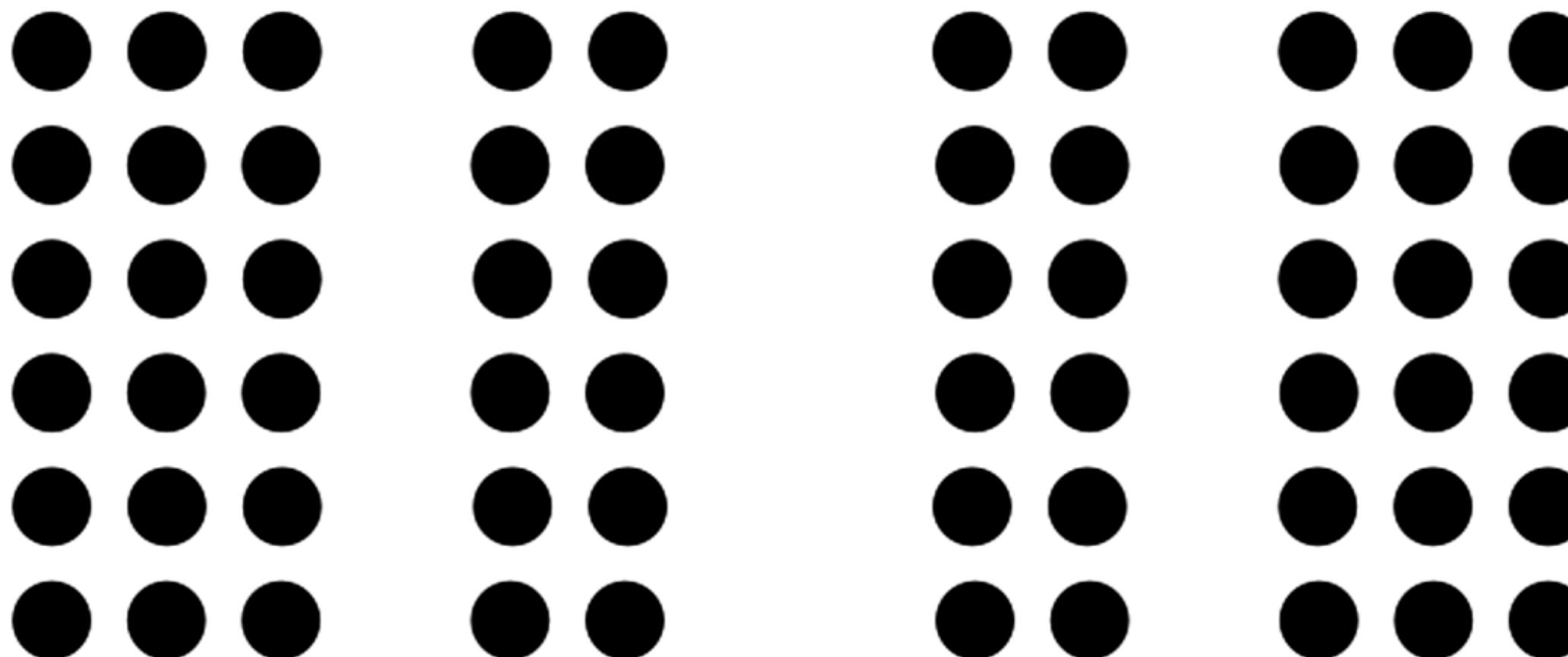


**Gestalt principles** underlie even the simplest graphics...

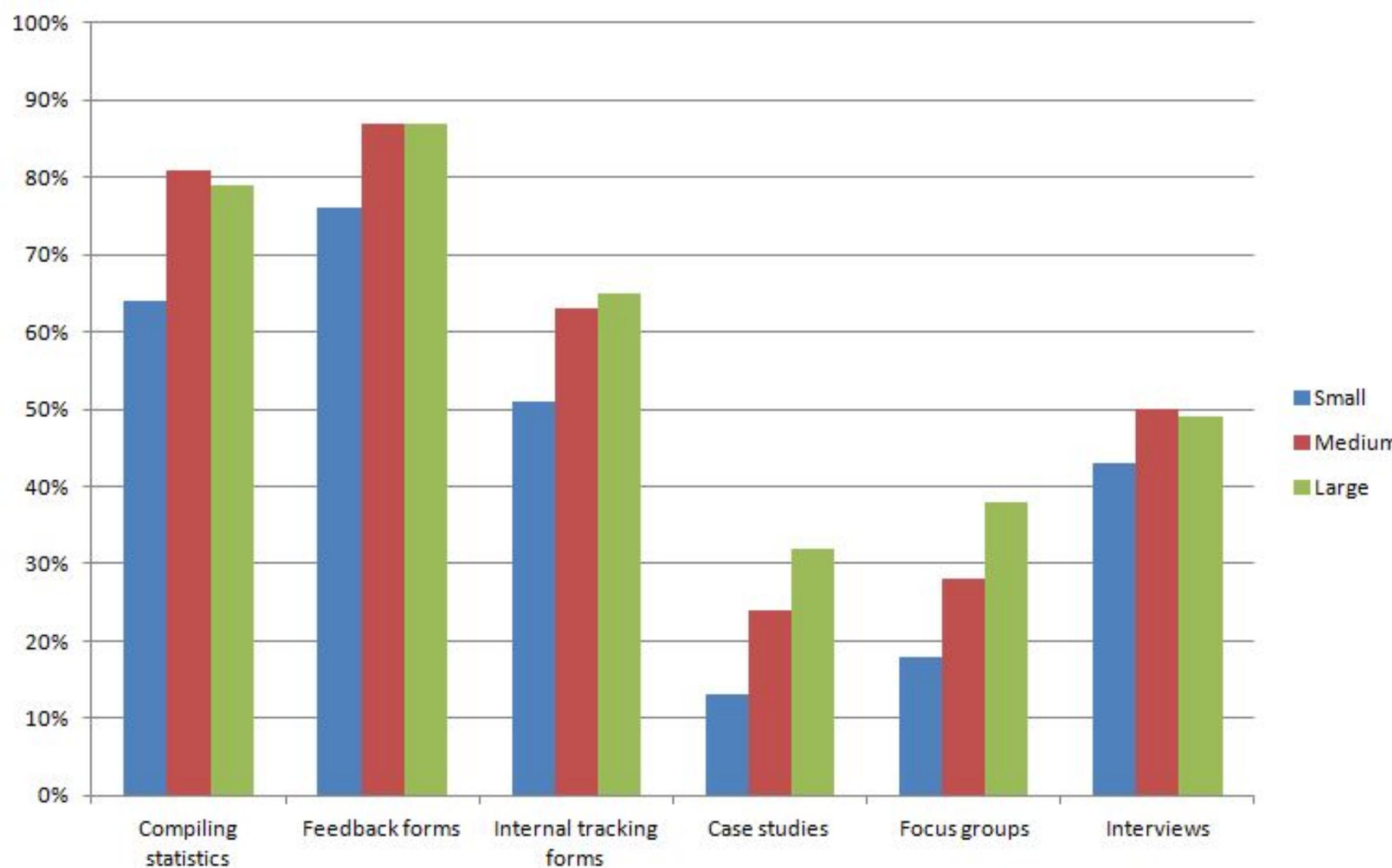
...graphics that **subtly** and **pervasively** inform our perspective of the world.

## **Proximity —**

Objects that are located close to one another will be perceived as being associated with one another (i.e. as belonging to a group, or as parts of a larger whole).

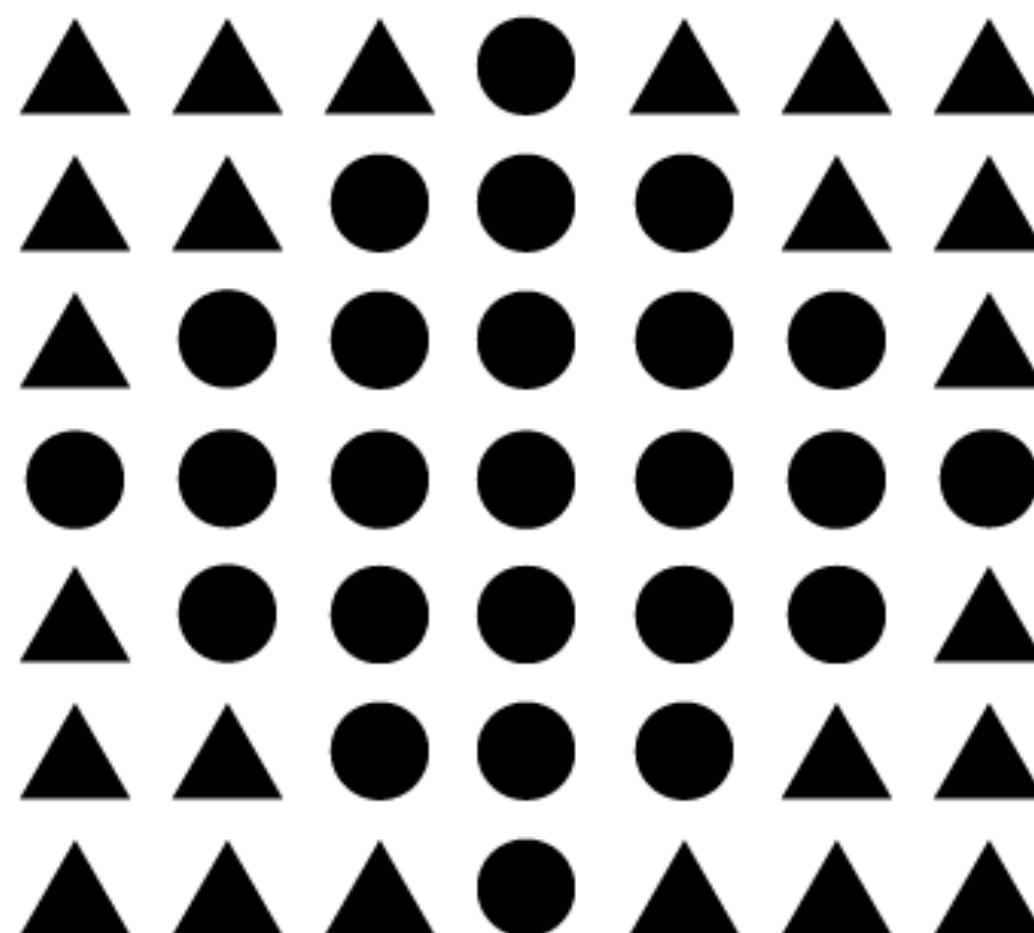


# Proximity —

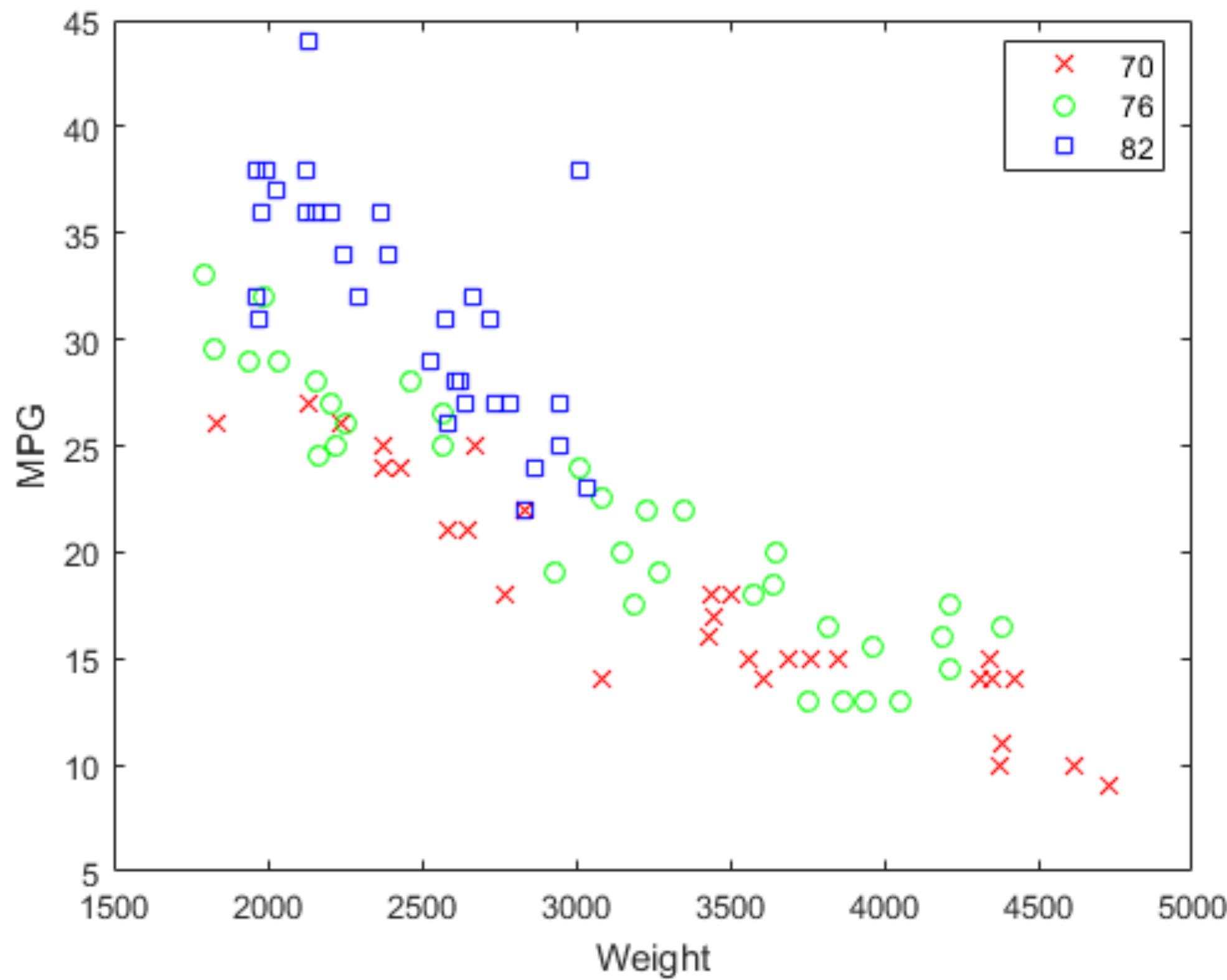


## **Similarity —**

Objects which share similar properties are assumed to have association with one another. These similar properties may be, for example, visual properties such as shape or color.

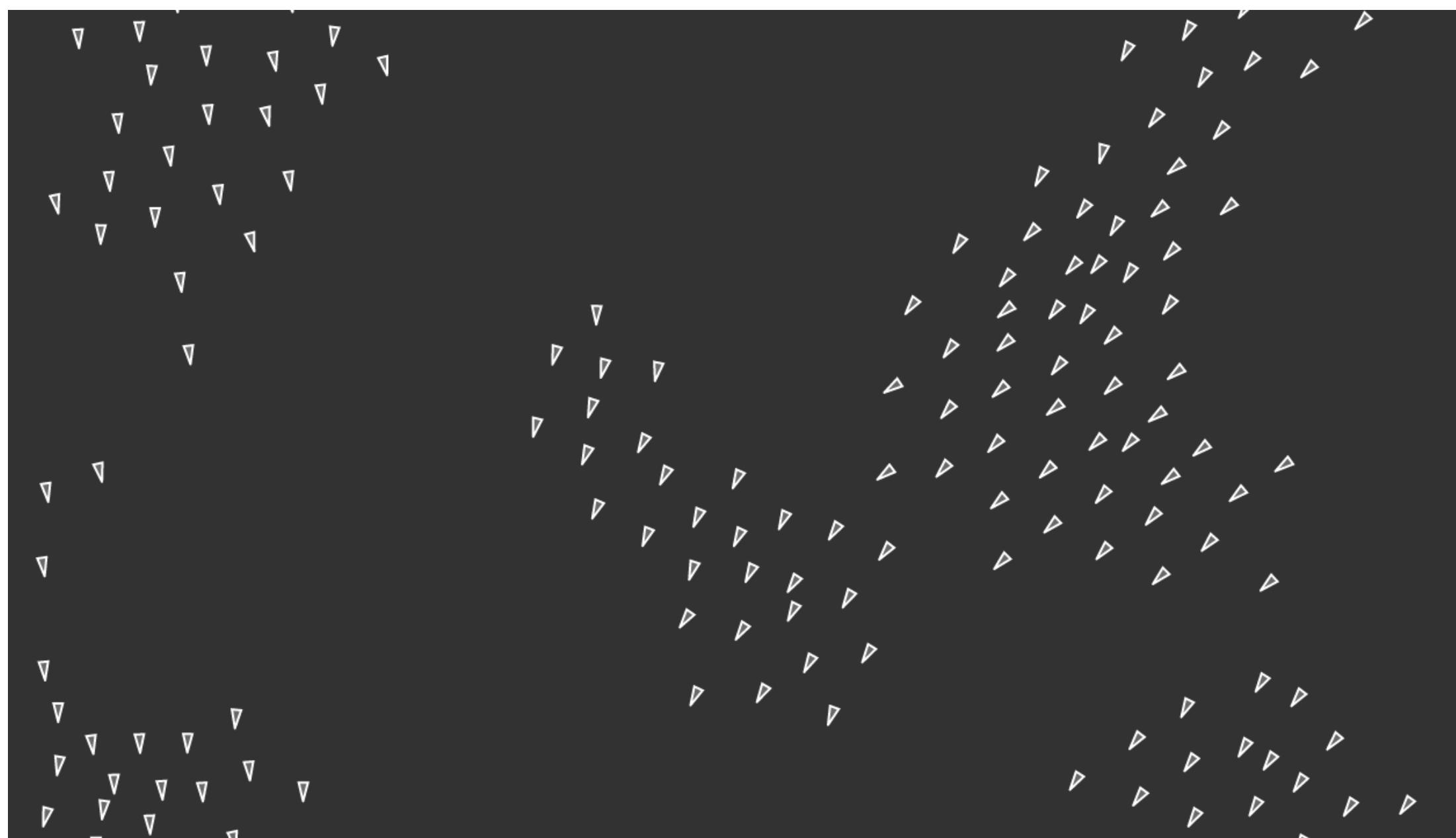


# Similarity —



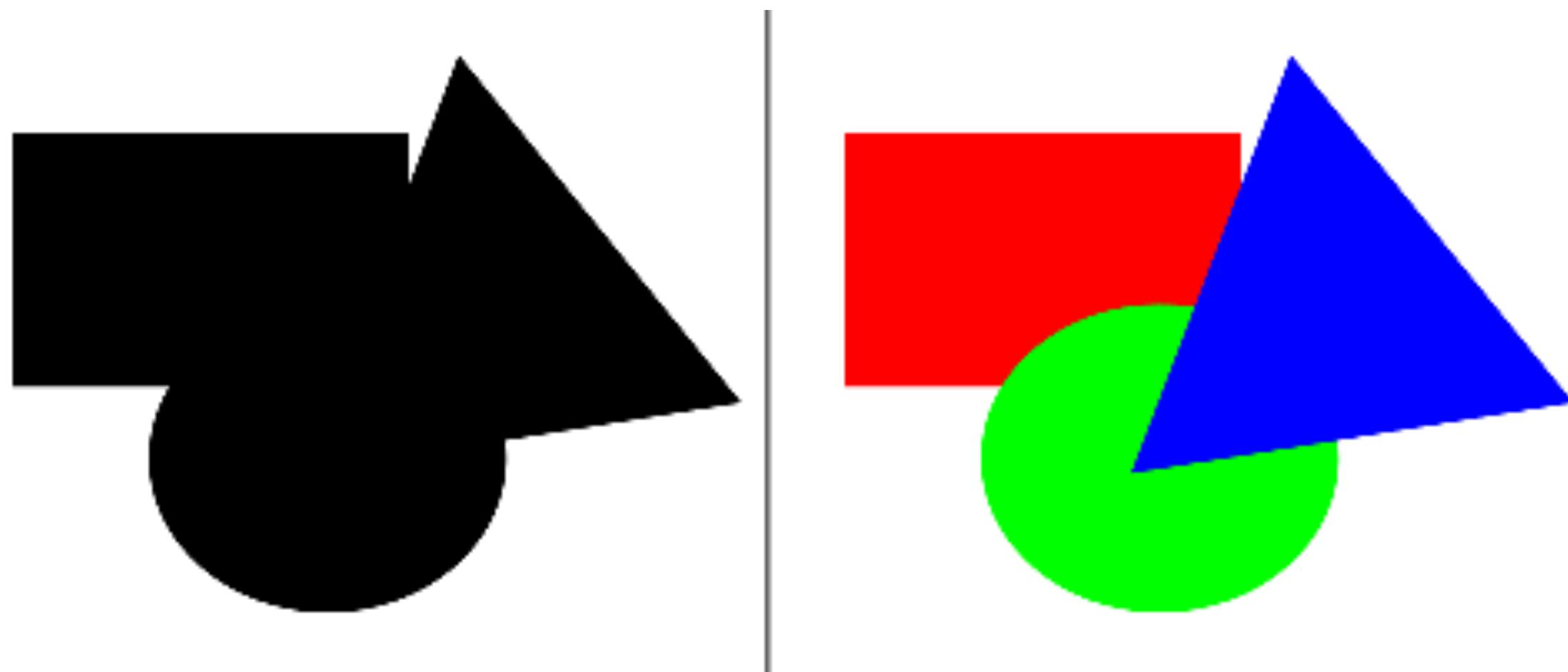
# Uniform destiny (“common fate”) –

Elements tend to be perceived as grouped together if they move together. (Link: [\*\*flocking\*\*](#))



## **Simplicity (*Prägnanzstufen*) –**

The simplest arrangement of elements is likely to be perceived first.

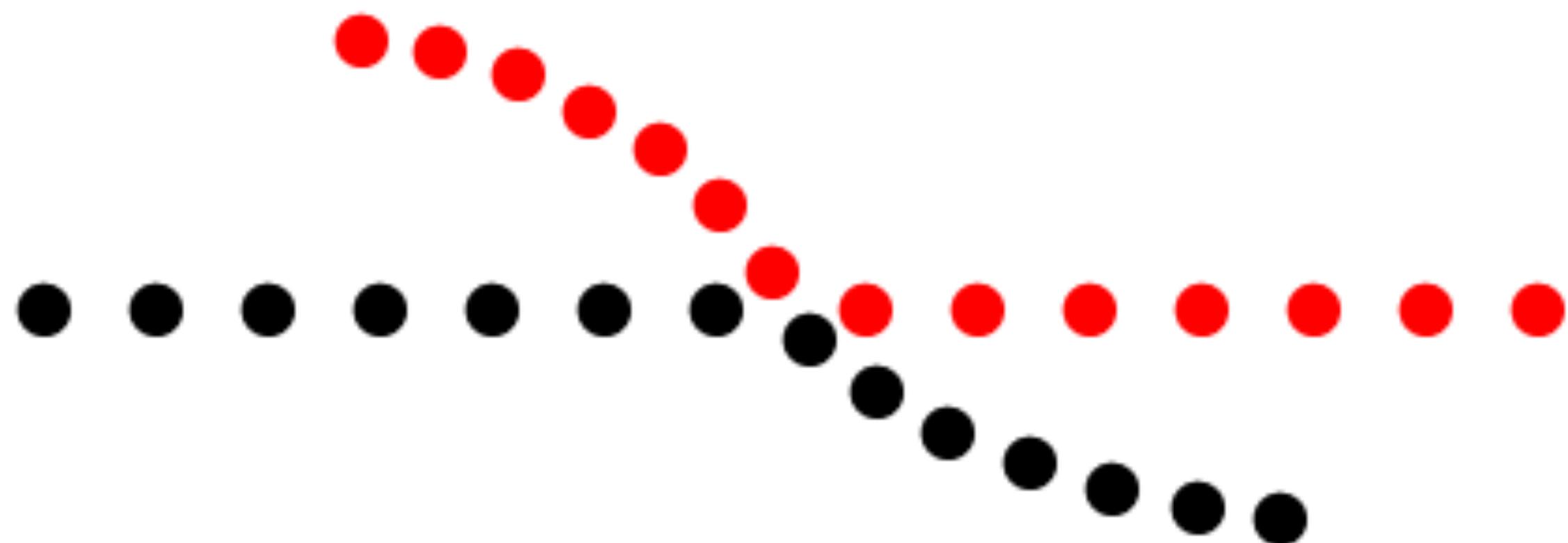


# Simplicity (*Prägnanzstufen*) –

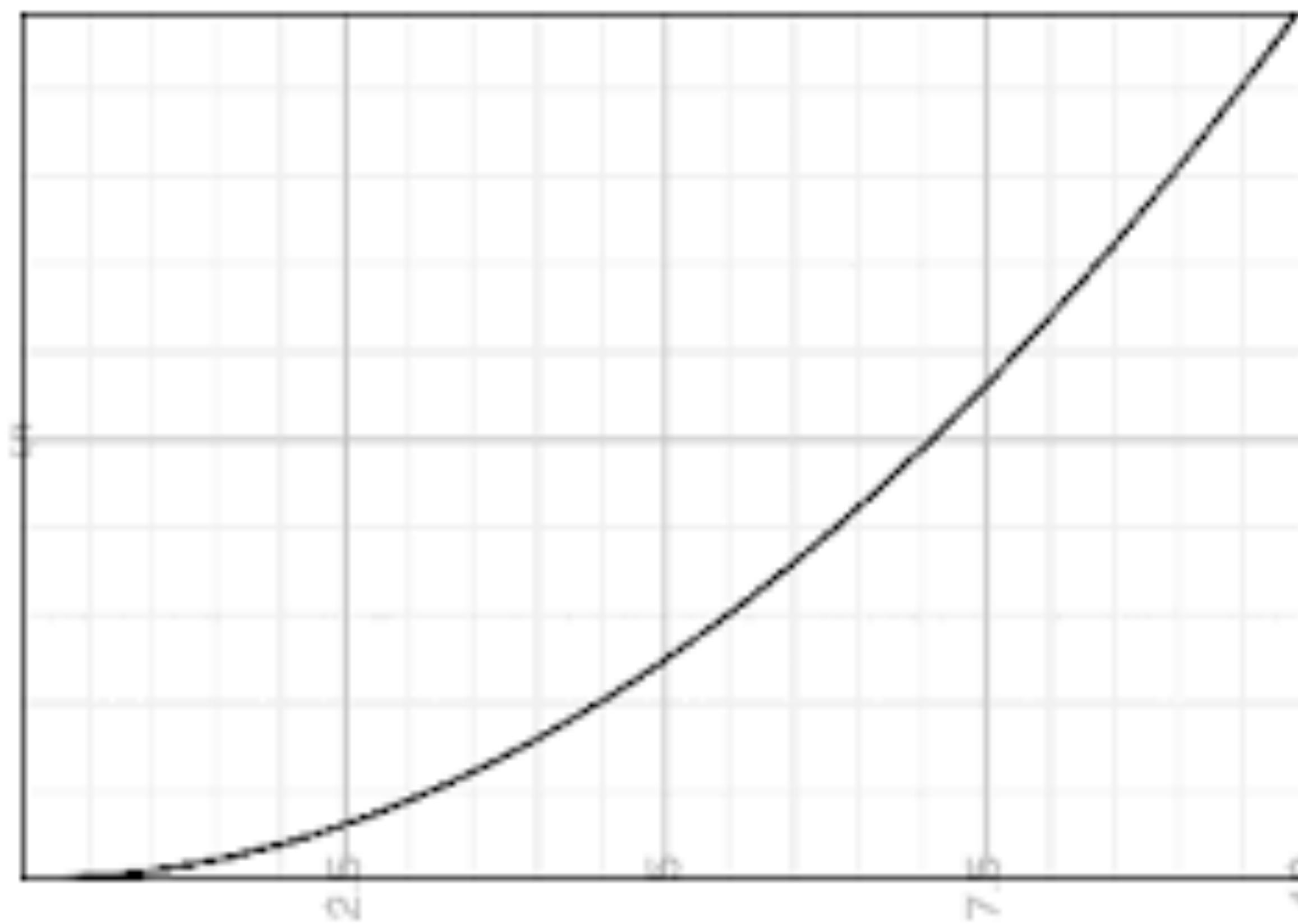


## Direction (“continuation”) –

Elements arranged on a line or curve are perceived as more related than elements not on the line or curve. (Also: we continue our perception of shapes beyond their ending points.)



# Direction (“continuation”) –



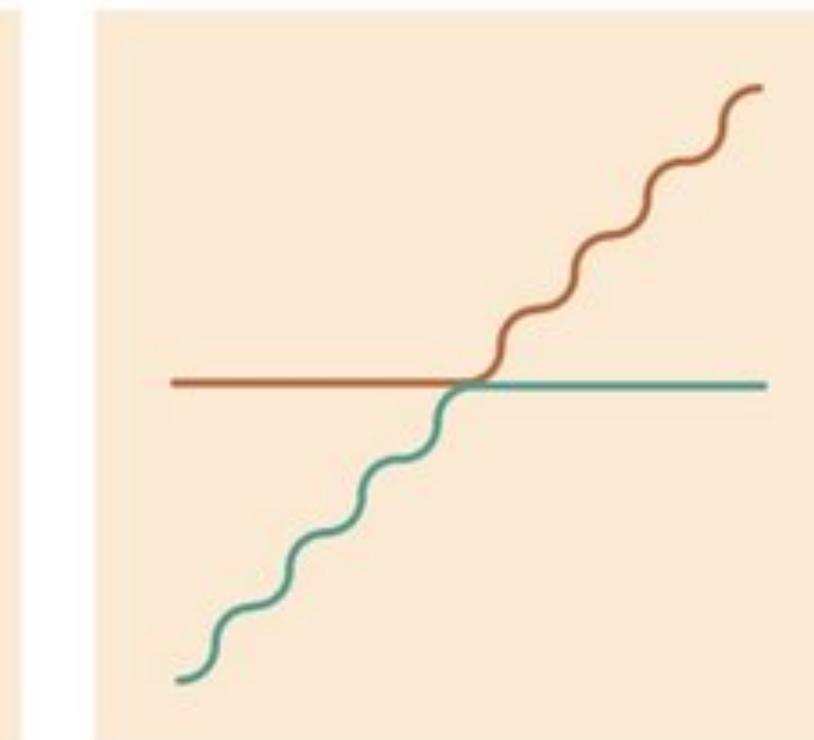
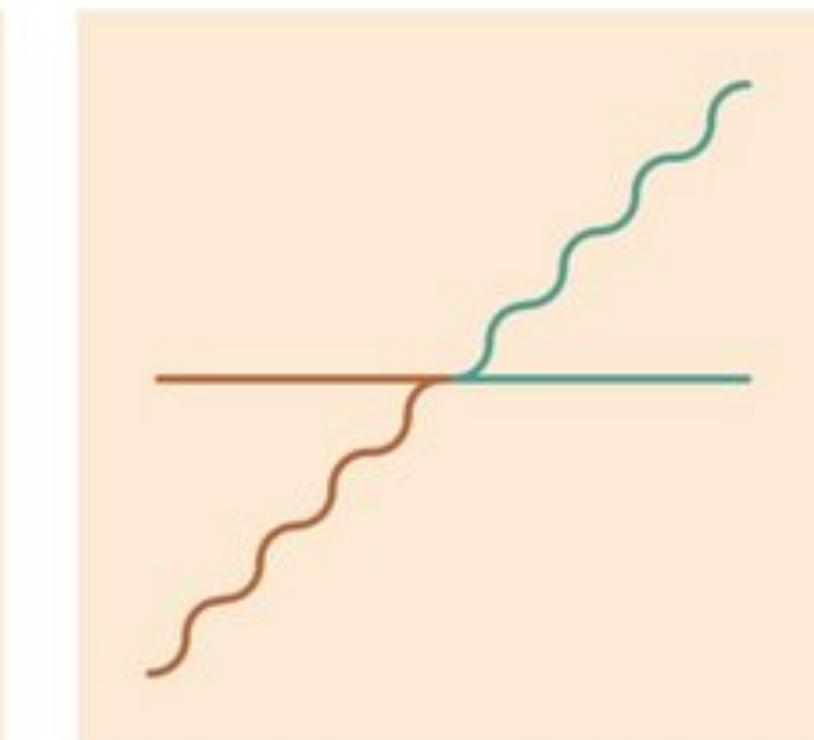
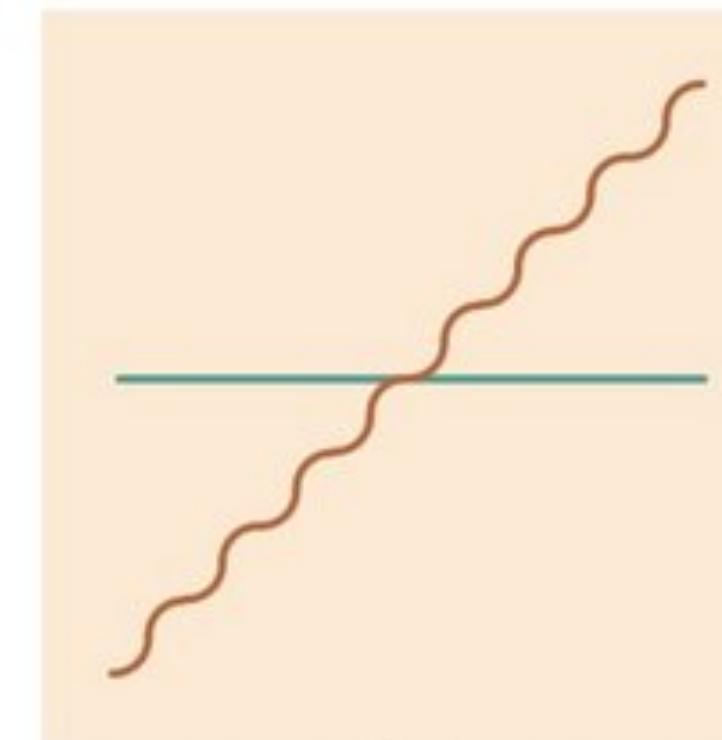
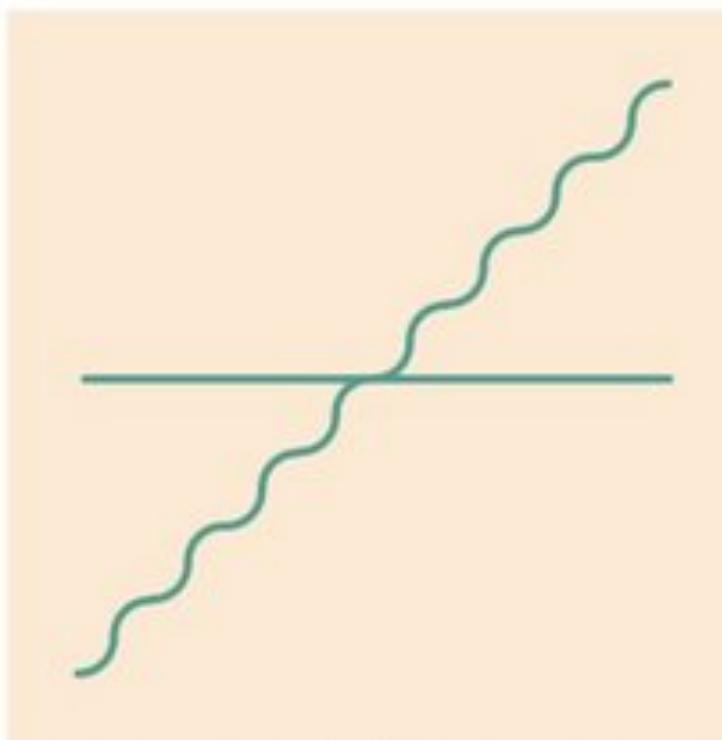
## **Closure –**

Objects that are close together are perceived as being part of a whole, to the extent that gaps between them may be imagined to be ‘closed’, forming complete shapes or borders.



## The ‘Good Curve’ –

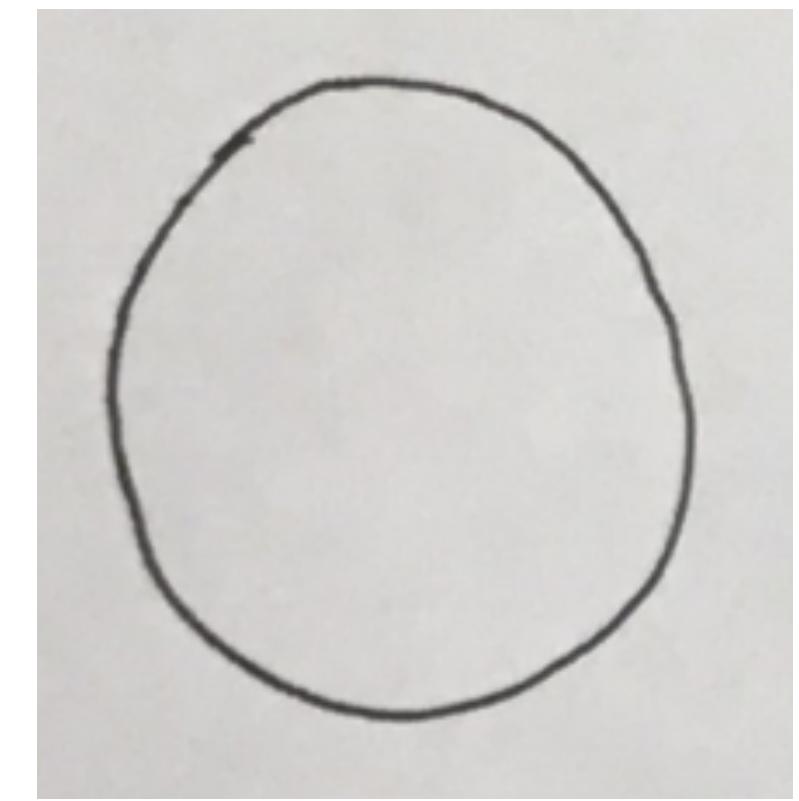
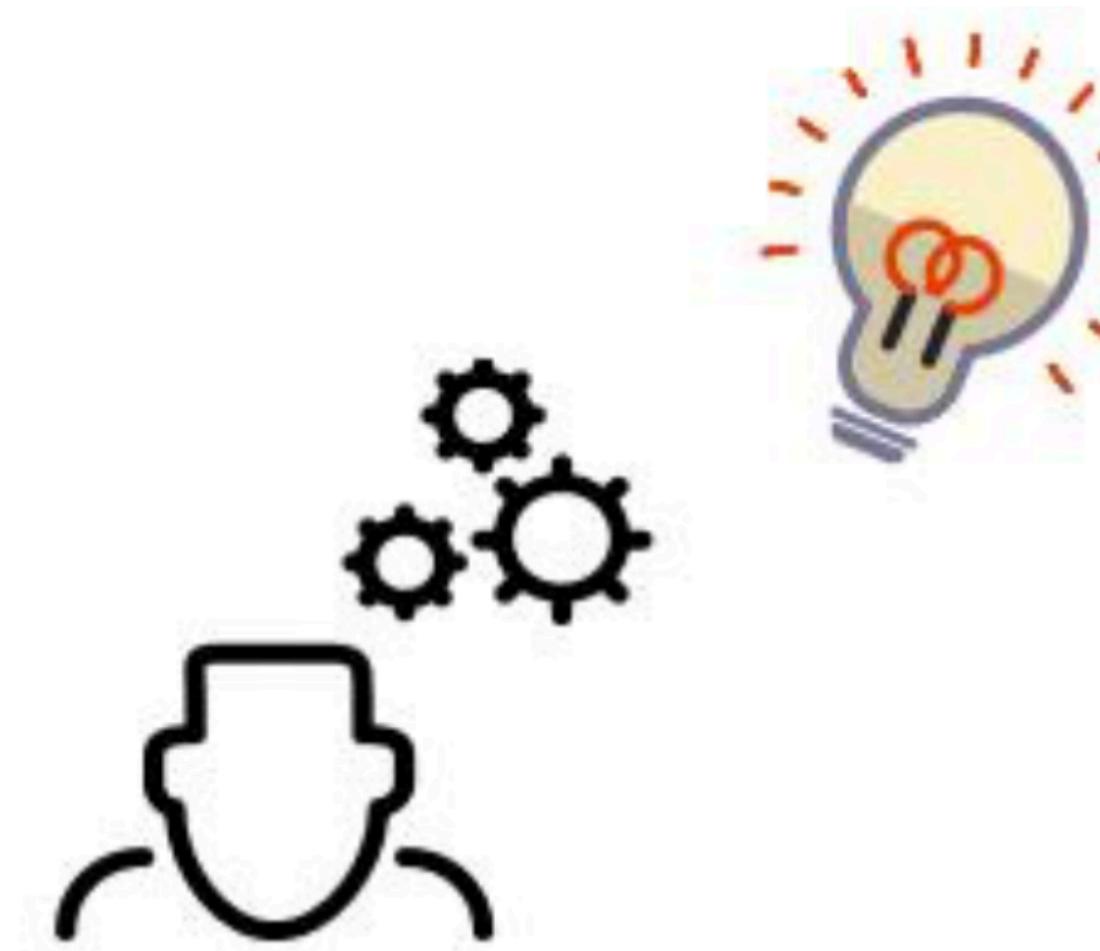
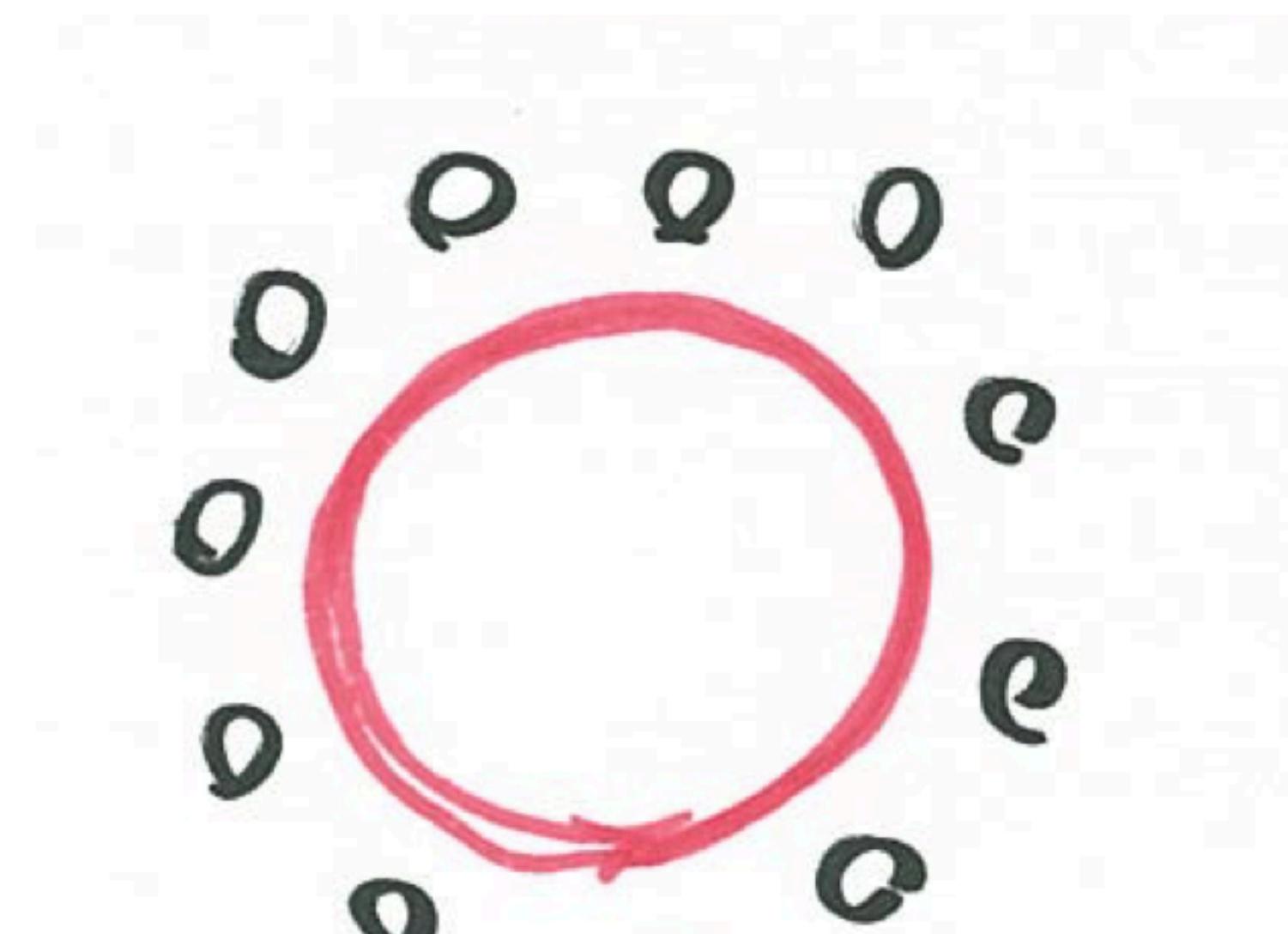
If continuity from one line to another is perceived (for example, if the angle or direction of a single line is continued into another), this may override other perceived shapes or groupings, as would otherwise be perceived according to Gestalt laws.



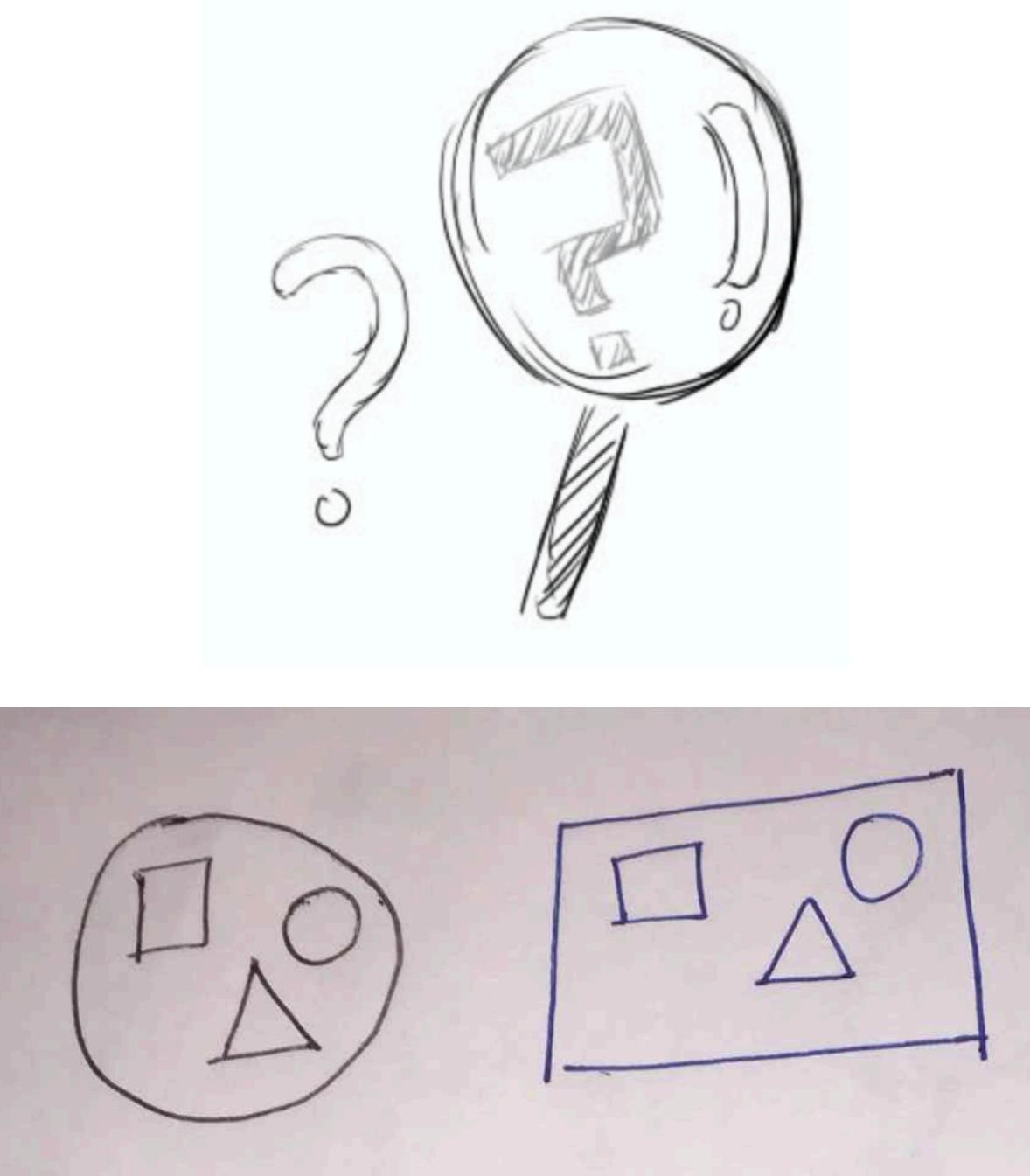
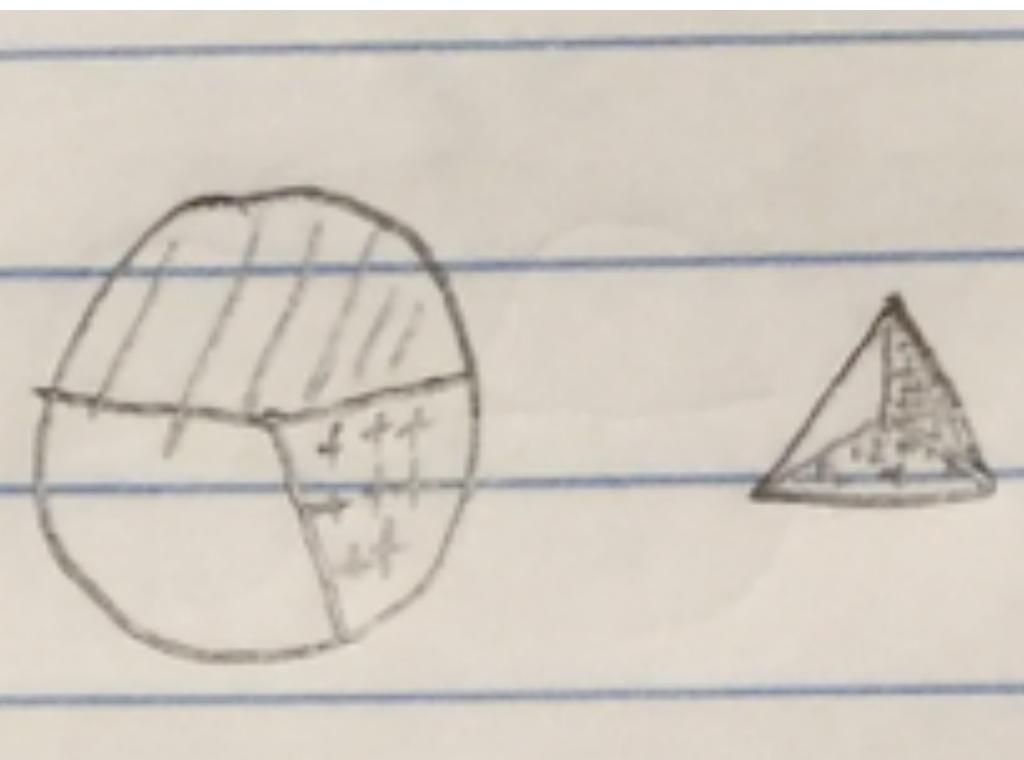
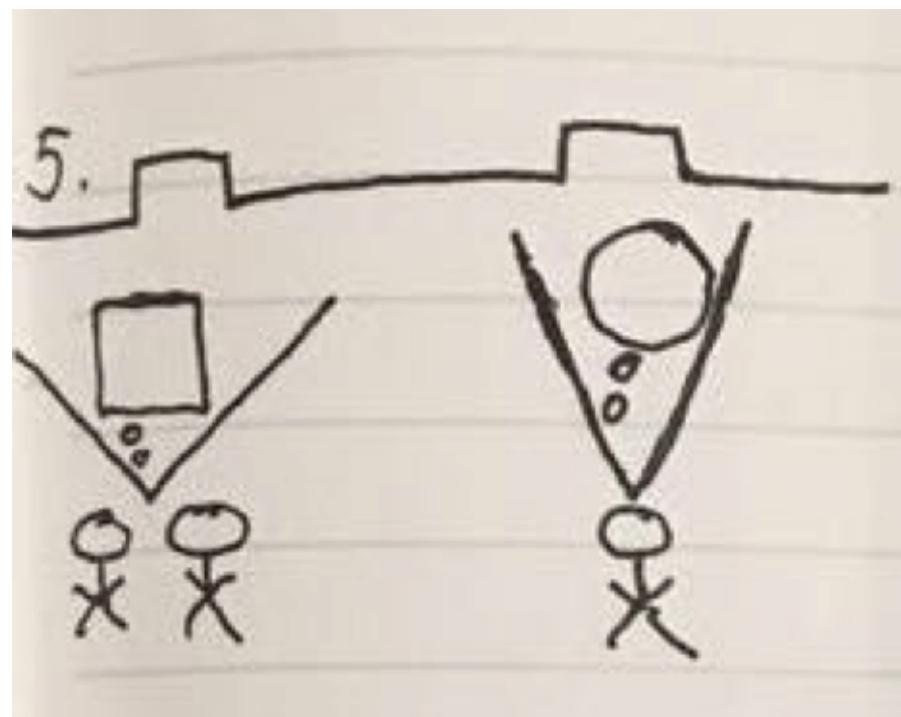
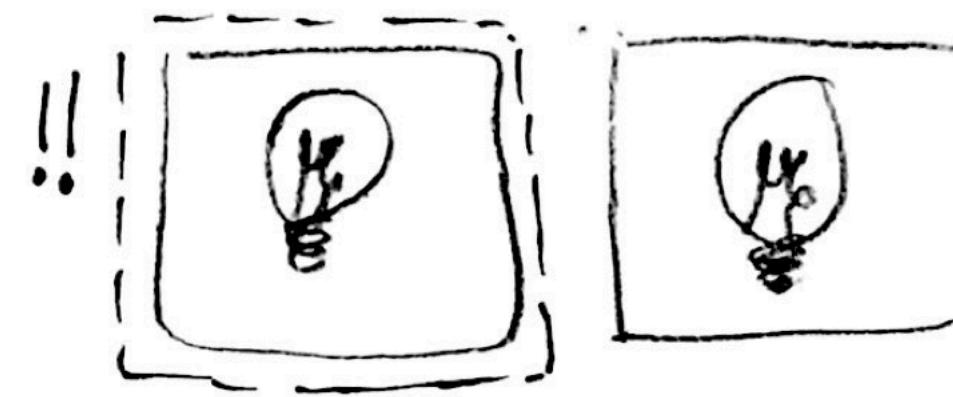
- We make many implicit assumptions when interpreting and constructing graphics
- Effective communication relies on understanding what these principles and tendencies are, and leveraging them for easier readability
- Our job is **not to persuade, but to show** (persuasion is sinister, showing is honest)
- Strive for **honesty** in graphics, by way of transparency

# Assignment review

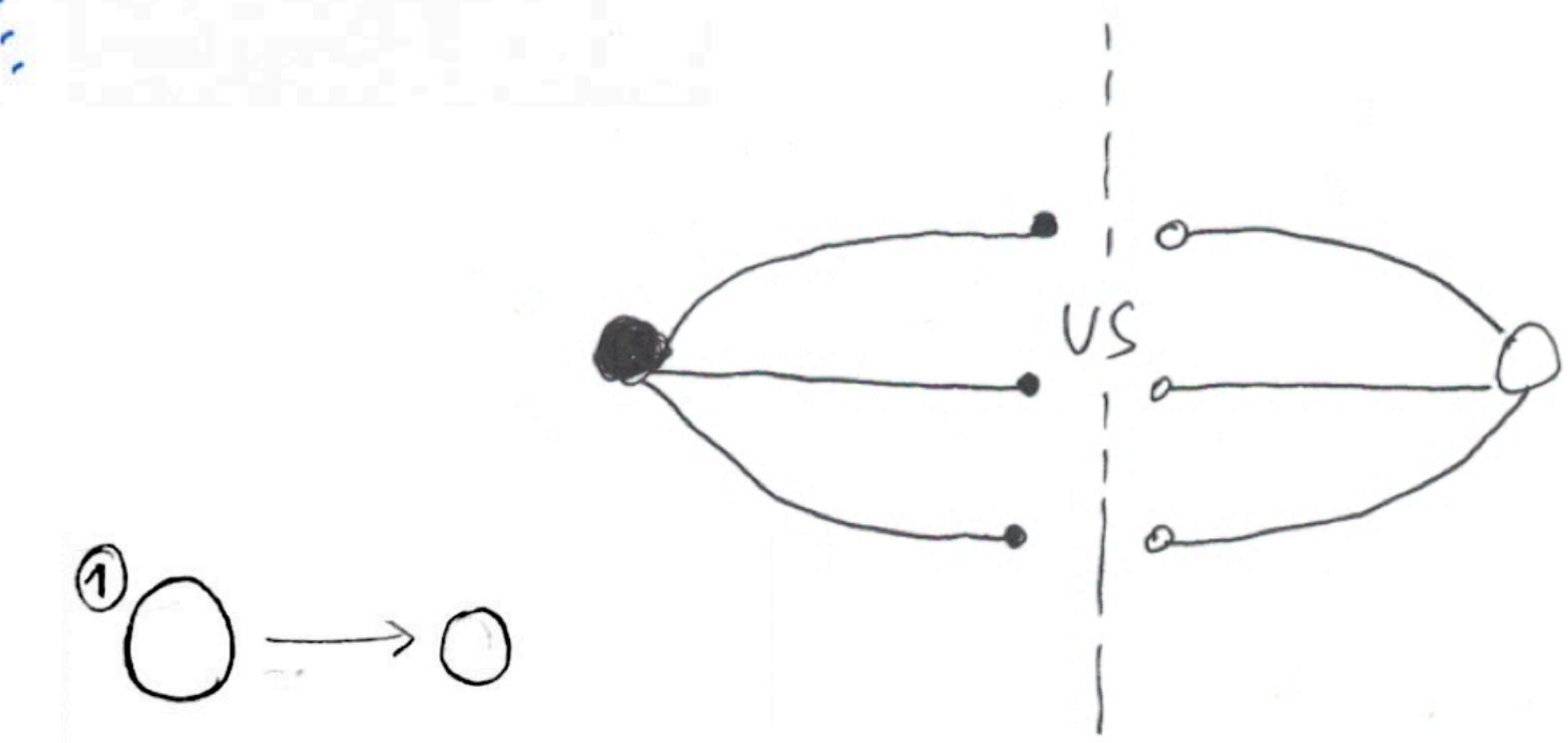
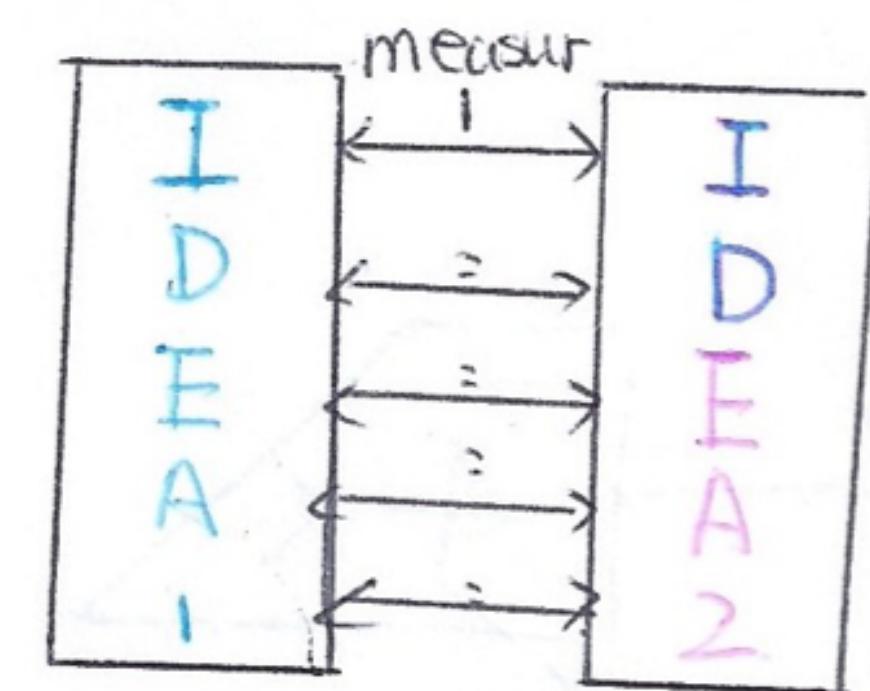
# 1. Concepts – “There is one big idea”



## 5. Concepts – “Two ideas vary on a number of measures”

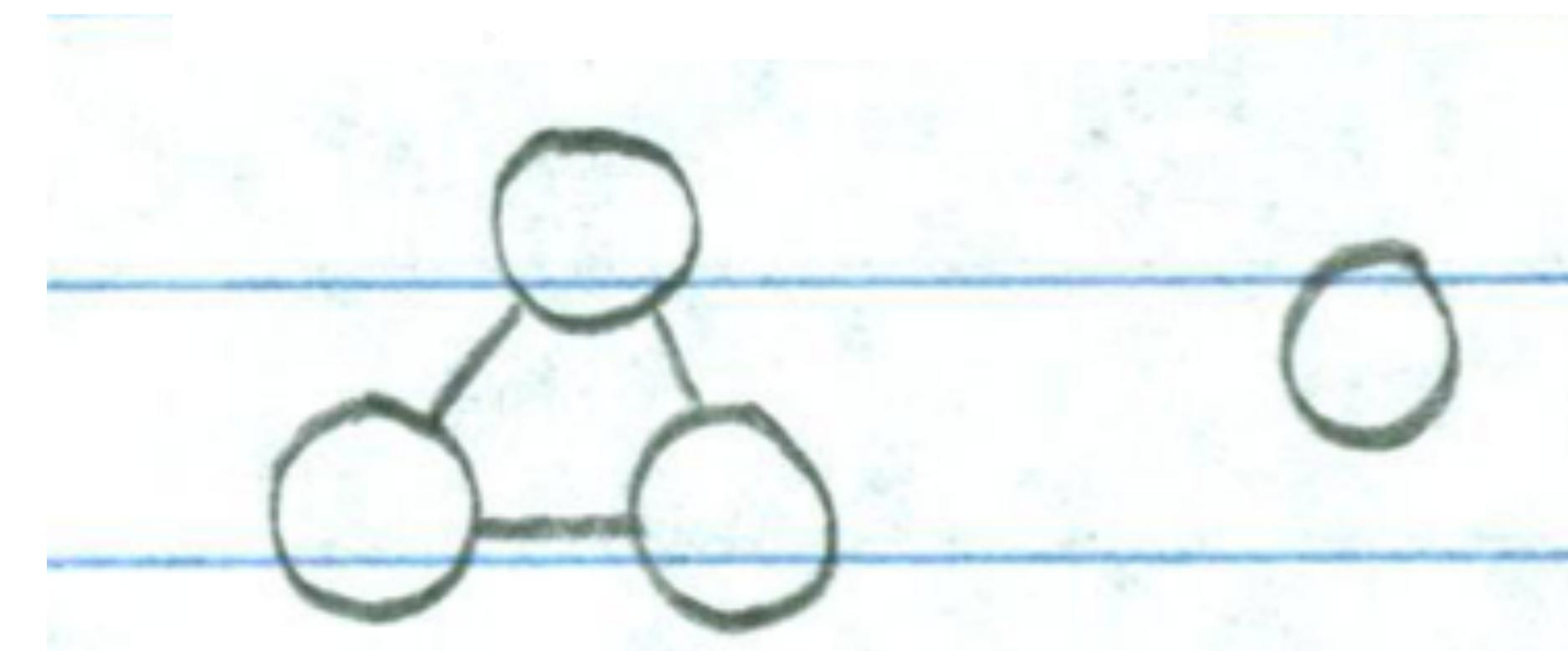
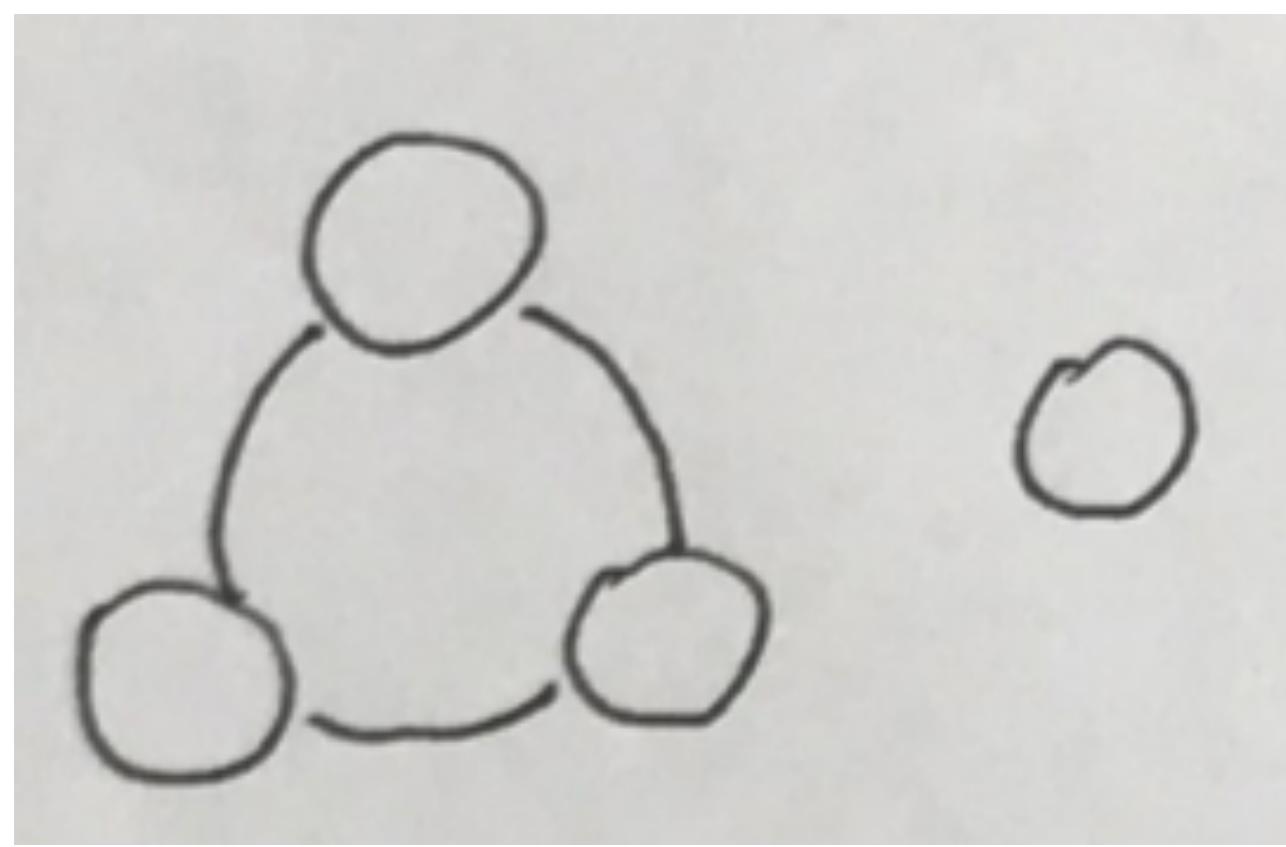
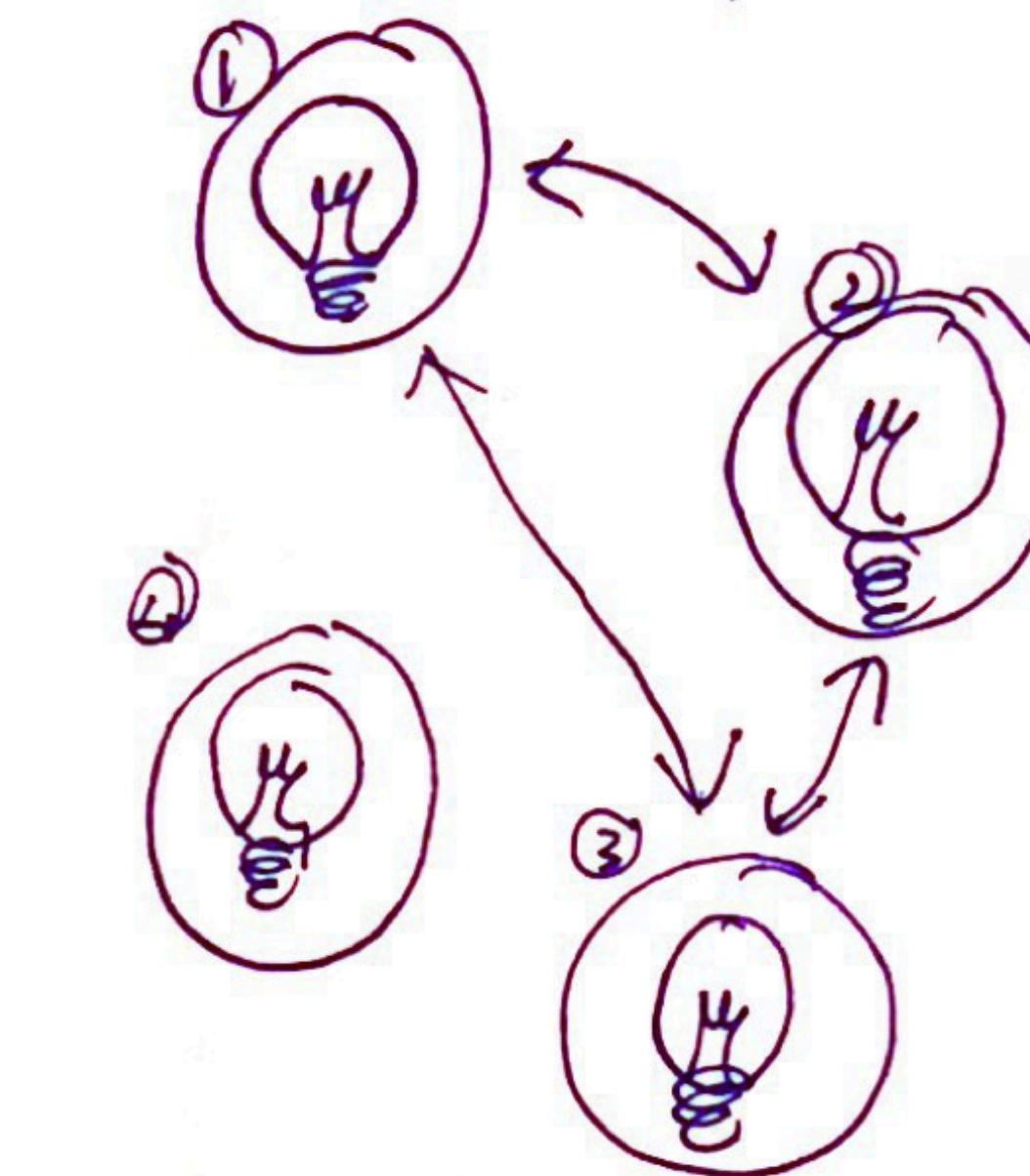
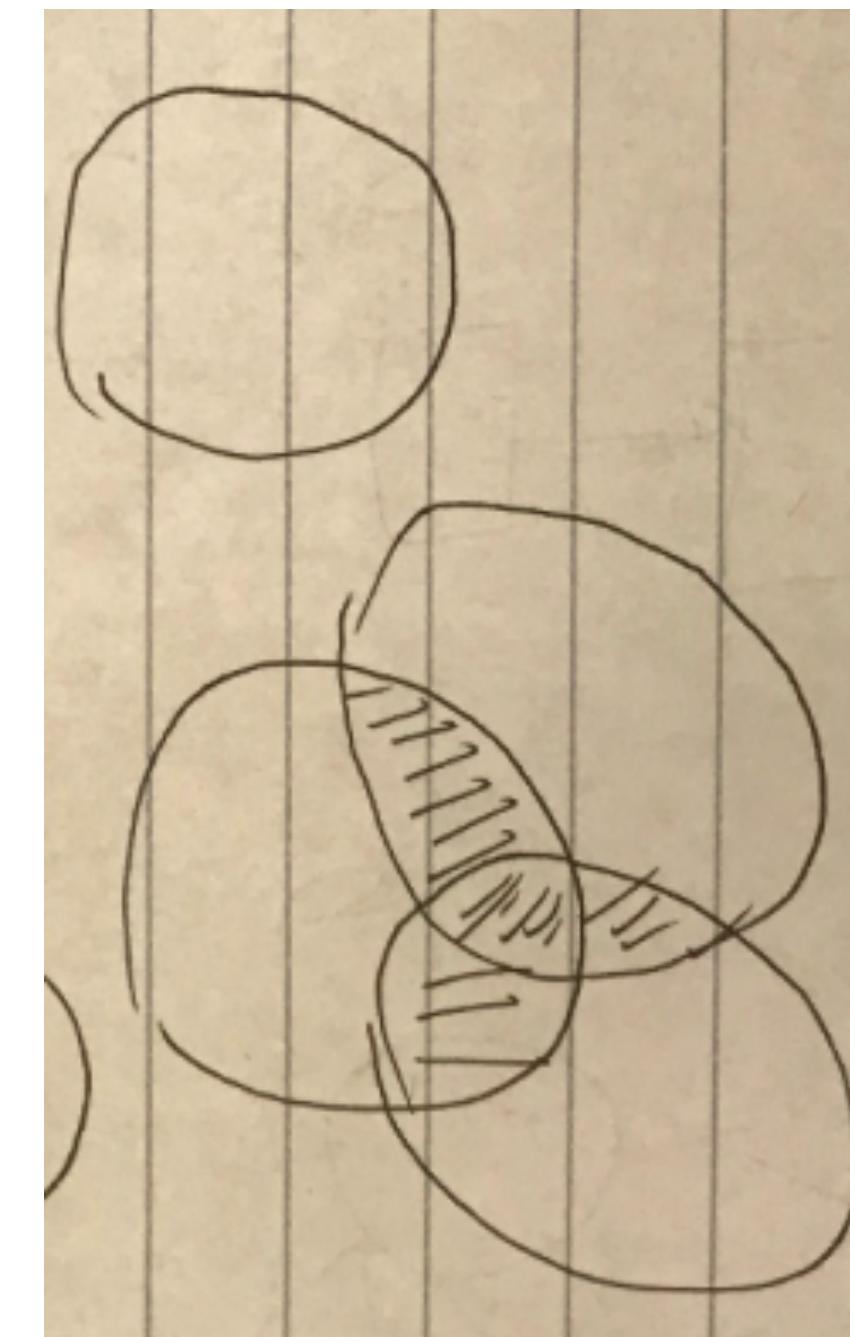
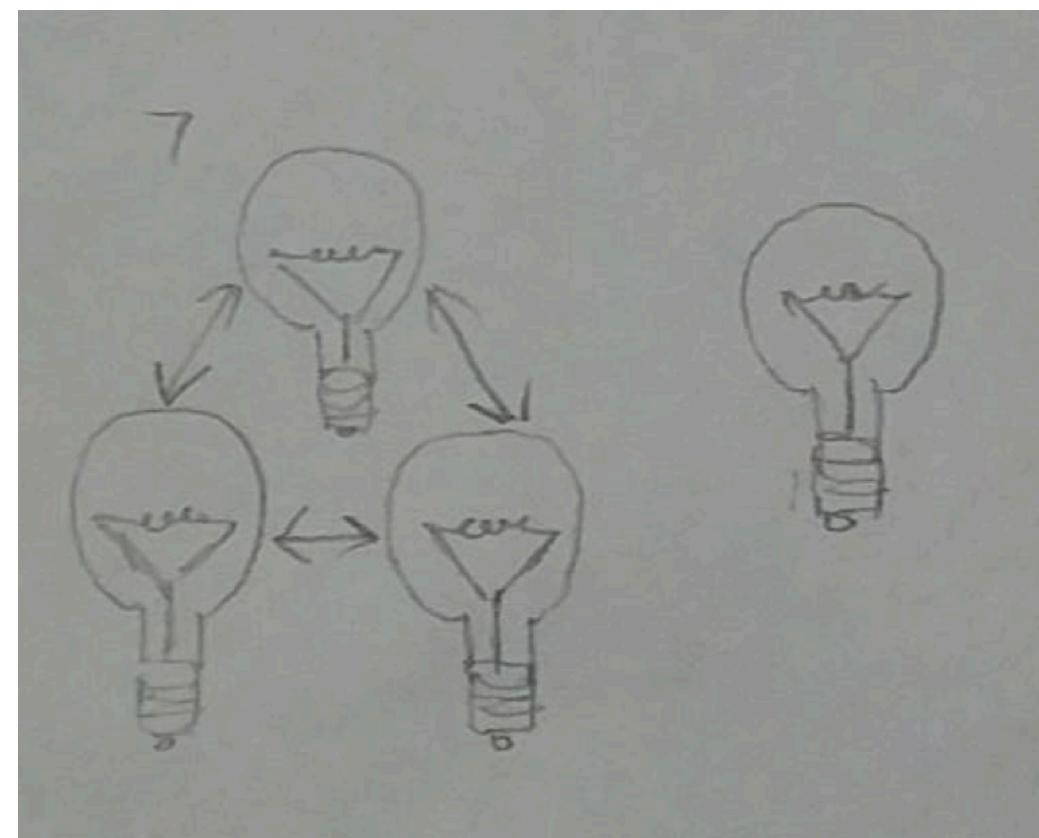


measure	ideal	idea2
1	:	:
2	:	:
3	:	:
4	:	:
⋮	⋮	⋮

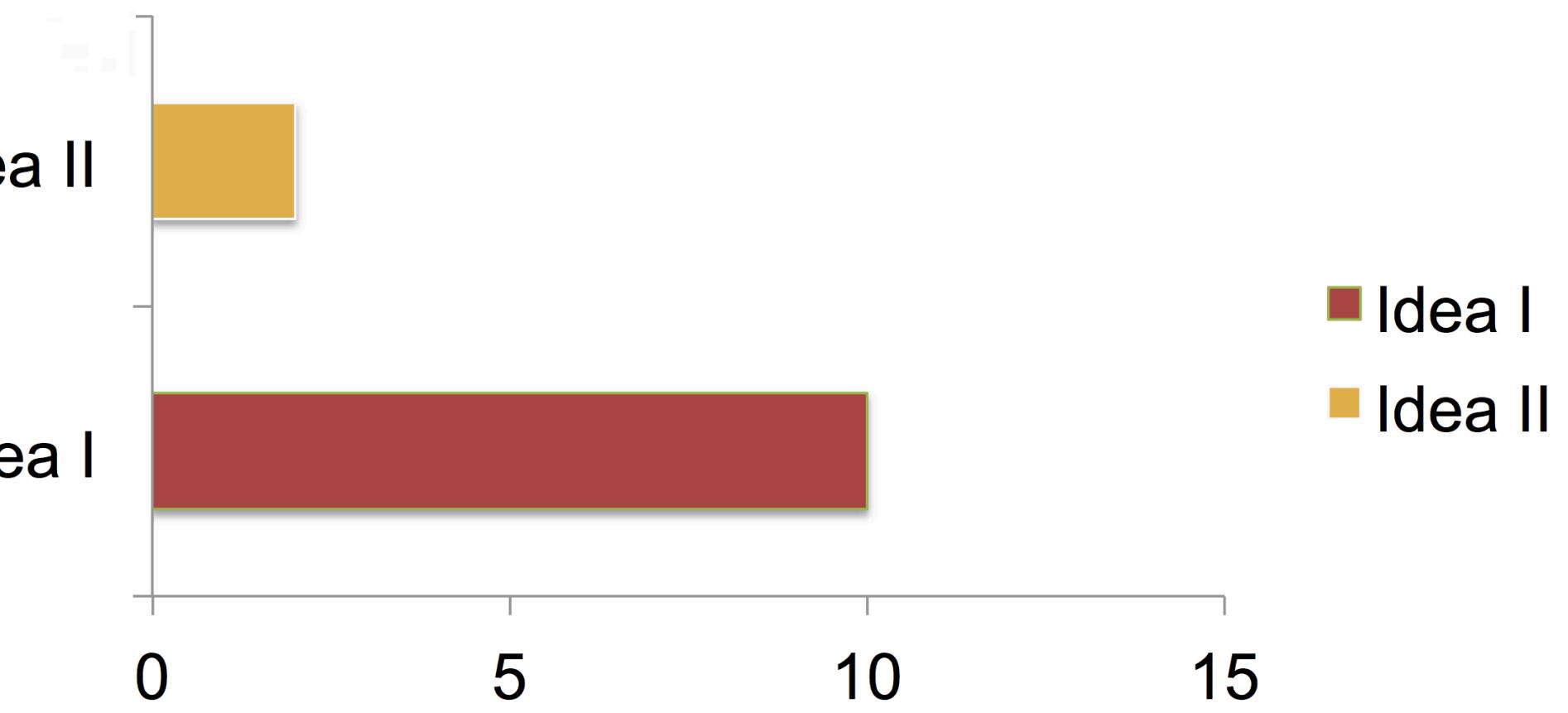
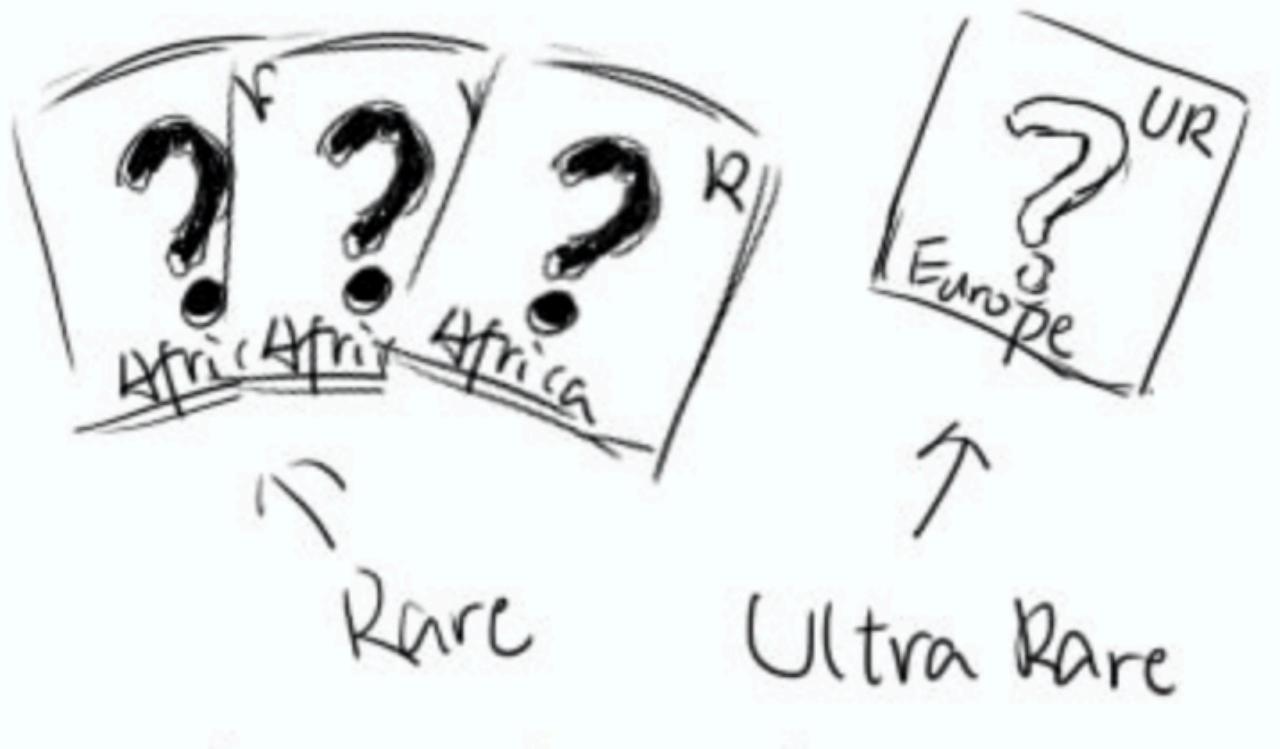
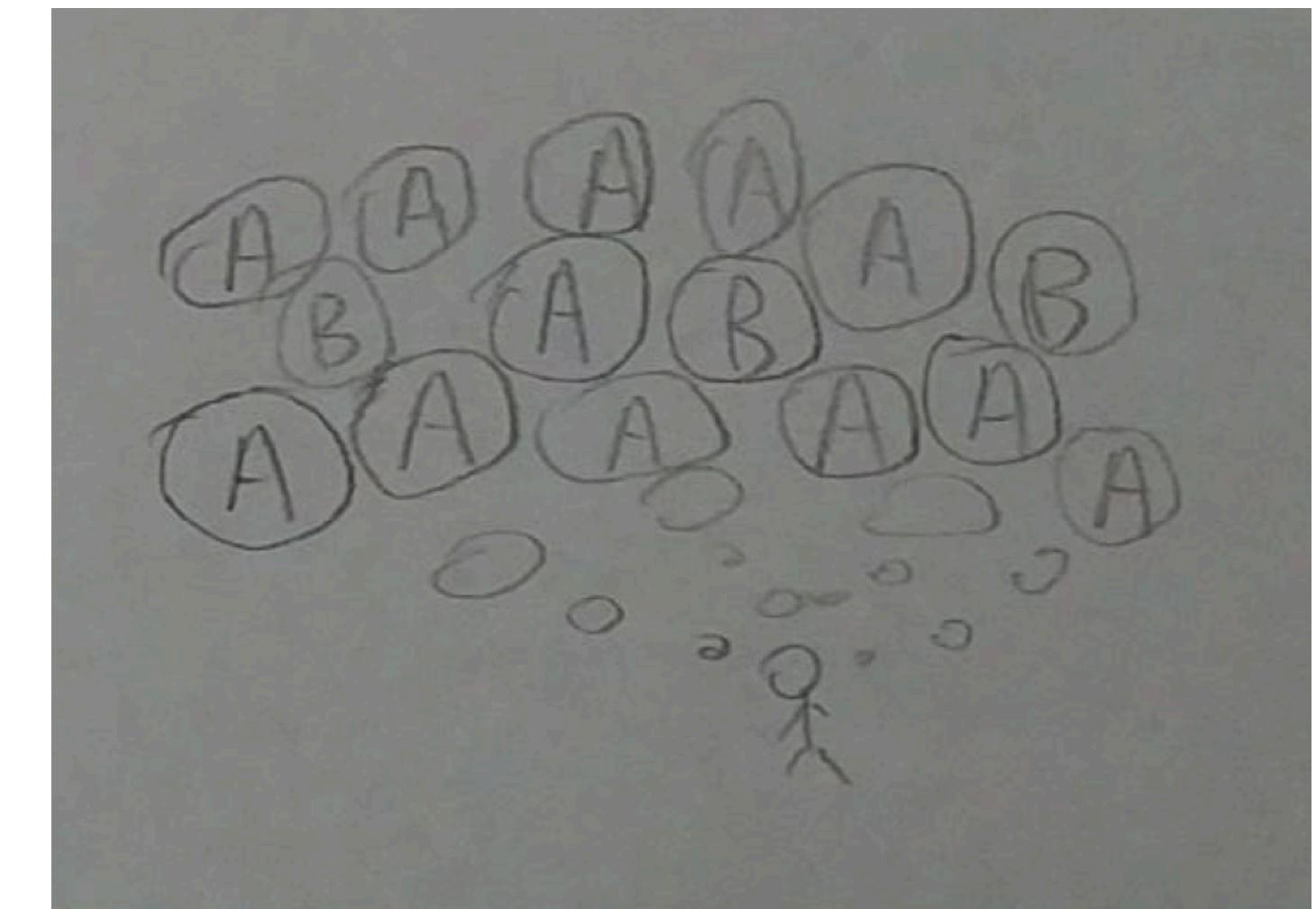
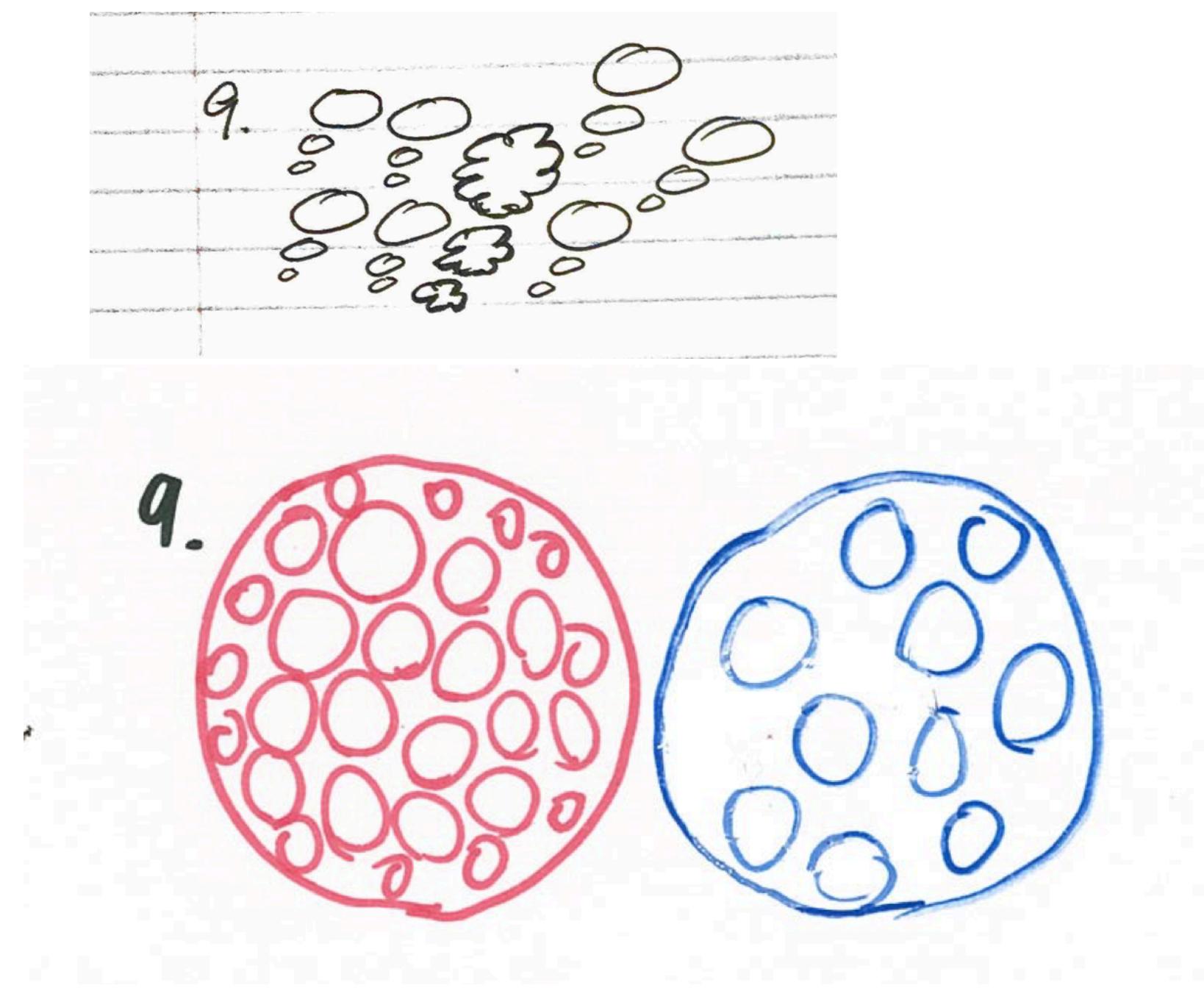
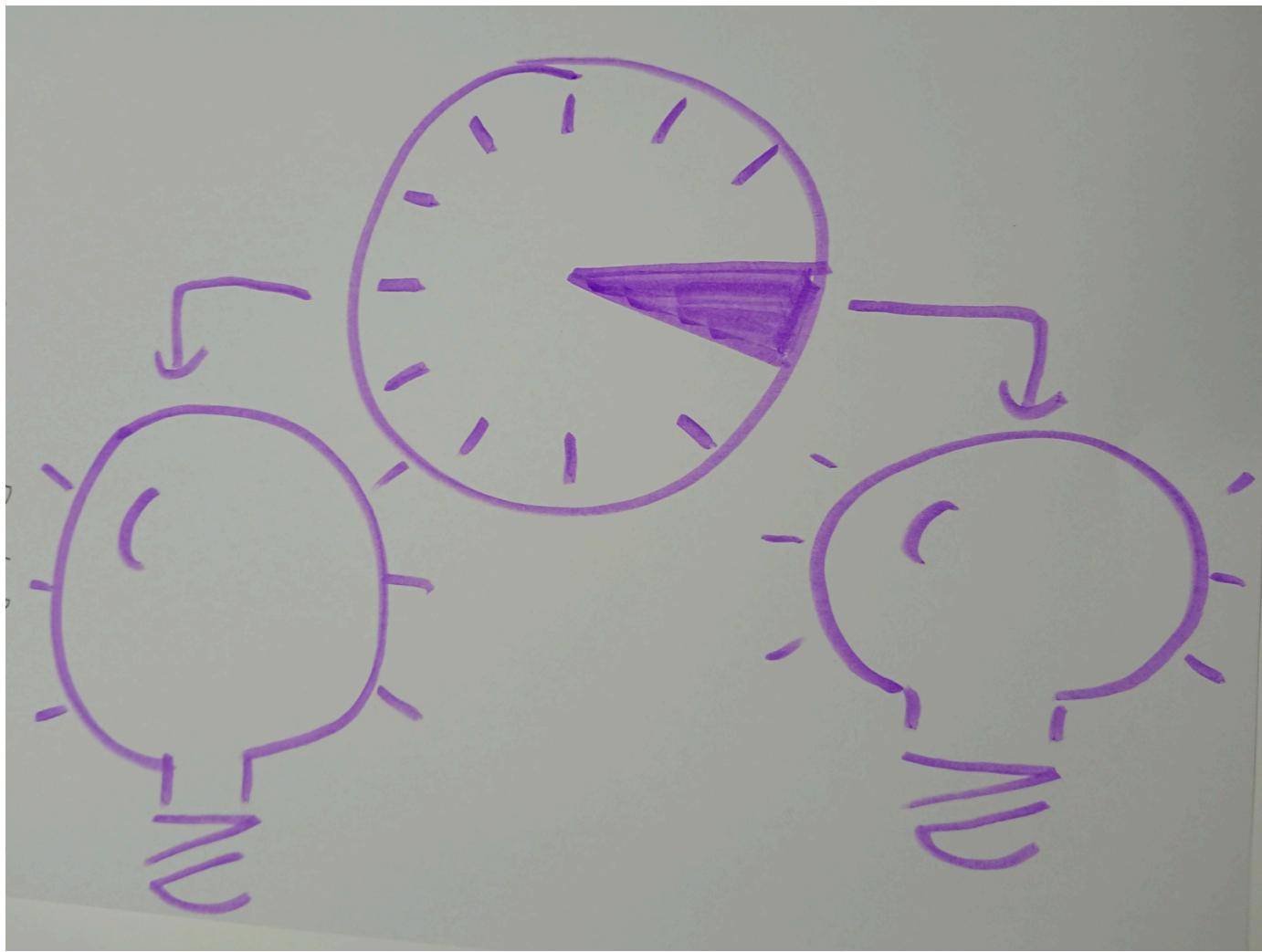


- ① →
- ② →
- ③ →
- ④ →

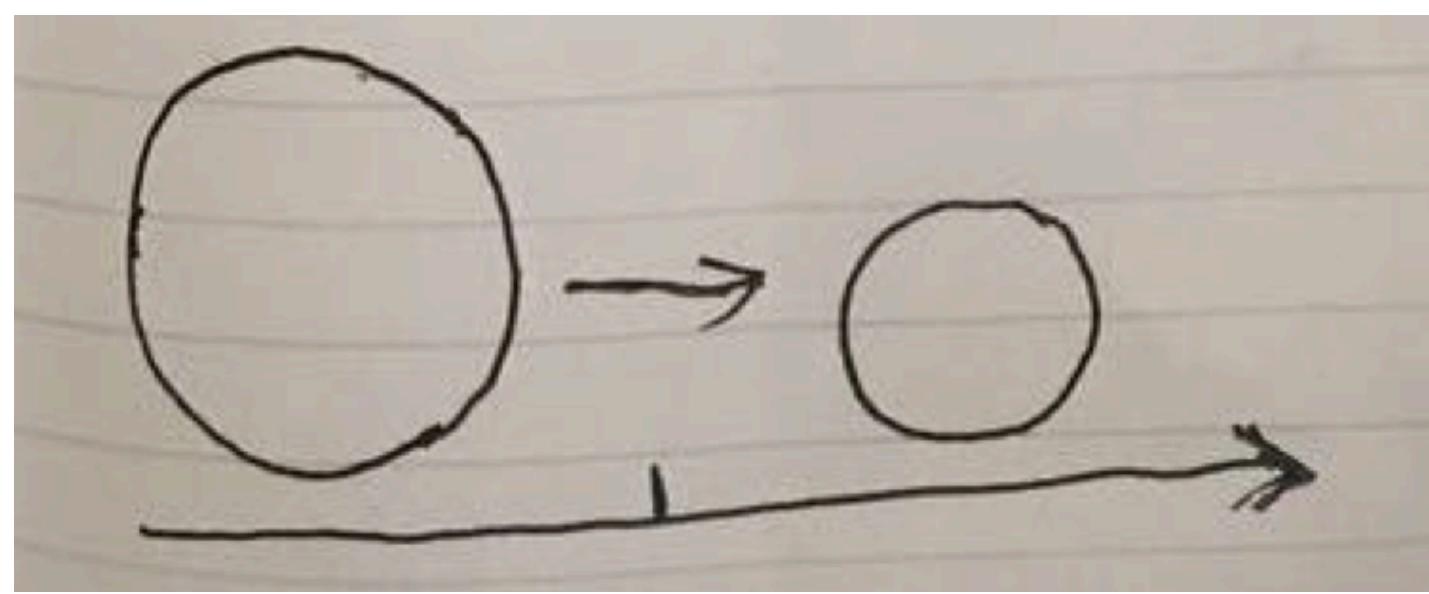
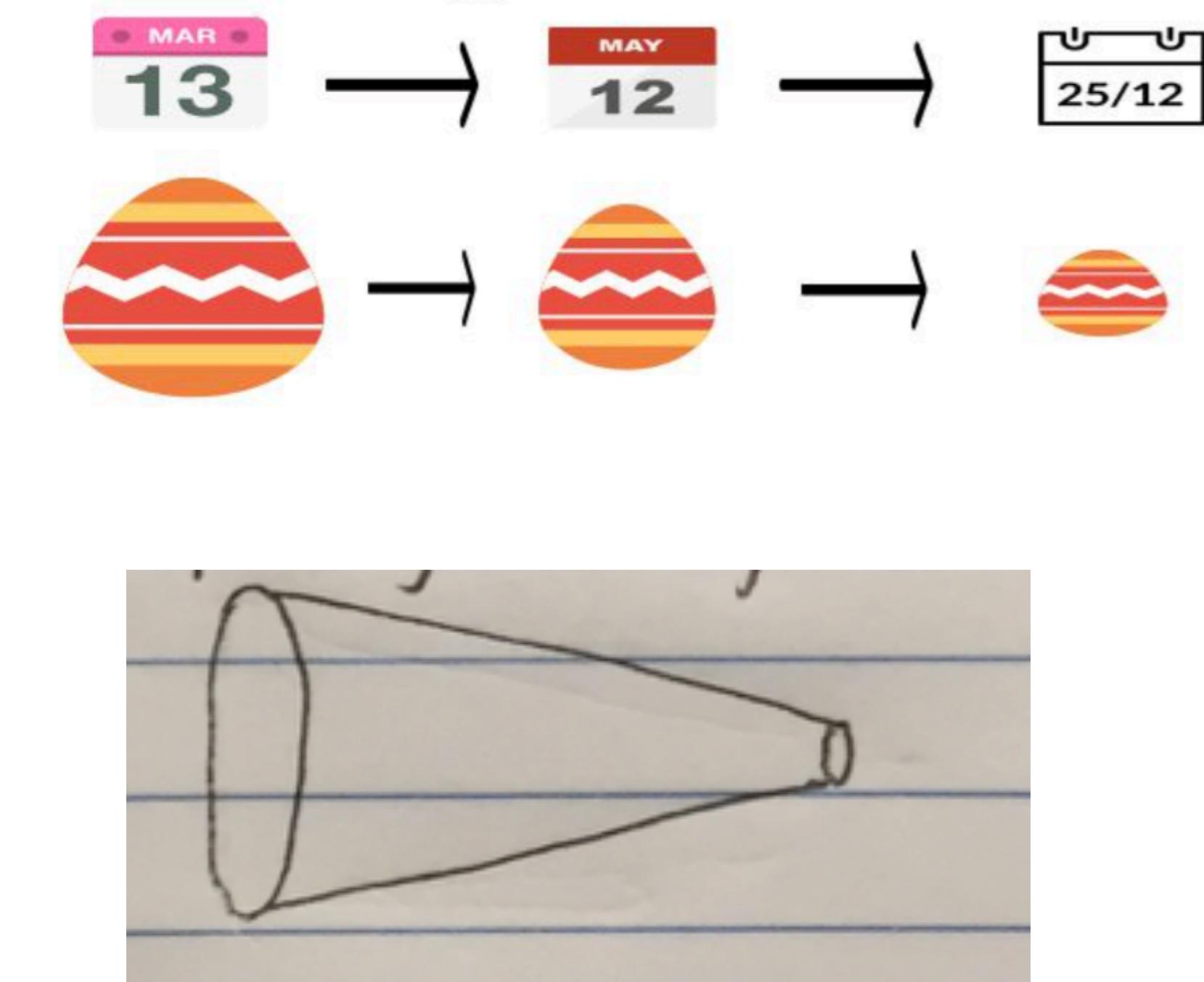
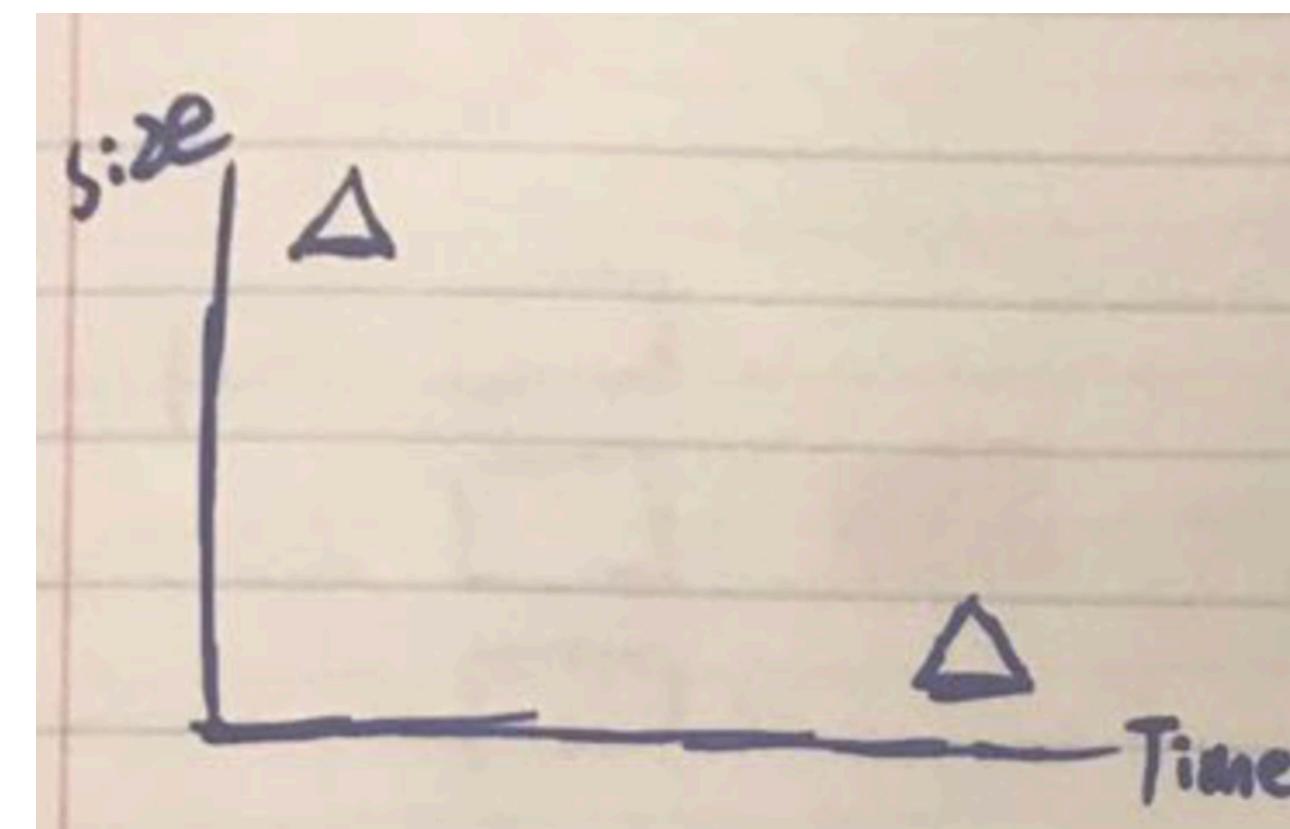
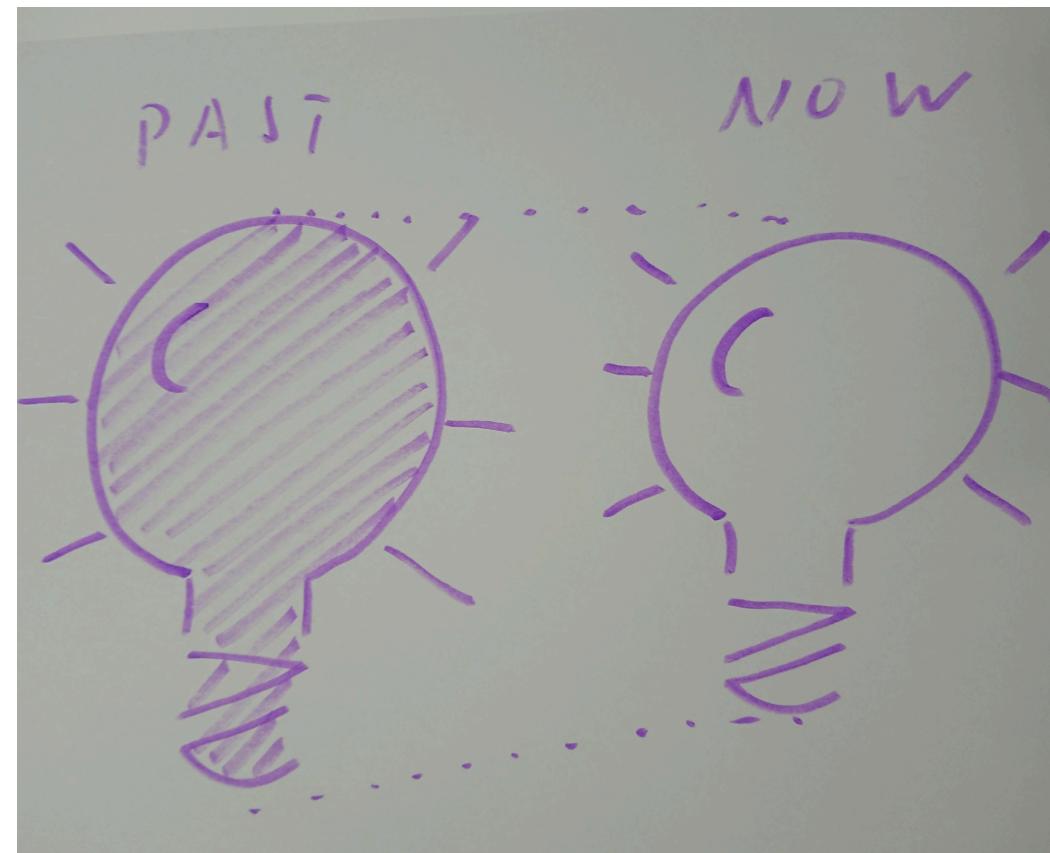
## 7. Concepts – “Three ideas relate to each other but one does not”



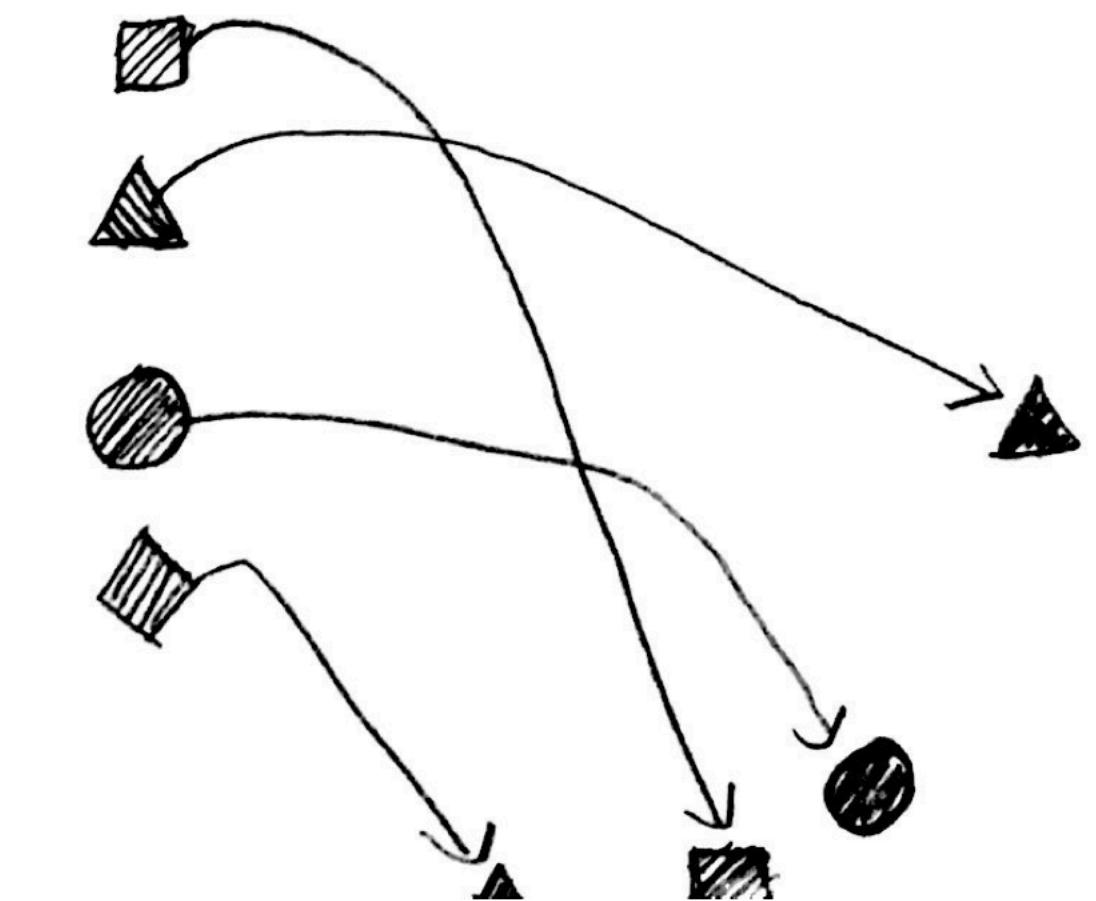
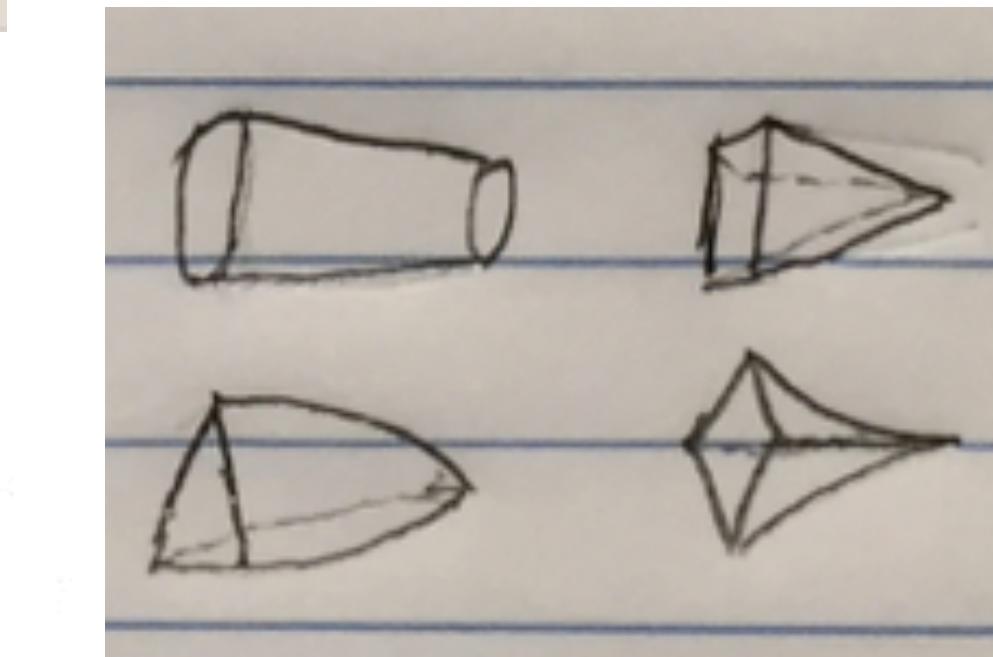
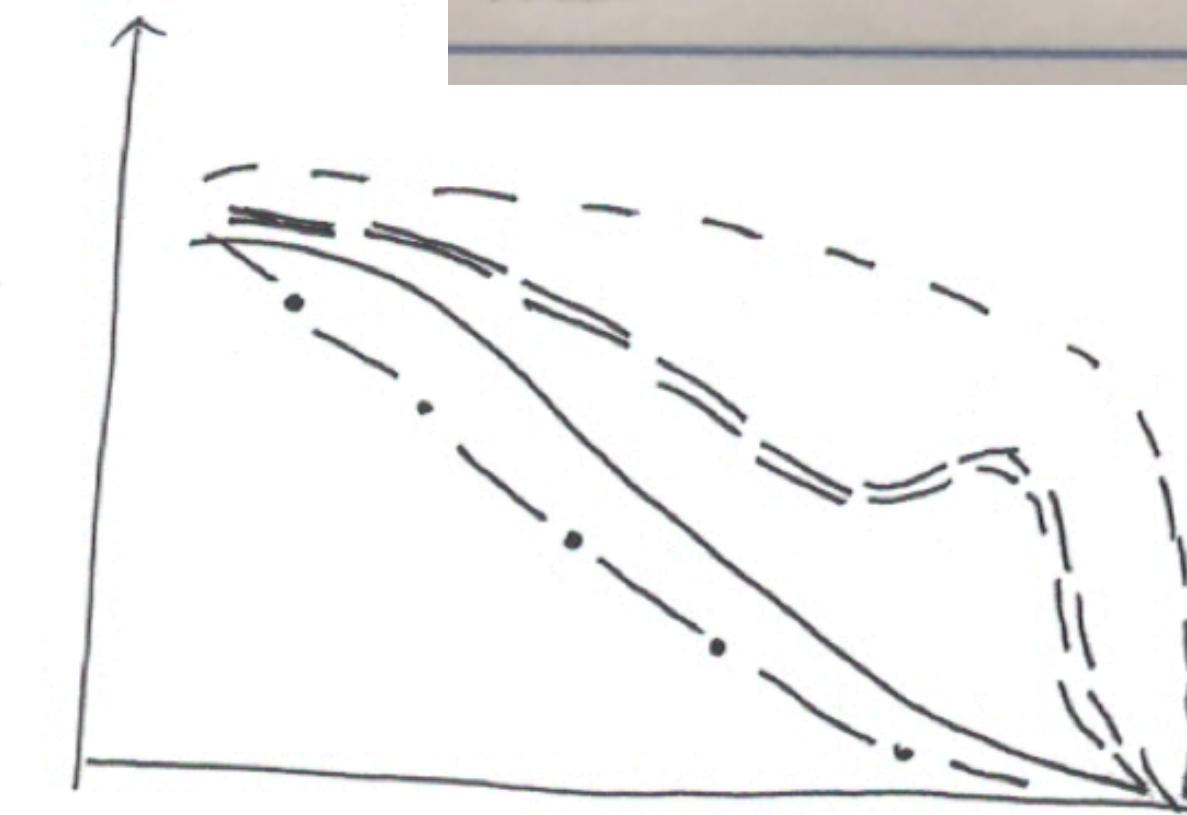
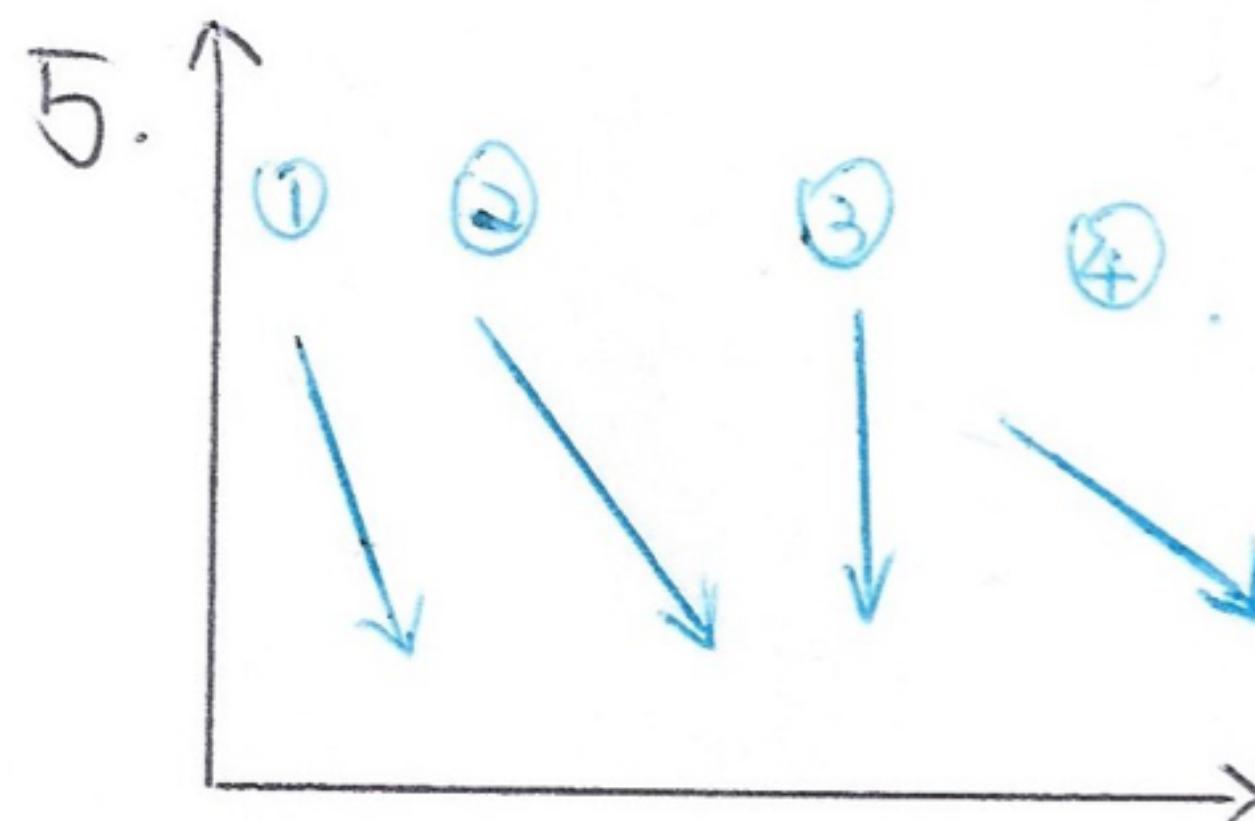
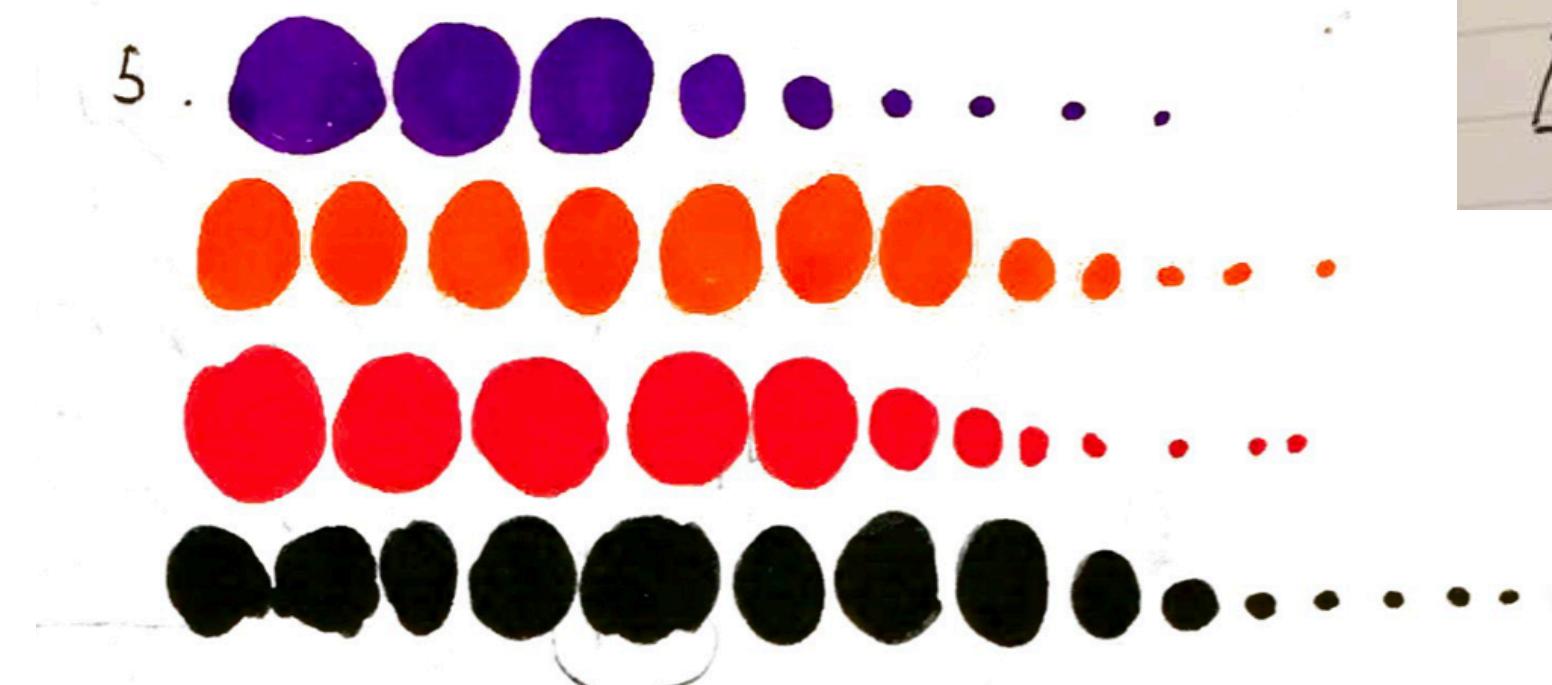
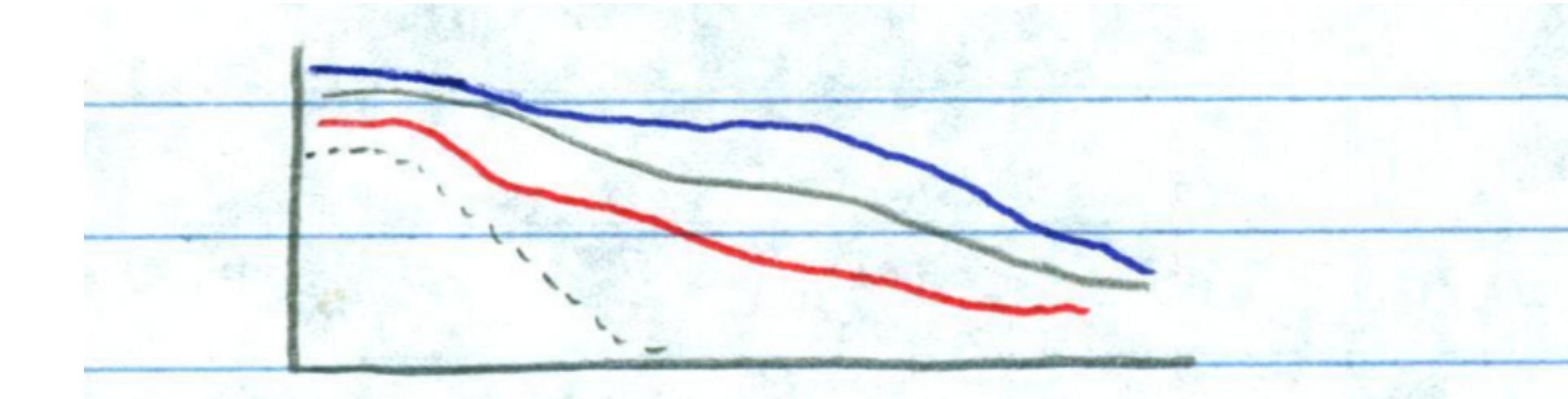
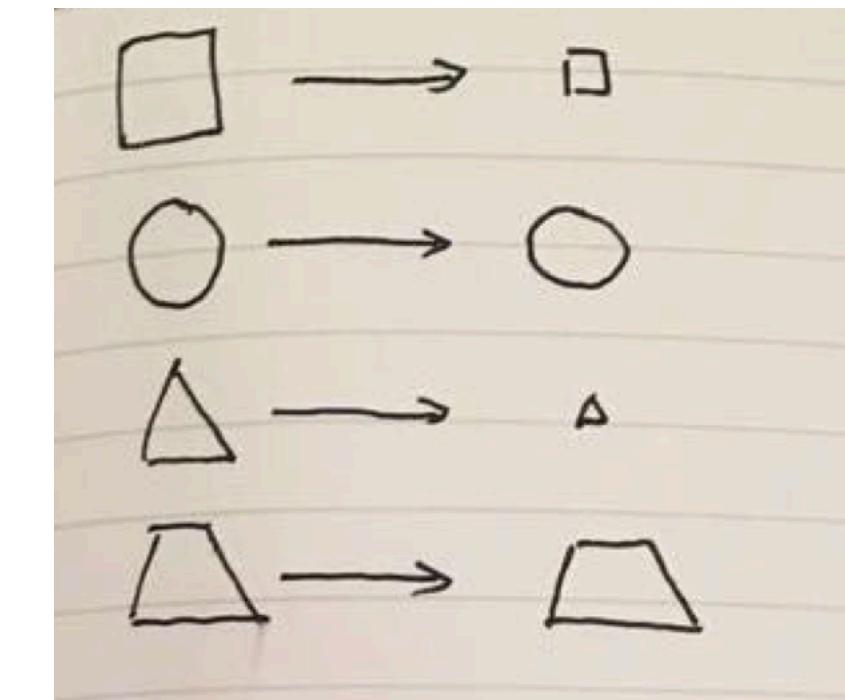
## 9. Concepts – “One idea occurs frequently; one is rare”



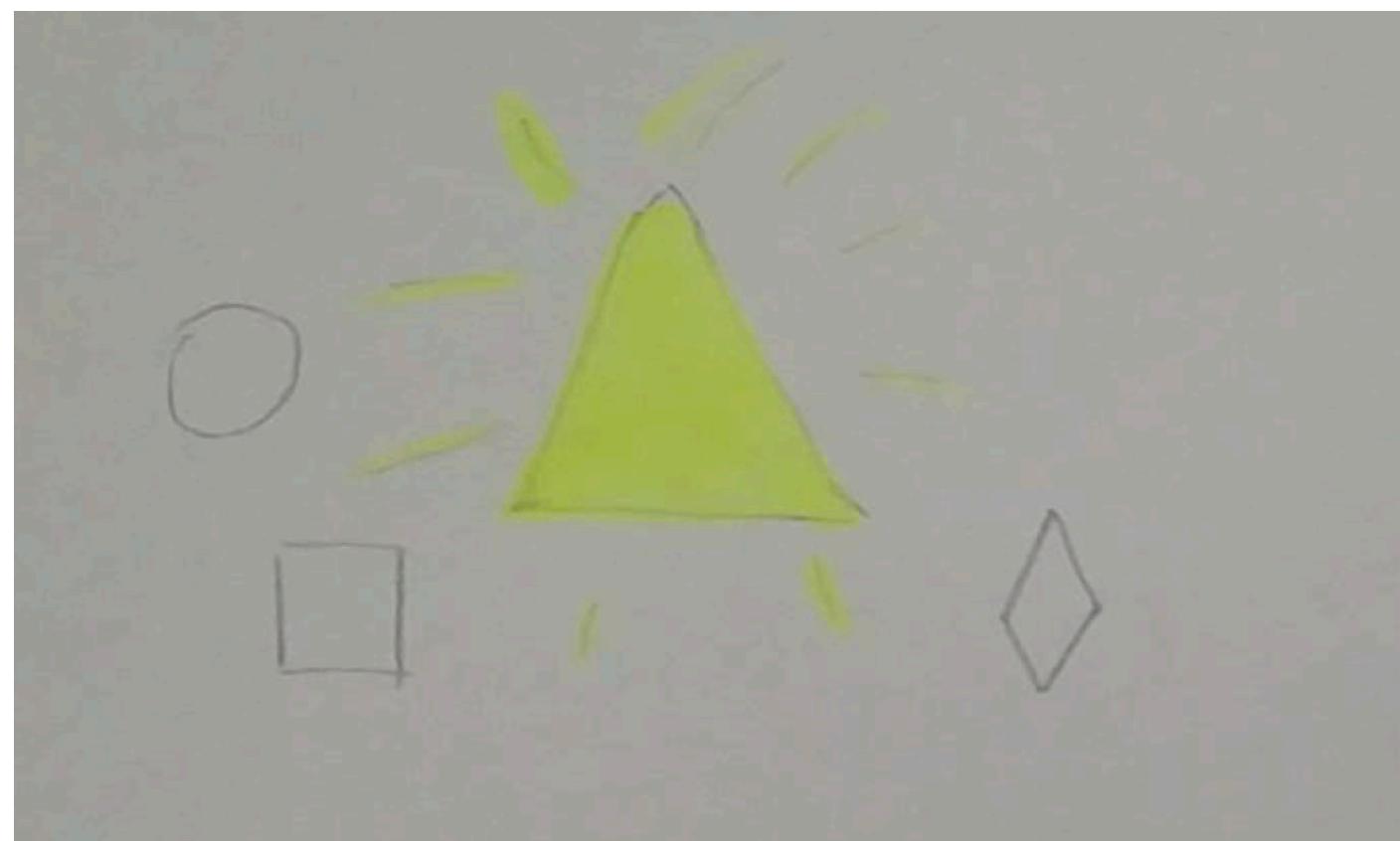
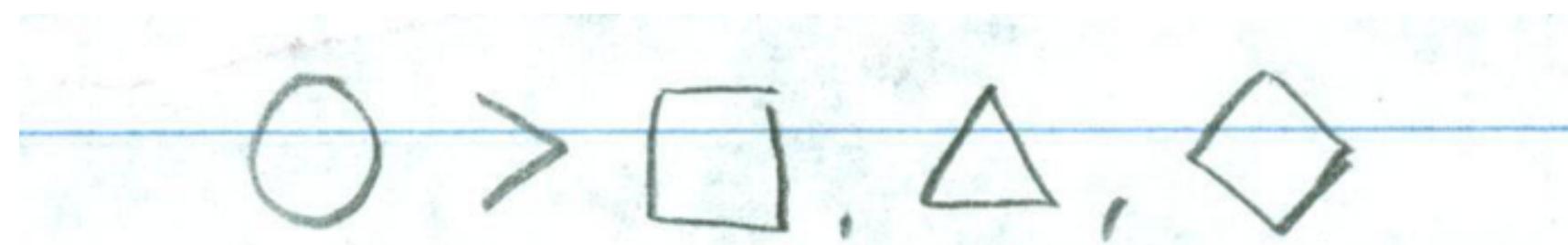
# 1. Changes over time – “It used to be bigger”



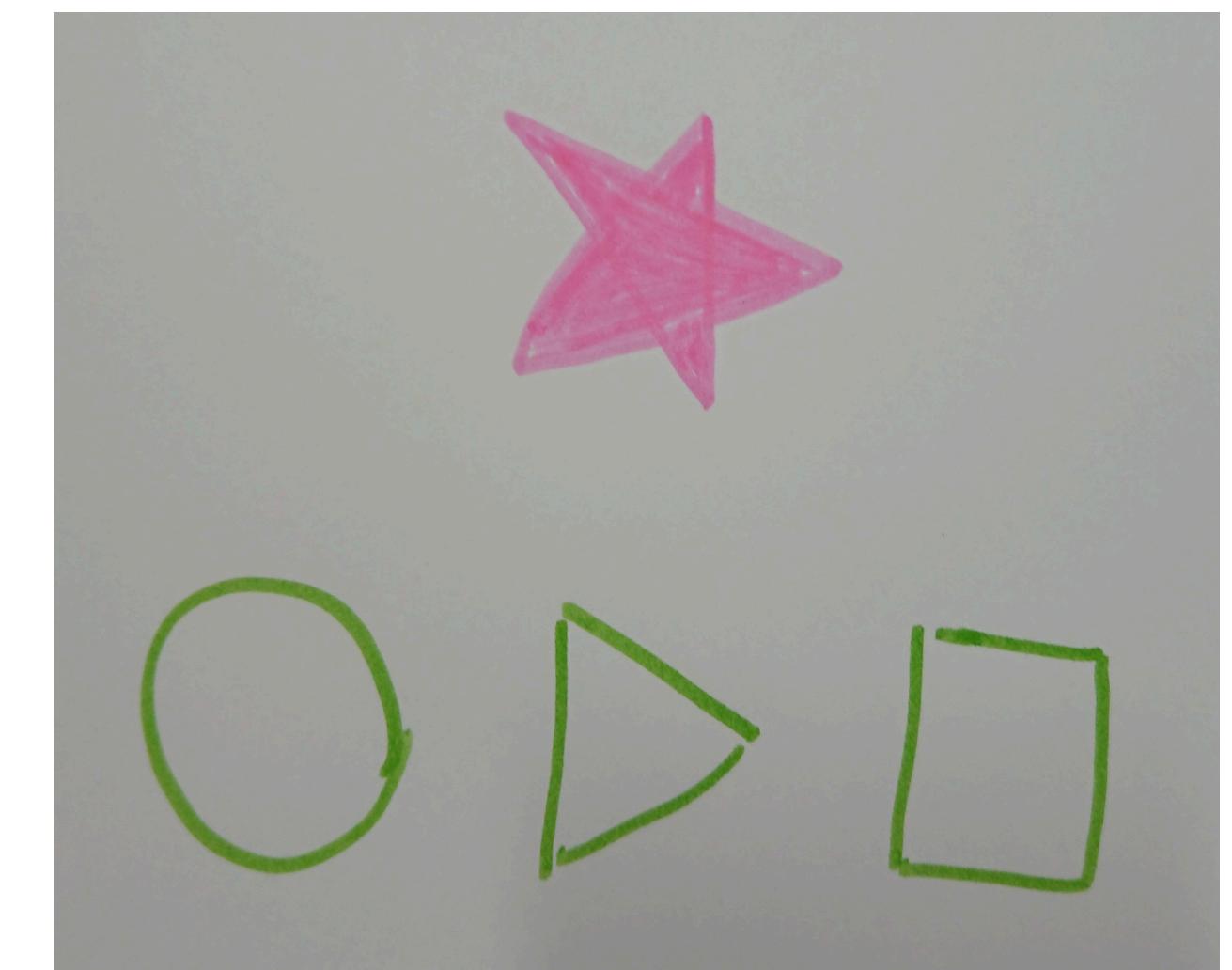
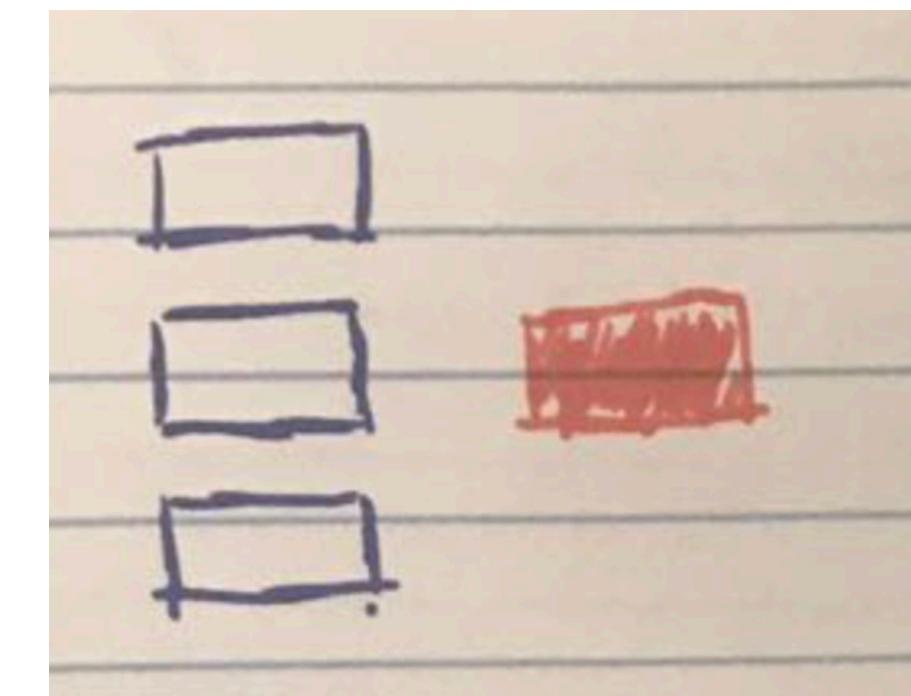
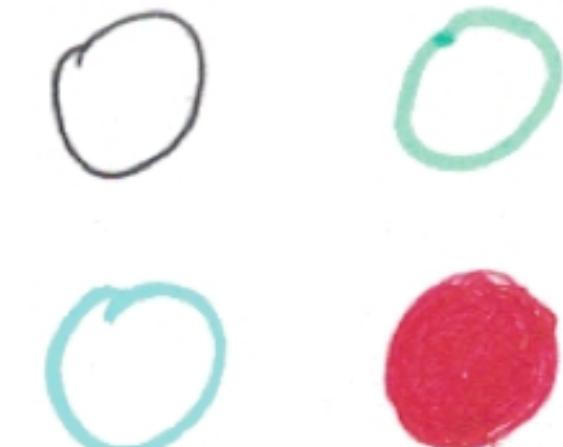
## 4. Changes over time – “Four concepts are diminishing at different rates”



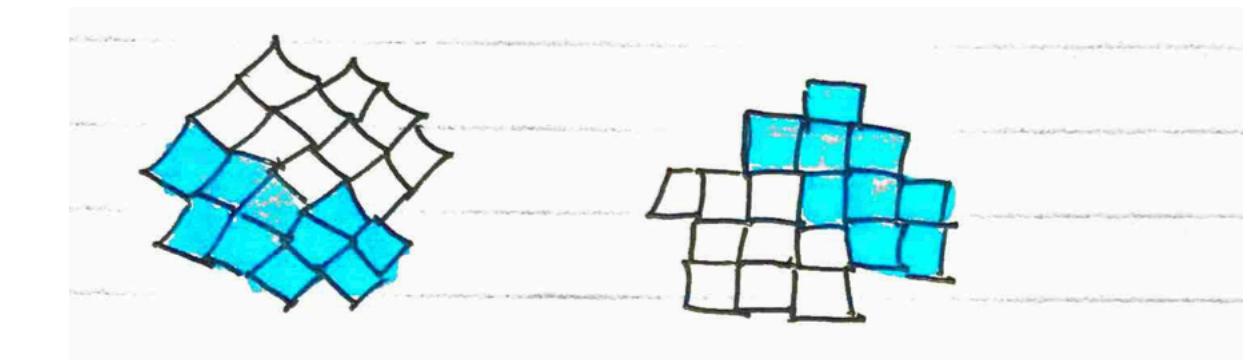
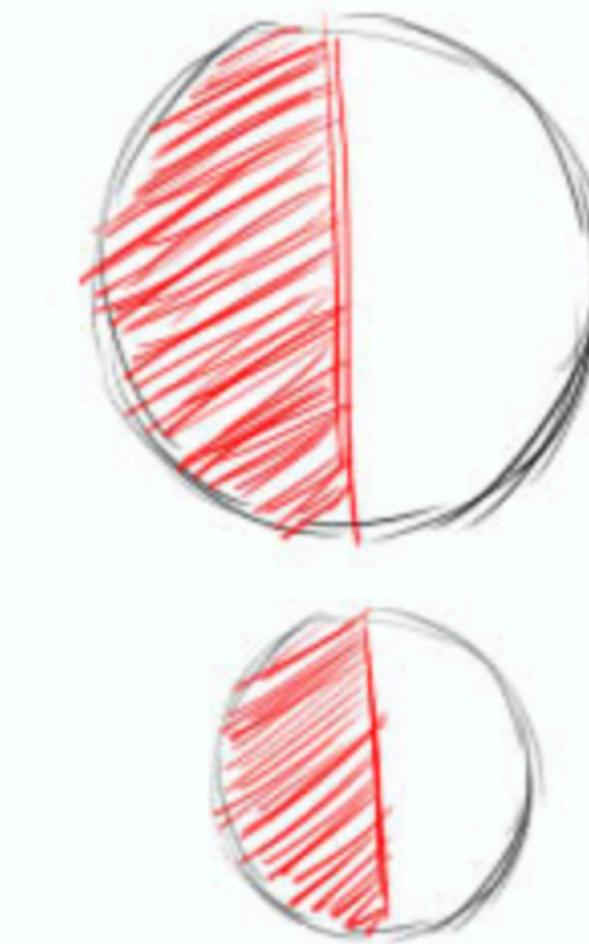
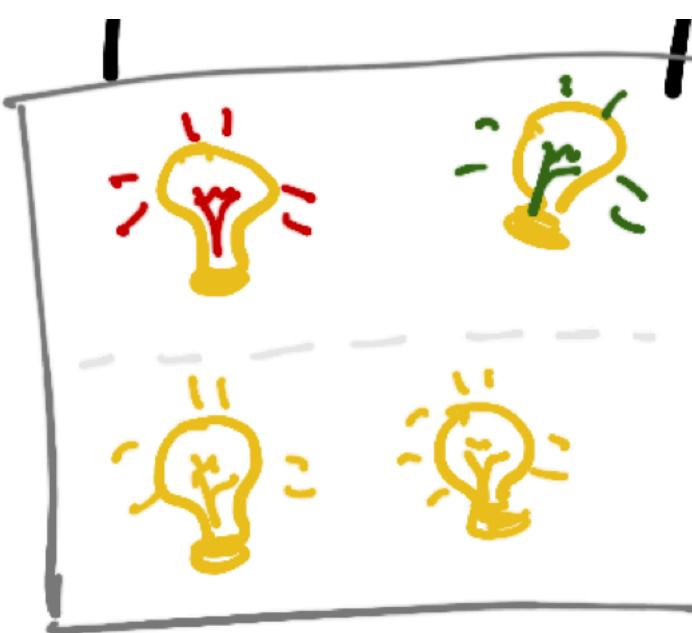
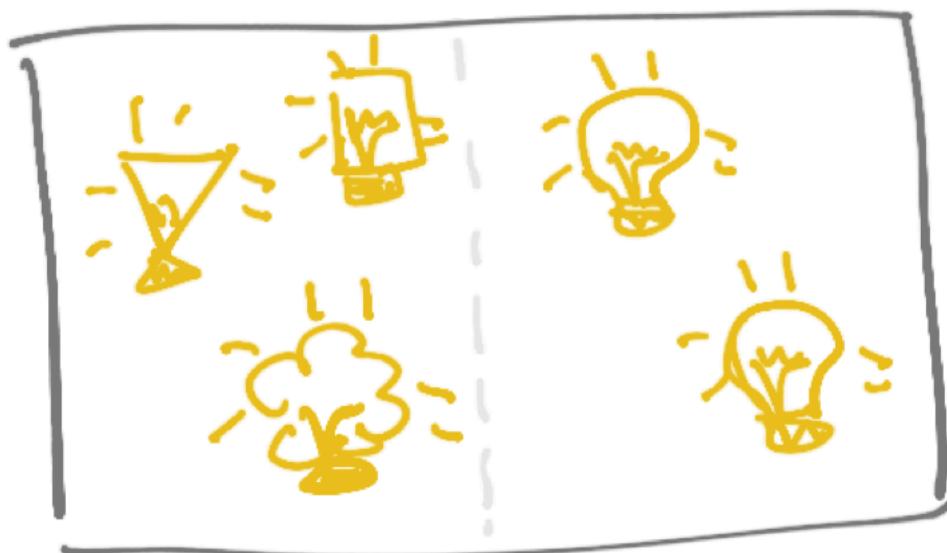
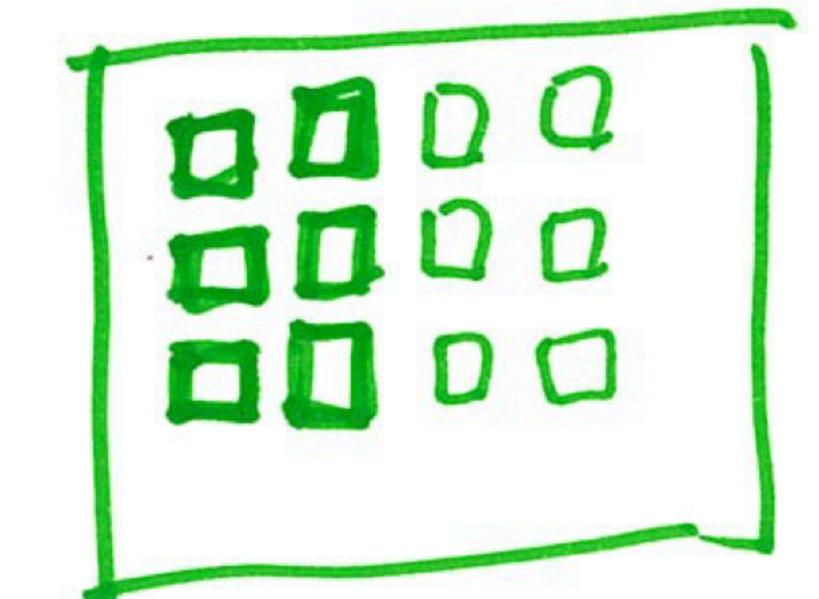
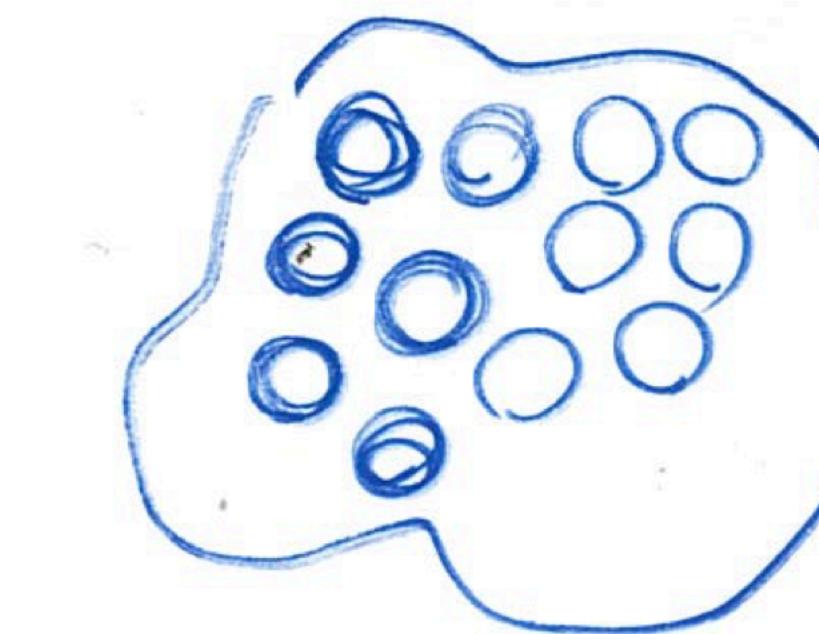
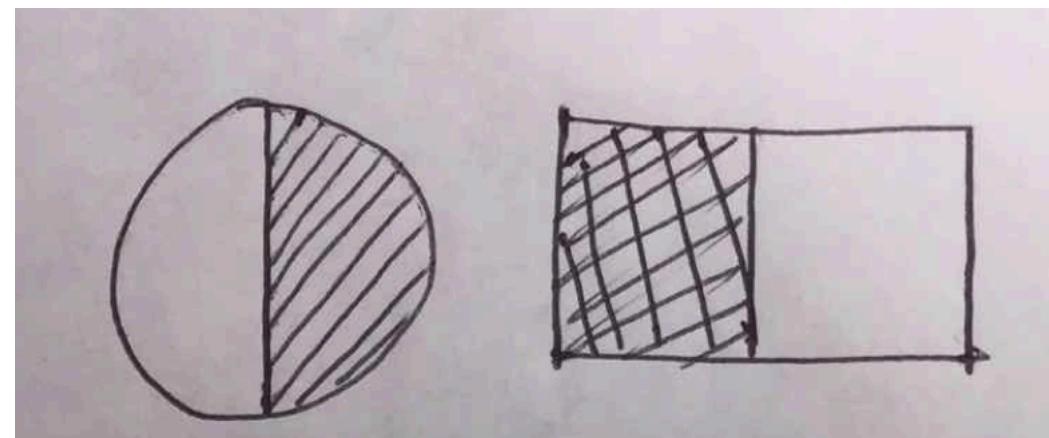
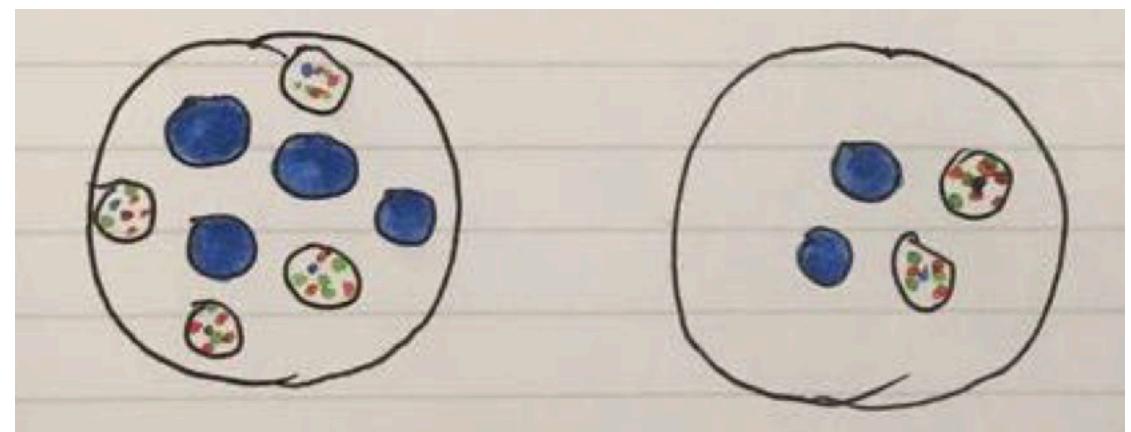
# 1. Multiple behaviors – “There are four different concepts, one is most important”



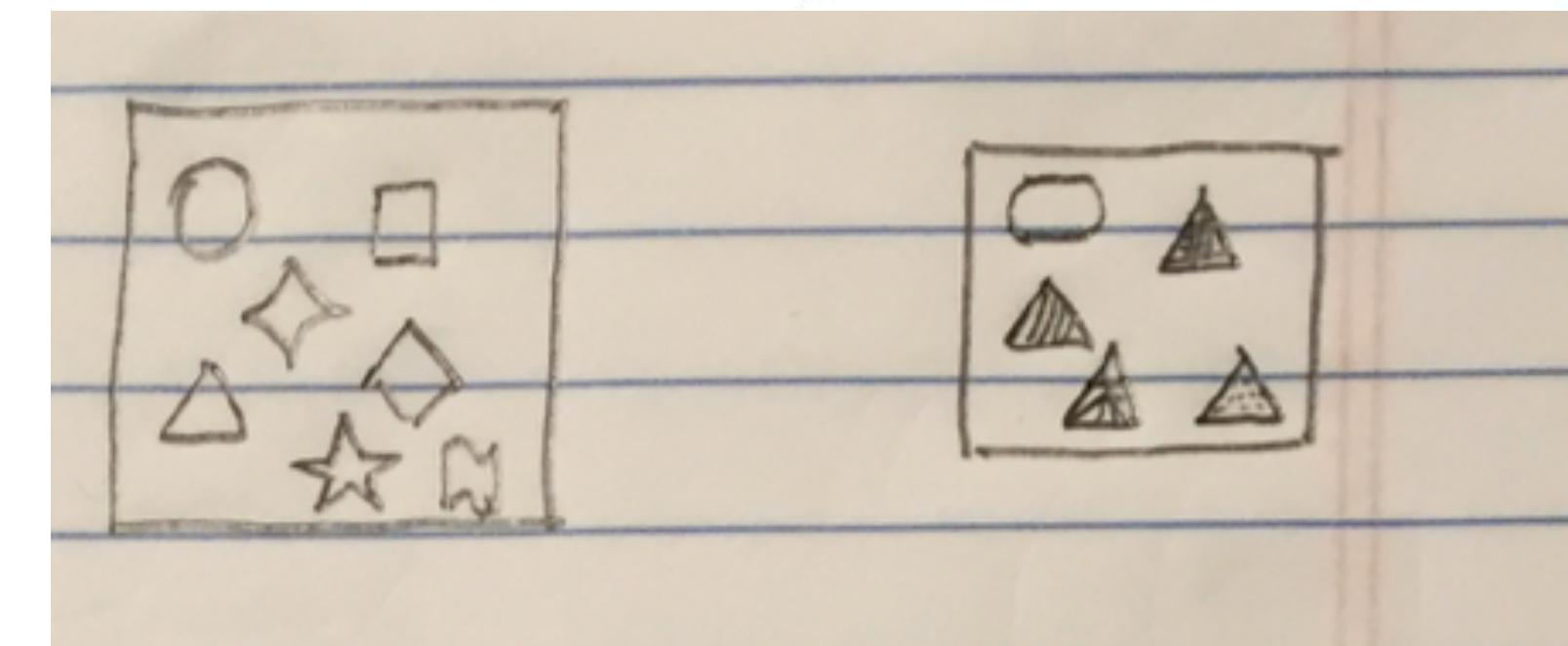
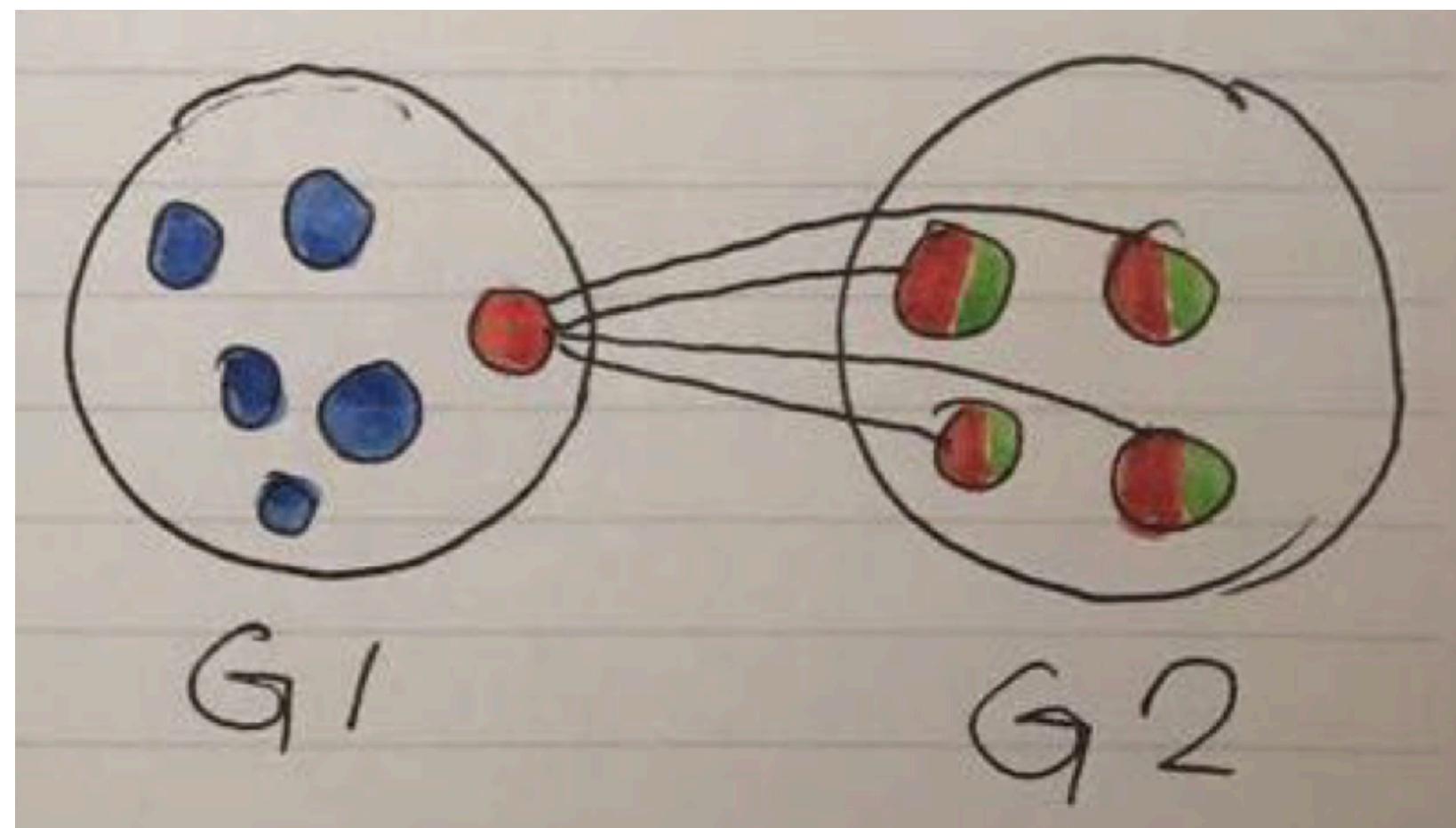
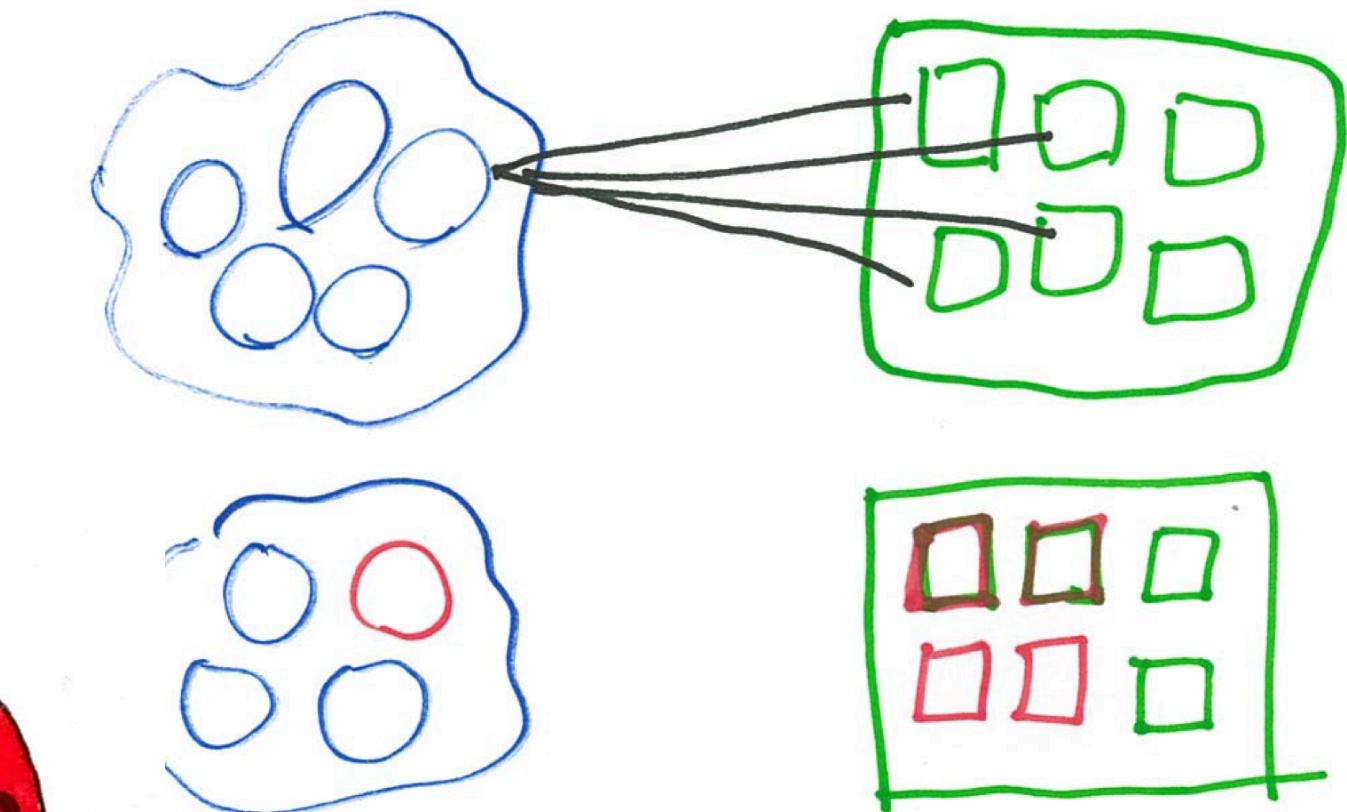
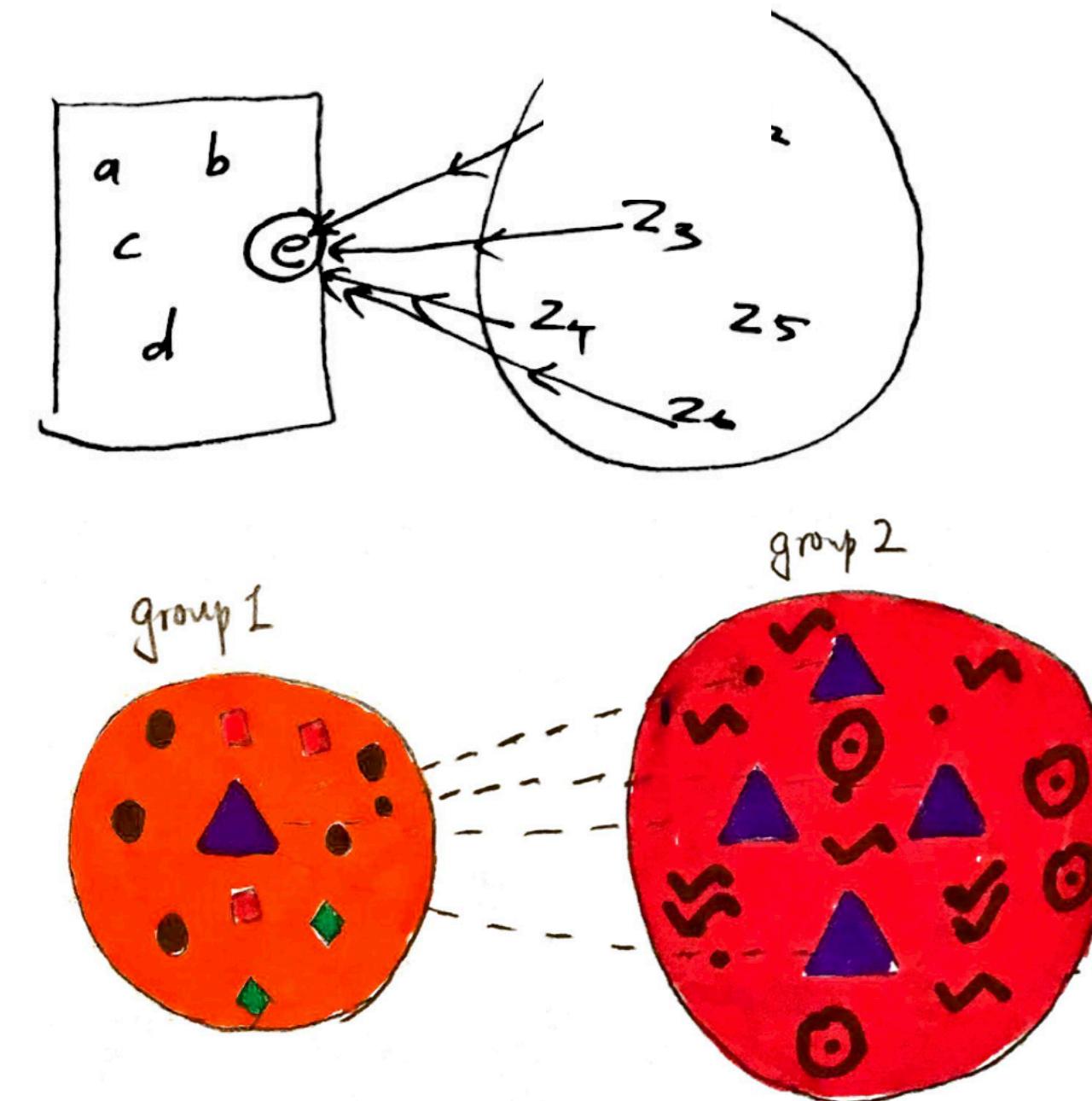
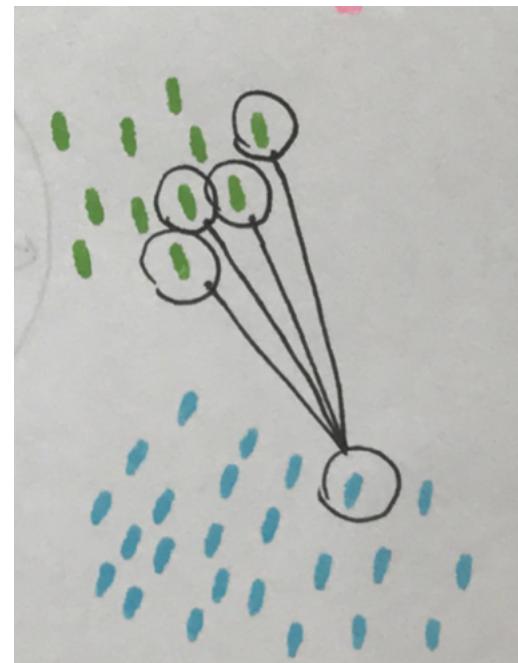
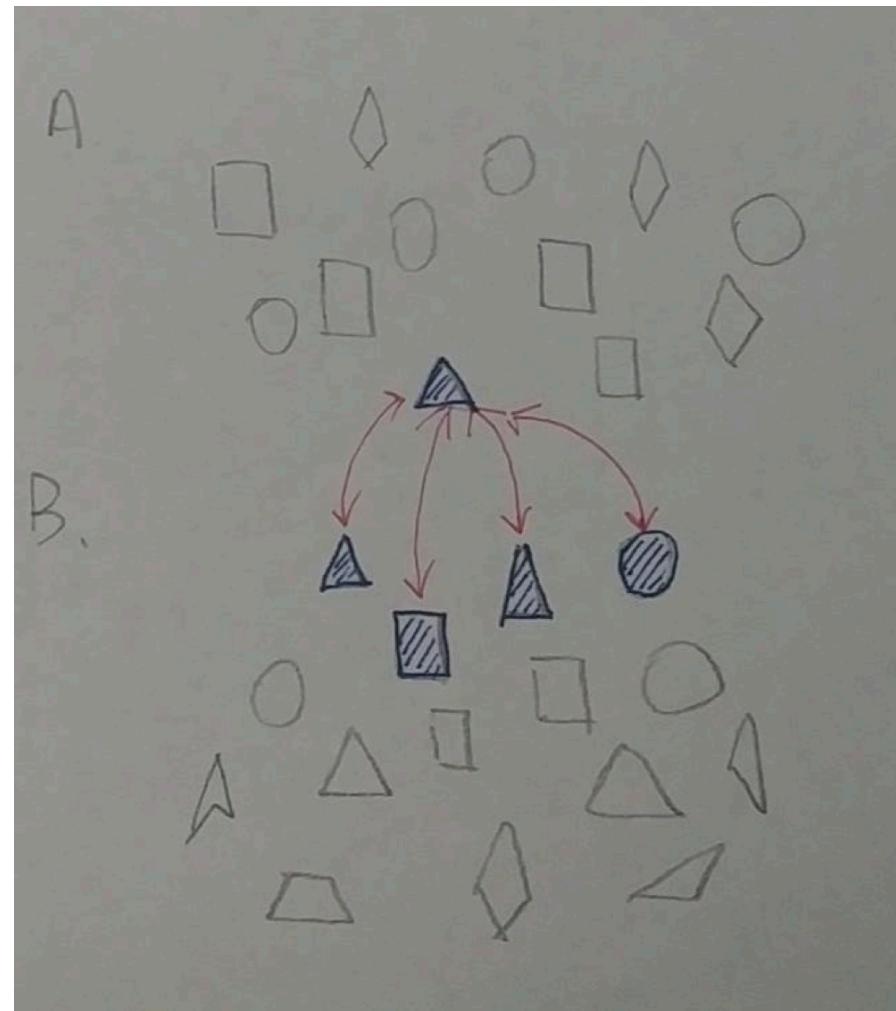
Idea I   Idea II   Idea III   Idea IV



### 3. Multiple behaviors – “There are two unequal groups of items, half in each group are special”



#### 4. Multiple behaviors – “There are two unequal groups of items; one of the items in group 1 relates to 4 items in group 2”



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