

COURSEWARE

# EDF

## Data Visualization Professional Courseware

Auteur: Michel Dekker

EDF Data Visualization  
Professional Courseware

## Colophon

Title: EDF Data Visualization Professional Courseware

Authors: Michel Dekker

Publisher: Van Haren Publishing, 's-Hertogenbosch

ISBN Hard Copy: 978 94 018 0988 7

Edition: First edition, first print, February 5<sup>th</sup>, 2023

Design: Van Haren Publishing, 's-Hertogenbosch

Copyright: © Van Haren Publishing 2023

For further information about Van Haren Publishing please e-mail us at: [info@vanharen.net](mailto:info@vanharen.net) or visit our website: [www.vanharen.net](http://www.vanharen.net)

No part of this publication may be reproduced in any form by print, photo print, microfilm or any other means without written permission by the publisher.

Although this publication has been composed with much care, neither author, nor editor, nor publisher can accept any liability for damage caused by possible errors and/or incompleteness in this publication.

No part of this document may be reproduced in any form without the written permission from Van Haren Publishing.

## **Publisher about the Courseware**

The Courseware was created by experts from the industry who served as the author(s) for this publication. The input for the material is based on existing publications and the experience and expertise of the author(s). The material has been revised by trainers who also have experience working with the material. Close attention was also paid to the key learning points to ensure what needs to be mastered.

The objective of the courseware is to provide maximum support to the trainer and to the student, during his or her training. The material has a modular structure and according to the author(s) has the highest success rate should the student opt for examination. The Courseware is also accredited for this reason, wherever applicable.

In order to satisfy the requirements for accreditation the material must meet certain quality standards. The structure, the use of certain terms, diagrams and references are all part of this accreditation. Additionally, the material must be made available to each student in order to obtain full accreditation. To optimally support the trainer and the participant of the training assignments, practice exams and results are provided with the material.

Direct reference to advised literature is also regularly covered in the sheets so that students can find additional information concerning a particular topic. The decision to leave out notes pages from the Courseware was to encourage students to take notes throughout the material.

Although the courseware is complete, the possibility that the trainer deviates from the structure of the sheets or chooses to not refer to all the sheets or commands does exist. The student always has the possibility to cover these topics and go through them on their own time. It is recommended to follow the structure of the courseware and publications for maximum exam preparation.

The courseware and the recommended literature are the perfect combination to learn and understand the theory.

-- Van Haren Publishing

## Other publications by Van Haren Publishing

Van Haren Publishing (VHP) specializes in titles on Best Practices, methods and standards within four domains:

- IT and IT Management
- Architecture (Enterprise and IT)
- Business Management and
- Project Management

Van Haren Publishing is also publishing on behalf of leading organizations and companies: ASLBiSL Foundation, BRMI, CA, Centre Henri Tudor, Gaming Works, IACCM, IAOP, IFDC, Innovation Value Institute, IPMA-NL, ITSqc, NAF, KNVI, PMI-NL, PON, The Open Group, The SOX Institute.

Topics are (per domain):

### IT and IT Management

ABC of ICT  
ASL®  
CATS CM®  
CMMI®  
COBIT®  
e-CF  
ISO/IEC 20000  
ISO/IEC 27001/27002  
ISPL  
IT4IT®  
IT-CMF™  
IT Service CMM  
ITIL®  
MOF  
MSF  
SABSA  
SAF  
SIAM™  
TRIM  
VeriSM™

### Enterprise Architecture

ArchiMate®  
GEA®  
Novius Architectuur  
Methode  
TOGAF®

### Business Management

*BABOK® Guide*  
BiSL® and BiSL® Next  
BRMBOK™  
BTF  
EFQM  
eSCM  
IACCM  
ISA-95  
ISO 9000/9001  
OPBOK  
SixSigma  
SOX  
SqEME®

### Project Management

A4-Projectmanagement  
DSDM/Atern  
ICB / NCB  
ISO 21500  
MINCE®  
M\_o\_R®  
MSP®  
P3O®  
*PMBOK® Guide*  
Praxis®  
PRINCE2®

For the latest information on VHP publications, visit our website: [www.vanharen.net](http://www.vanharen.net).

## Table of content

	-- Slide number	-- Page number
Reflection		6
Agenda		8
<b>EDF Slides</b>	<b>(1)</b>	<b>9</b>
<b>Introduction</b>	<b>(7)</b>	<b>12</b>
<i>Exercise 1</i>	(20)	18
<b>Human Perception</b>	<b>(33)</b>	<b>24</b>
<i>Exercise 2</i>	(52)	33
<b>Visualizing data</b>	<b>(61)</b>	<b>35</b>
<i>Exercise 3</i>	(70)	40
<i>Exercise 4</i>	(84)	45
<b>Designing data visualizations</b>	<b>(90)</b>	<b>46</b>
Design Categorical	(93)	48
Design Hierarchy	(101)	52
Design Relational	(108)	55
Design Temporal	(112)	57
<i>Exercise 5</i>	(119)	61
Design Tabular	(123)	62
Design Spatial	(132)	66
Design Color	(137)	69
<b>Design Management Dashboard</b>	<b>(144)</b>	<b>73</b>
<i>Exercise 6</i>	(165)	82
Explore to Explain	(166)	83
<b>Workflow</b>	<b>(175)</b>	<b>88</b>
Practice exams info		92
<b>Data Visualization Certification Syllabus</b>		93
Introduction		95
The EDF – Data Visualization Exam		96
Topics of the EDF Data Visualization Exam		98
Exam regulations		100

## Self-Reflection of understanding Diagram

*‘What you do not measure, you cannot control.’ – Tom Peters*

Fill in this diagram to self-evaluate your understanding of the material. This is an evaluation of how well you know the material and how well you understand it. In order to pass the exam successfully you should be aiming to reach the higher end of Level 3. If you really want to become a pro, then you should be aiming for Level 4. Your overall level of understanding will naturally follow the learning curve. So, it’s important to keep track of where you are at each point of the training and address any areas of difficulty.

Based on where you are within the Self-Reflection of Understanding diagram you can evaluate the progress of your own training.

<i>Level of Understanding</i>	<i>Before Training (Pre-knowledge)</i>	<i>Training Part 1 (1st Half)</i>	<i>Training Part 2 (2nd Half)</i>	<i>After studying / reading the book</i>	<i>After exercises and the Practice exam</i>
<i>Level 4 I can explain the content and apply it .</i>					
<i>Level 3 I get it! I am right where I am supposed to be.</i>					<i>Ready for the exam!</i>
<i>Level 2 I almost have it but could use more practice.</i>					
<i>Level 1 I am learning but don't quite get it yet.</i>					

(Self-Reflection of Understanding Diagram)

Write down the problem areas that you are still having difficulty with so that you can consolidate them yourself, or with your trainer. After you have had a look at these, then you should evaluate to see if you now have a better understanding of where you actually are on the learning curve.

**Troubleshooting**

*Problem areas:*

*Topic:*

---

Part 1

---

---

---

---

---

Part 2

---

---

---

---

---

You have gone through the book and studied.

---

---

---

You have answered the questions and done the practice exam.

---

---

---

---

---

---

---

## Timetable

---

### Part 1: Visual and Quantitative Thinking

---

What is data visualisation and where does it come from?

How does our brain process visual information?

What type of data do we have and how can we best visualize it?

---

### Part 2: Visualising data effectively

---

How do you make data easy and understandable to read?

What are the basic principles and guidelines?

What are the main pitfalls in data visualisation?

---

### Part 3: Building blocks of data visualizations

---

Which basic blocks do data visualisations consist of?

When is it better to use a table and when a graph?

What type of table/graph works best in a given situation?

How do you create a composite visualisation, the management dashboard?

---

### Part 4: Arguing with data, data storytelling.

---

What is the data visualisation process like?

Arguing with data, data storytelling.

Making agreements within your organisation, the data visualization style guide.

---

A slide with a blue background. At the top, there is a horizontal band with a colorful, abstract pattern of dots and lines. Below this, the title "Data Visualization" is written in large white font. Underneath the title, the subtitle "design effective data visualizations" is written in a smaller, light blue font. At the bottom of the slide, there is another horizontal band with a colorful, abstract pattern of dots and lines, similar to the top one. In the bottom right corner of this band, the text "COU SEWARE" is visible. At the very bottom of the slide, there is a small copyright notice.

# Data Visualization

design effective data visualizations

COU SEWARE

©2023 - All training materials are sole property of Van Haren Publishing BV and are not to be reproduced in any form or shape without written permission.

A slide with a solid blue background. The text is white and arranged in several lines. The first line is "Effective Data Foundation". The following lines are "not-for-profit collective,", "who enables **professionals** to", "**leverage data** to make", "**sustainable business**", and "**decisions**". In the bottom right corner, there is a logo for "Effective DATA Foundation" and a small copyright notice.

Effective Data Foundation

not-for-profit collective,  
who enables **professionals** to  
**leverage data** to make  
**sustainable business**  
**decisions**

Effective DATA Foundation

©2023 Van Haren Publishing BV.

**Effective Data Foundation**

# DATA

**Analysis / Literacy / Management / Visualization**

©2023 Van Haren Publishing BV. 

**Certification**

Effective Data Foundation



Congratulations to  
**Marly Buitenhuis**  
for achieving the  
**Data Visualization**  
certificate from the Effective Data Foundation.

©2023 Van Haren Publishing BV. 

## Certification



**60** multiple choice questions  
within **60** minutes  
at least **65%** correct to pass

©2023 Van Haren Publishing BV. 

## Training Structure

Human Perception	20%
Visualizing Data	30%
Visualization Design	25%
Storytelling	15%
Workflow	10%

©2023 Van Haren Publishing BV. 

## Introduction

*It's **less a technology** problem,  
**more a people** problem*

Aron Pilhofer – Executive Director of Digital for the Guardian

©2023 Van Haren Publishing BV.



## Why do we visualize data?

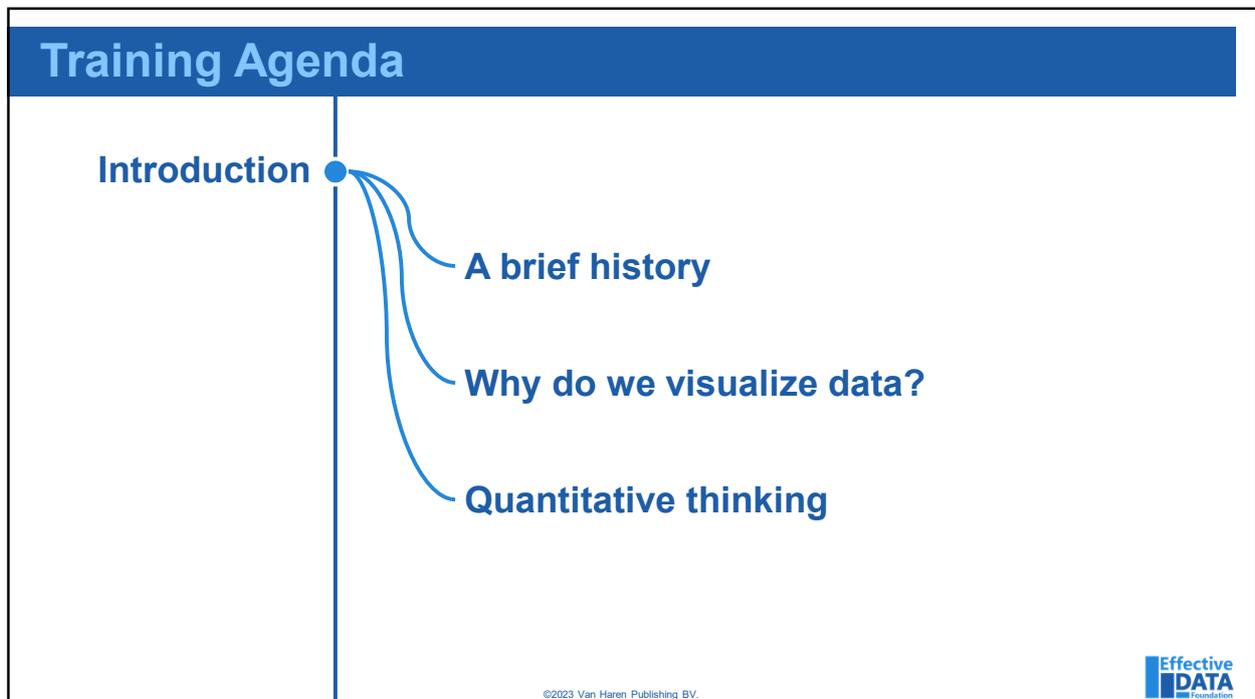
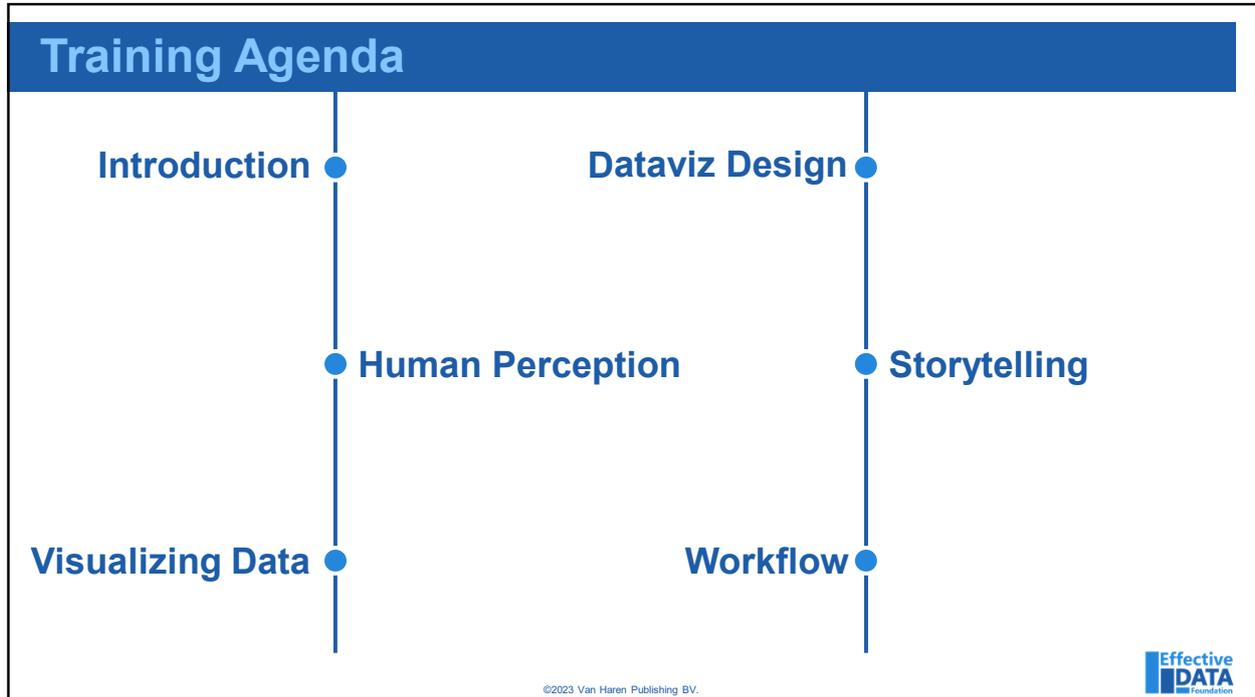
To facilitate **understanding**

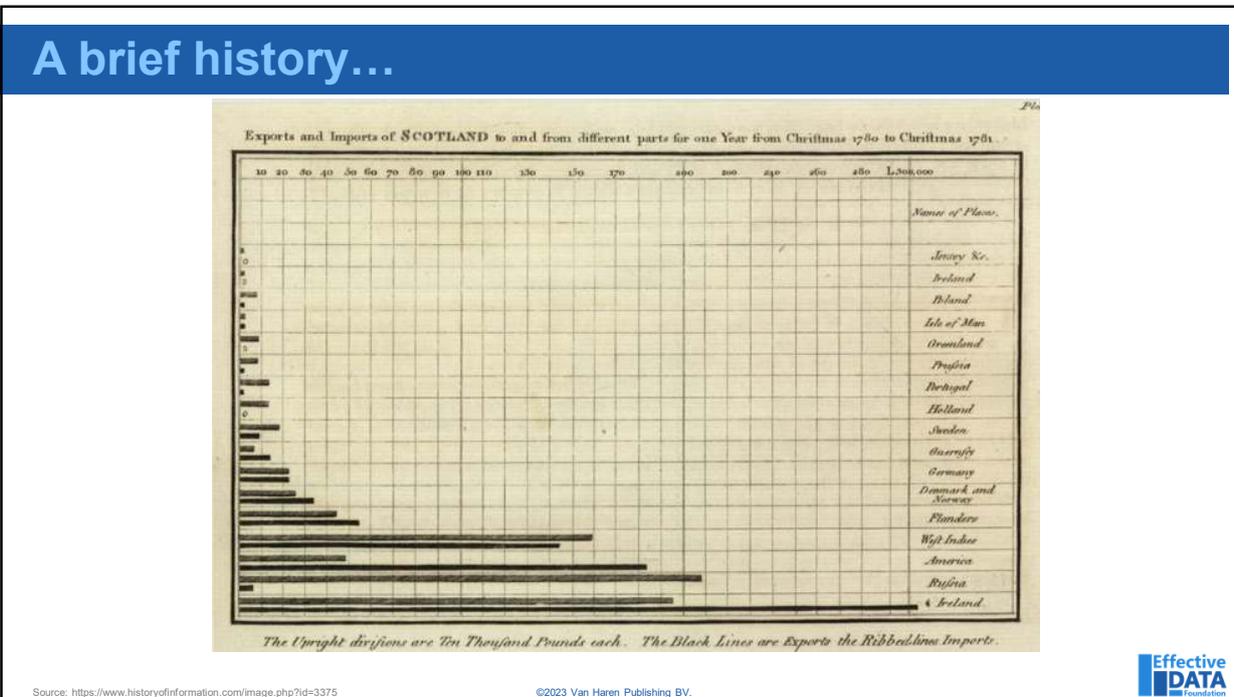
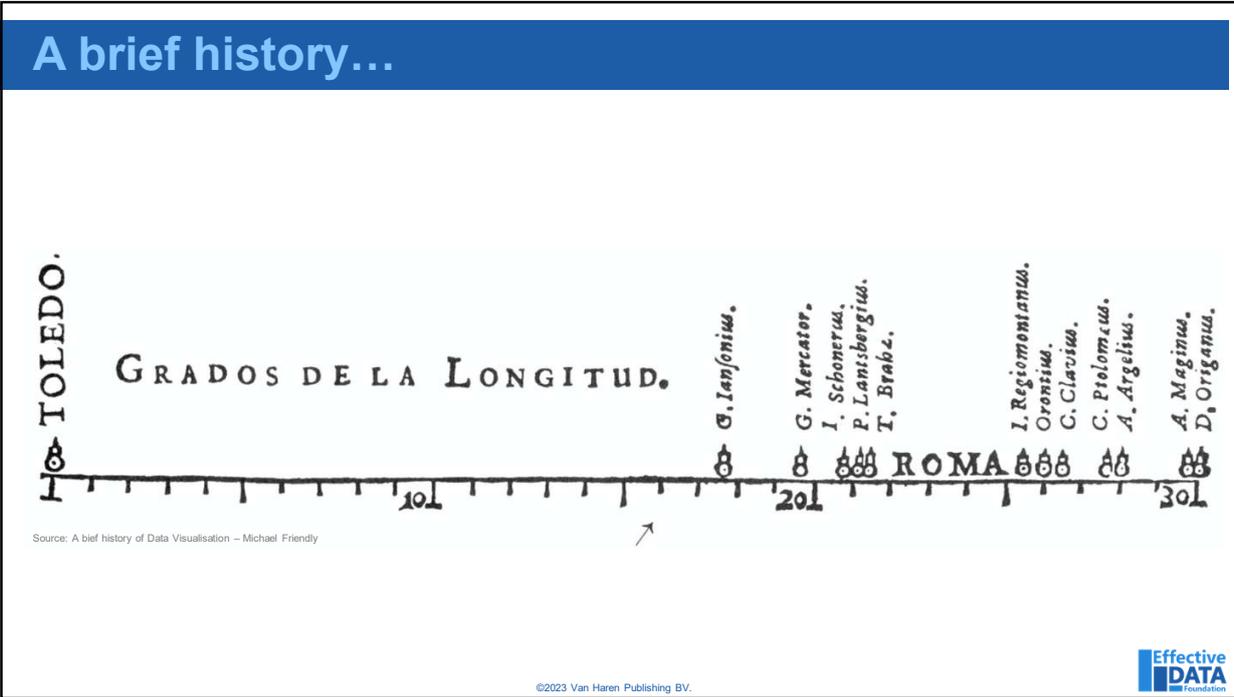
Allow **people to act** on data

Visually **identify & compare**  
patterns, trends and outliers in data

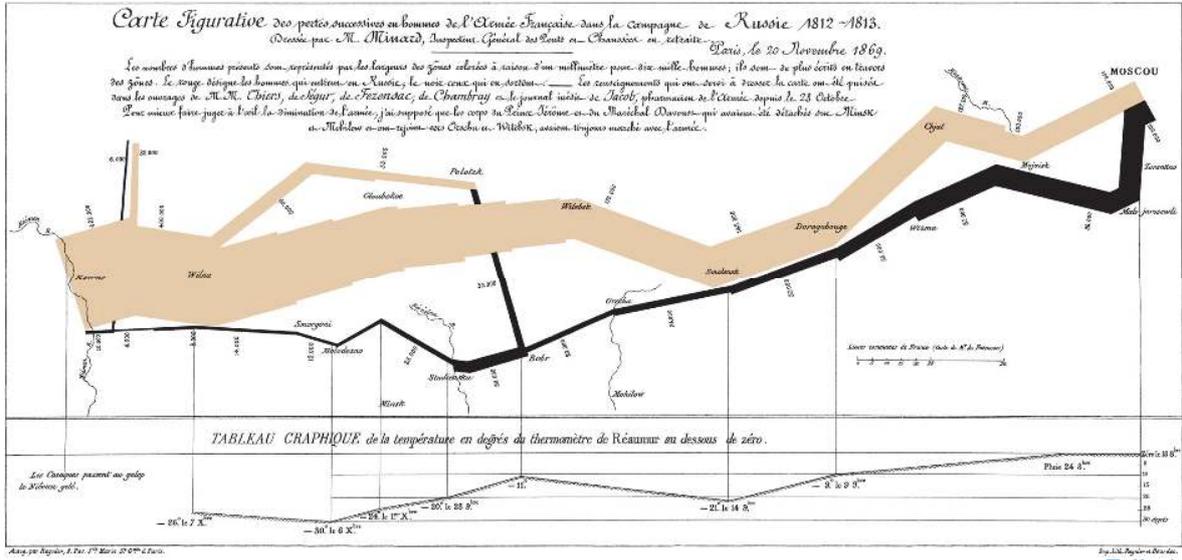
©2023 Van Haren Publishing BV.







# A brief history...

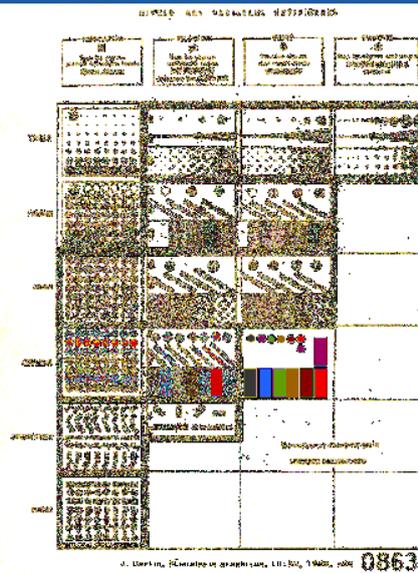


Source: A brief history of Data Visualisation – Michael Friendly

©2023 Van Haren Publishing BV.



# A brief history...



Source: A brief history of Data Visualisation – Michael Friendly

©2023 Van Haren Publishing BV.



## Why do we visualize data?

### Dataset I

X	Y
10.0	8.04
8.0	6.95
13.0	7.58
9.0	8.81
11.0	8.33
14.0	9.96
6.0	7.24
4.0	4.26
12.0	10.84
7.0	4.82
5.0	5.68

### Dataset II

X	Y
10.0	9.14
8.0	8.14
13.0	8.74
9.0	8.77
11.0	9.26
14.0	8.10
6.0	6.13
4.0	3.10
12.0	9.13
7.0	7.26
5.0	4.74

### Dataset III

X	Y
10.0	7.46
8.0	6.77
13.0	12.74
9.0	7.11
11.0	7.81
14.0	8.84
6.0	6.08
4.0	5.39
12.0	8.15
7.0	6.42
5.0	5.73

### Dataset IV

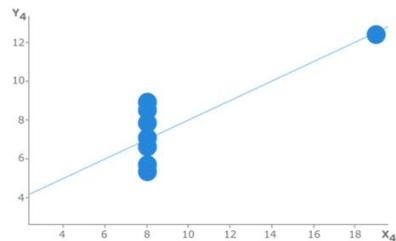
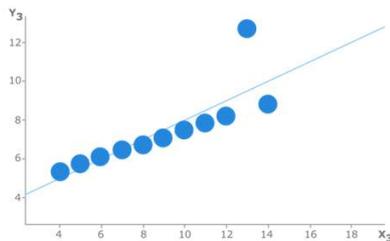
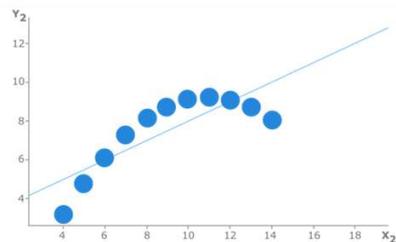
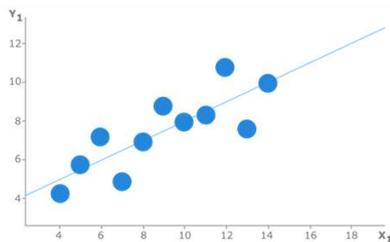
X	Y
8.0	6.58
8.0	5.76
8.0	7.71
8.0	8.84
8.0	8.47
8.0	7.04
8.0	5.25
19.0	12.50
8.0	5.56
8.0	7.91
8.0	6.89

Source: [https://en.wikipedia.org/wiki/Anscombe%27s\\_quartet](https://en.wikipedia.org/wiki/Anscombe%27s_quartet)

©2023 Van Haren Publishing BV.



## Why do we visualize data?



Source: [https://en.wikipedia.org/wiki/Anscombe%27s\\_quartet](https://en.wikipedia.org/wiki/Anscombe%27s_quartet)

©2023 Van Haren Publishing BV.



## Why do we visualize data?



Paul Grice

### Be informative

- Make your contribution **as informative as is required**.
- Do **not** make your contribution **more informative than is required**.

### Be truthful

- Do **not** say what you believe **to be false**.
- Do **not** say that for which you **lack evidence**.

### Be clear

- Avoid **obscurity** of expression.
- Avoid **ambiguity**.
- Be **brief**.
- Be **orderly**.

### Be relevant

- Make sure that all the information is **relevant** to the current exchange.

Source: <https://effectiviology.com/principles-of-effective-communication/>

©2023 Van Haren Publishing BV.



## Why do we visualize data?



Jock Mackinlay

### Expressiveness

if the **relevant information** of a dataset is expressed by the visualization, and **only this**.

### Effectiveness

a visualization addresses the **capabilities** of the **human visual system**: it's **easier to understand**.

Source: Jock Mackinlay, Automating the Design of Graphical Presentations of Relational Information.

©2023 Van Haren Publishing BV.



## Why do we visualize data?



Jock Mackinlay

### Expressiveness

tell the **truth** and nothing but the truth.  
(don't lie, not even by **omission**)

### Effectiveness

use code that **humans** are **best** at **decoding**.  
(best = faster and/or more accurate)

Source: Jock Mackinlay. Automating the Design of Graphical Presentations of Relational Information.

©2023 Van Haren Publishing BV.



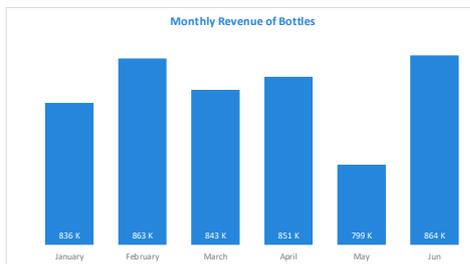
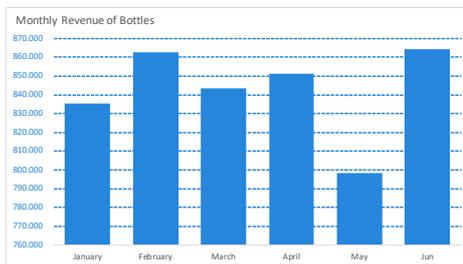
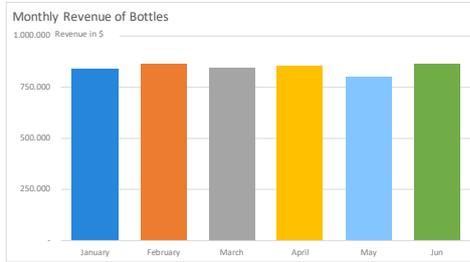
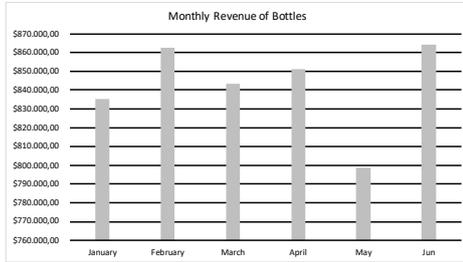
## Exercise 1

let's **PRACTICE**

©2023 Van Haren Publishing BV.



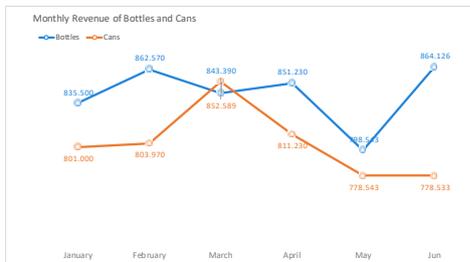
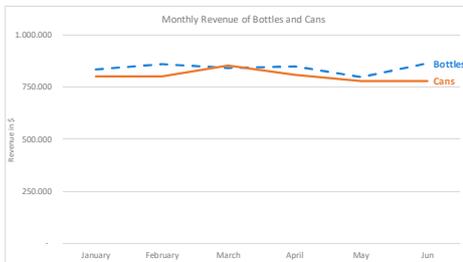
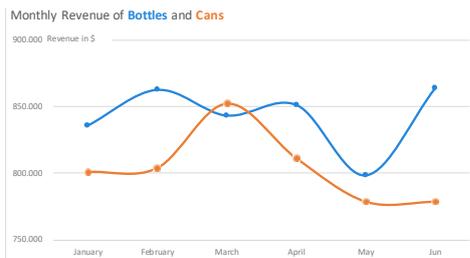
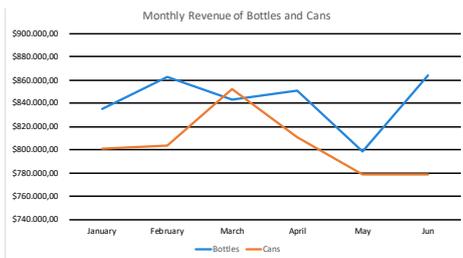
## Exercise: Four Column Charts



©2023 Van Haren Publishing BV.

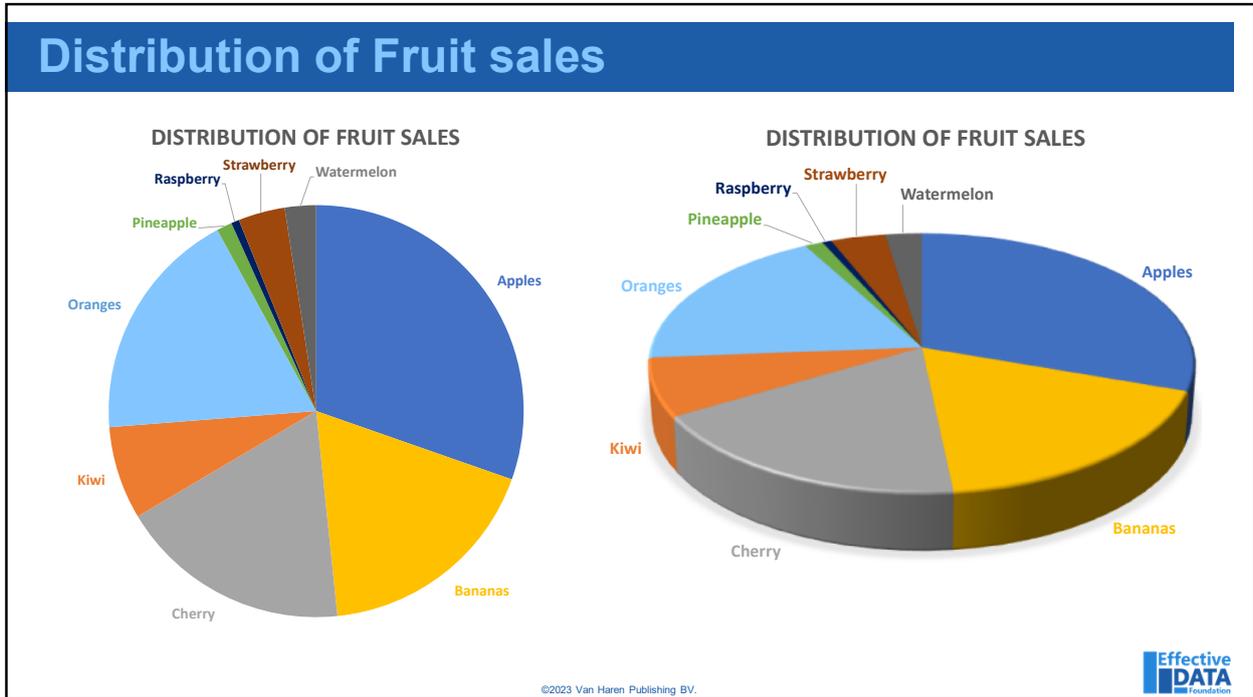


## Exercise: Four Line Charts



©2023 Van Haren Publishing BV.





### Quantitative thinking

Discipline that concerns the **collection, organization, analysis, interpretation, and presentation of data**

©2023 Van Haren Publishing BV. Effective DATA Foundation

### Quantitative thinking



A cartoon illustration of Homer Simpson pointing his finger at Lisa Simpson. Homer is on the left, wearing a white polo shirt and blue shorts. Lisa is on the right, wearing a red dress and a pearl necklace. They are standing in front of a wooden fence with green bushes and a blue sky with a white cloud in the background.

Source: The Simpsons, Much Apu About Nothing, Season 7, Episode 23, May 1996

©2023 Van Haren Publishing BV.



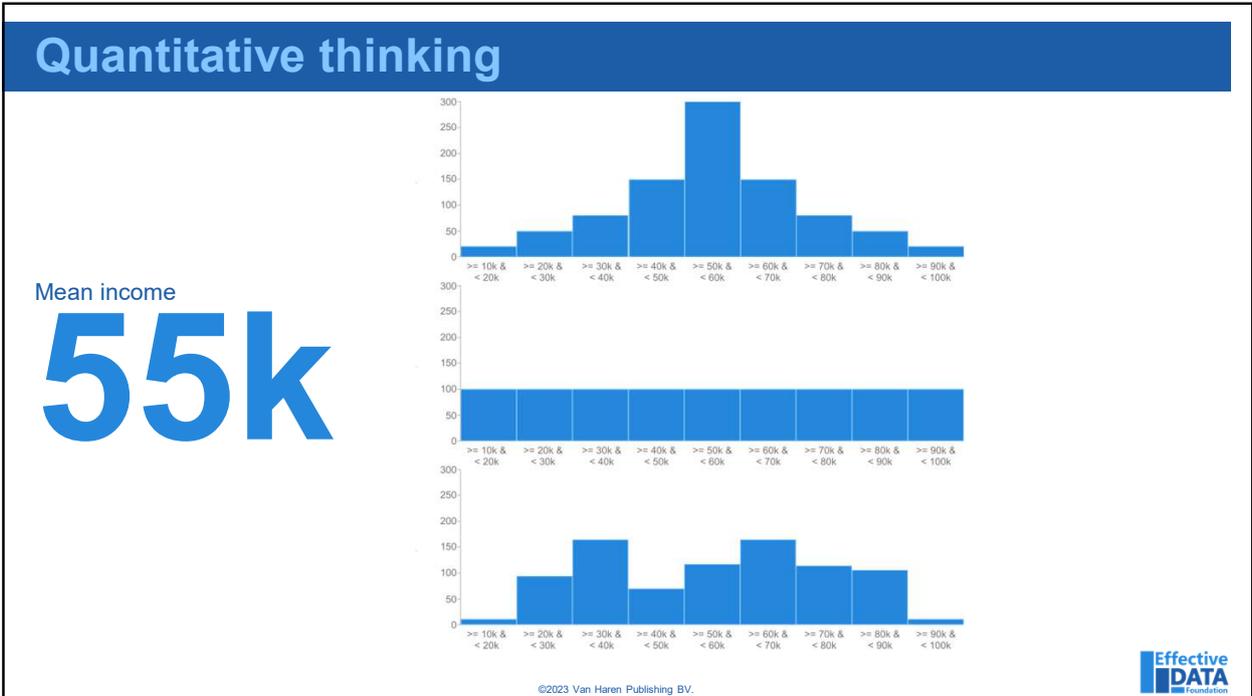
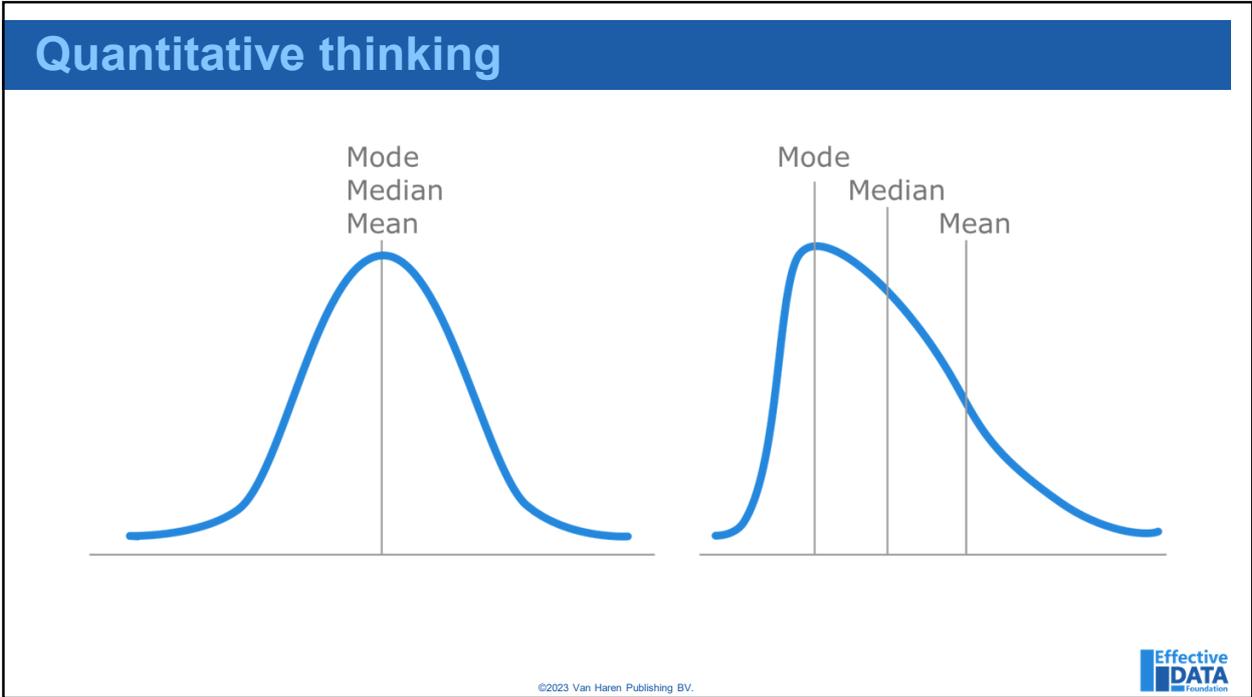
### Quantitative thinking



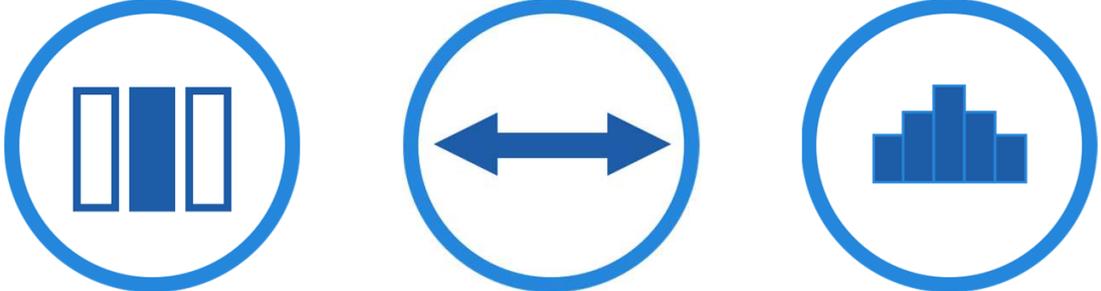
Three instances of the number 12 and the letters ABC are displayed. The first instance has the number 12 in blue above the letters ABC, which are also in blue. The second instance has the number 12 in grey above the letters ABC, which are also in grey. The third instance has the number 12 in blue above the letters ABC, which are also in blue.

©2023 Van Haren Publishing BV.





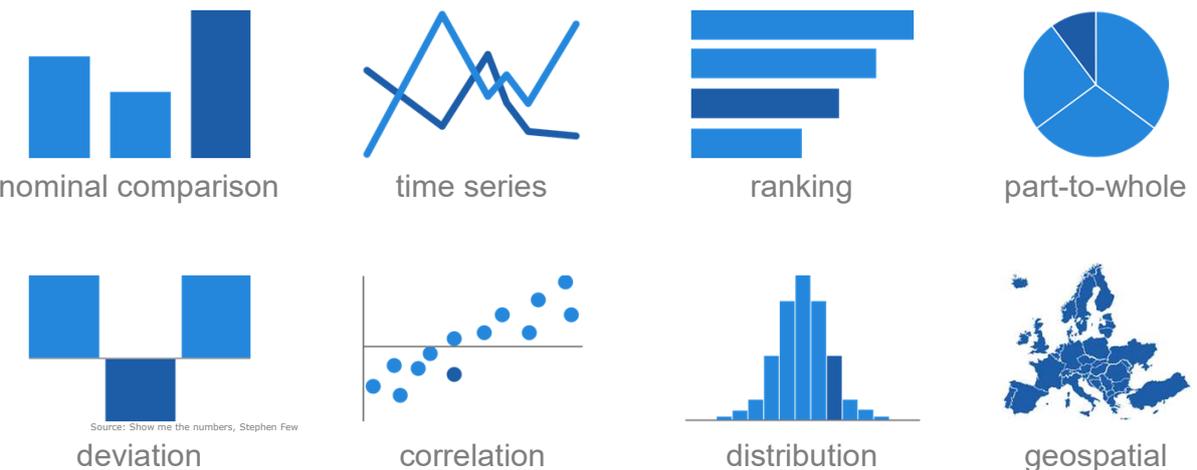
## Quantitative thinking



**Central Tendency**      **Spread**      **Shape**

Source: Stephen S. Few, Now you see it, 2009      ©2023 Van Haren Publishing BV.      **Effective DATA** Foundation

## Quantitative thinking



nominal comparison      time series      ranking      part-to-whole

deviation      correlation      distribution      geospatial

Source: Show me the numbers, Stephen Few      Source: Stephen S. Few, Show me the Numbers, 2004      ©2023 Van Haren Publishing BV.      **Effective DATA** Foundation

## Human perception

Getting **visualization** right is much **more a science** than an art, which we can only achieve by **studying human perception.**

Stephen Few – Data Visualization for Human Perception

©2023 Van Haren Publishing BV.



## Training Agenda

Human Perception ●

We see with our brains

Pre-attentive attributes

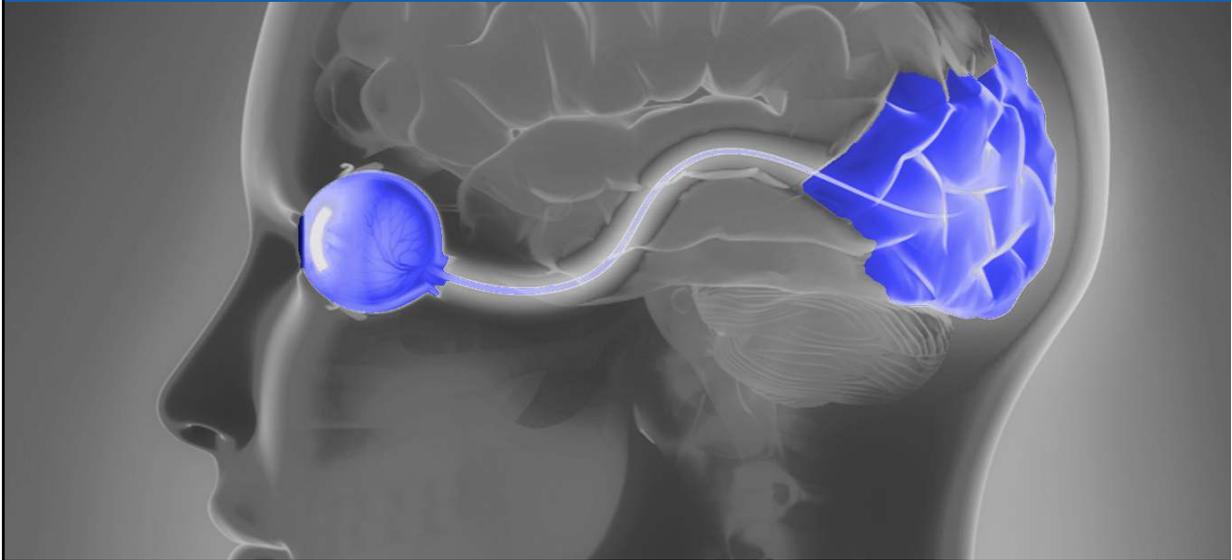
Gestalt

System 1 & System 2

©2023 Van Haren Publishing BV.



## We see with our brains



©2023 Van Haren Publishing BV.



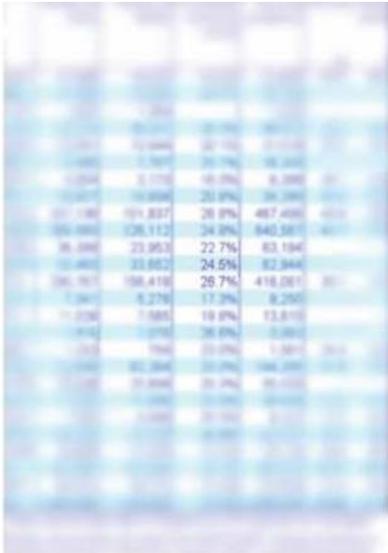
## Human perception



©2023 Van Haren Publishing BV.



## Human perception

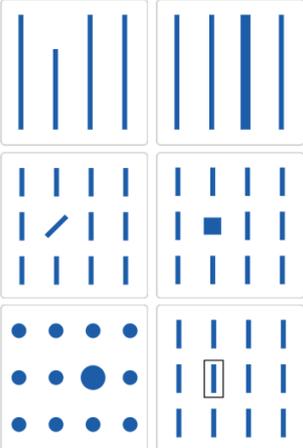



Source: Colin Ware – 2008 – Visual Thinking for design ©2023 Van Haren Publishing BV.

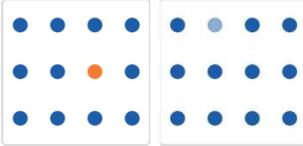


## Pre-attentive attributes

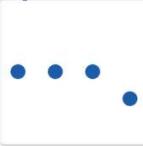
### Form



### Color



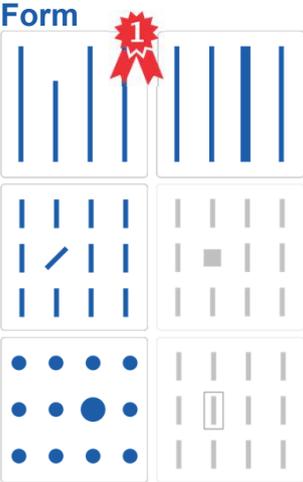
### Spatial Position

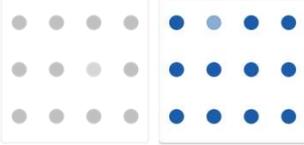


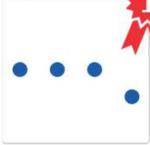
Source: Information Visualization: perception for design – Colin Ware ©2023 Van Haren Publishing BV.



## Pre-attentive attributes

**Form** 

**Color** 

**Spatial Position** 

Source: Information Visualization: perception for design – Colin Ware ©2023 Van Haren Publishing BV. 

## Human perception

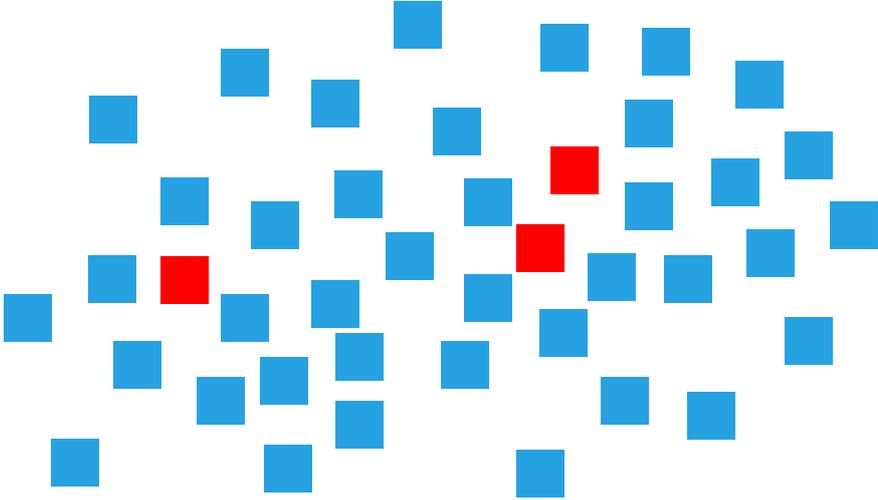
 **Sensory Memory** – Iconic Memory

 **Short-term Memory** – Working Memory

 **Long-term Memory**

Source: <https://www.verywellmind.com/different-types-of-memory-and-their-functions-5194859> ©2023 Van Haren Publishing BV. 

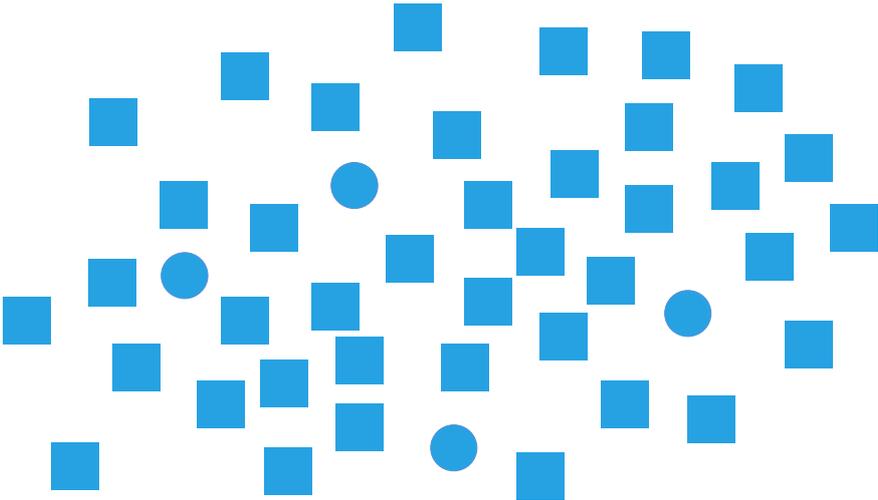
### Test: How many red squares?



©2023 Van Haren Publishing BV.



### Test: How many circles?



©2023 Van Haren Publishing BV.



### Test: How many blue circles?

©2023 Van Haren Publishing BV. Effective DATA Foundation

### Scale of elementary perceptual tasks

Accurate

Approximate

- 2D Position
- Length
- Direction/ Slope
- Width
- Area
- Shading & saturation

Source: The truthful art, Albert Cairo. ©2023 Van Haren Publishing BV. Effective DATA Foundation

## Human perception

The diagram shows the word 'GESTALT' where each letter is constructed using different Gestalt principles. 'G' uses enclosure, 'E' uses proximity, 'S' uses continuity, and 'T' uses simplicity. A bracket labeled 'similarity' spans the 'S' and 'T'.

enclosure proximity continuity simplicity similarity

©2023 Van Haren Publishing BV.

## Gestalt - Simplicity

Sales by Product type

Product type	Sales (bn)
Binoculars	0.20
Climbing Accesso...	0.30
Cooking Gear	0.40
Eyewear	0.65
First Aid	0.15
Golf Accessories	0.15
Insect Repellents	0.15
Irons	0.15
Knives	0.20
Lanterns	0.50
Navigation	0.35
Packs	0.25
Putters	0.15
Rope	0.15
Safety	0.15
Sleeping Bags	0.35
Sunscreen	0.15
Tents	0.20
Tools	0.20
Watches	0.50
Woods	0.15

©2023 Van Haren Publishing BV.