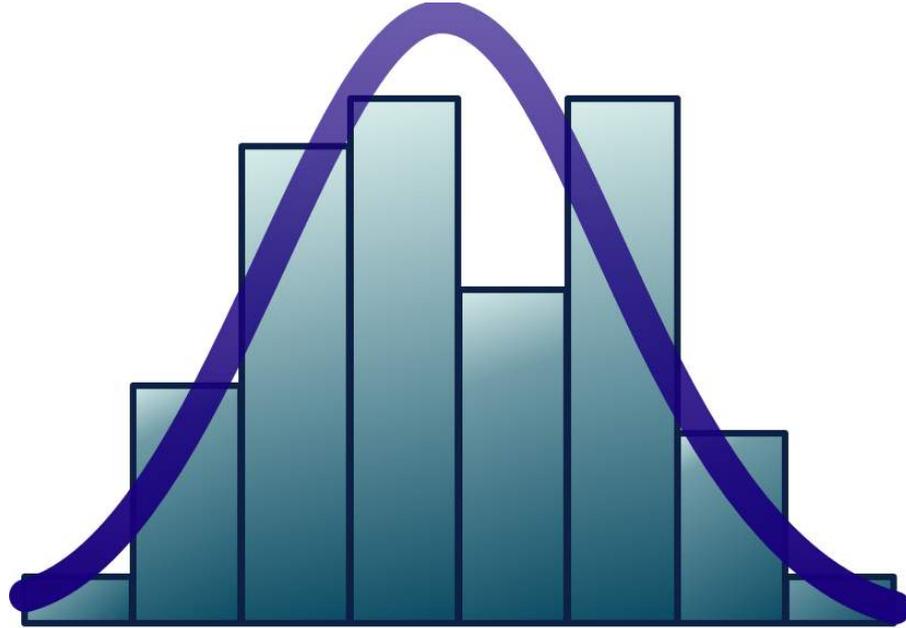


Statistical Fallacies



https://upload.wikimedia.org/wikipedia/commons/4/40/Fisher_iris_versicolor_sepalwidth.svg

Mustafa Fuad Rifet Ibrahim

Outline

- Introduction
- Sampling
- Measurement

Introduction

Introduction

- Survey about University Heidelberg students

Introduction

- Survey about University Heidelberg students
- Love for mathematics

Introduction

- Survey about University Heidelberg students
- Love for mathematics
- Ask random people in the Mathematikon:
„Do you love mathematics?“ Yes/No

Introduction

- Survey about University Heidelberg students
- Love for mathematics
- Ask random people in the Mathematikon:
„Do you love mathematics?“ Yes/No
- Result: 223/302 said YES and the rest said NO

Introduction

- Survey about University Heidelberg students
- Love for mathematics
- Ask random people in the Mathematikon:
„Do you love mathematics?“ Yes/No
- Result: 223/302 said YES and the rest said NO
- I report my astonishing results:
„...with this we were able to show that 73.8410596% of Heidelberg students love math. The Heidelberg student is truly a mathematically inclined person!“

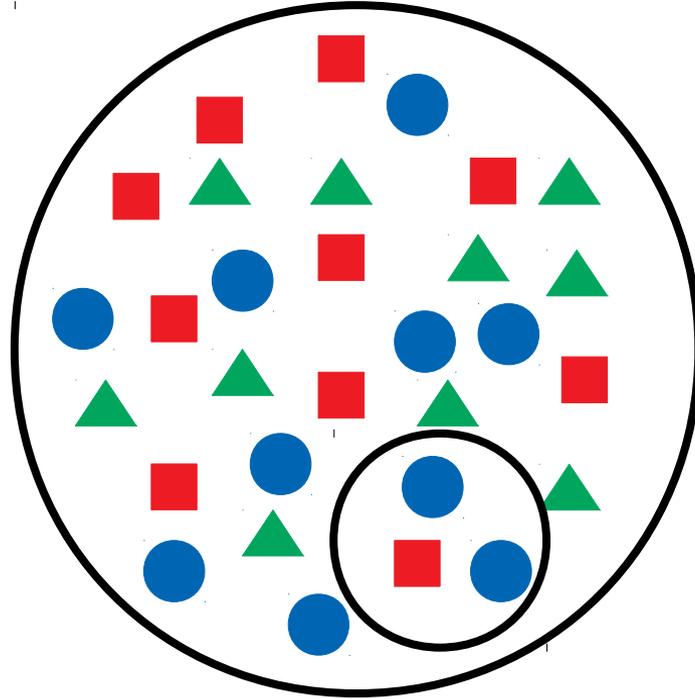
Introduction

- Survey about University Heidelberg students
- Love for mathematics
- Ask random people in the Mathematikon:
„Do you love mathematics?“ Yes/No
- Result: 223/302 said YES and the rest said NO
- I report my astonishing results:
„...with this we were able to show that 73.8410596% of Heidelberg students love math. The Heidelberg student is truly a mathematically inclined person!“

Really?.....Eh..I don't think so..

Sampling

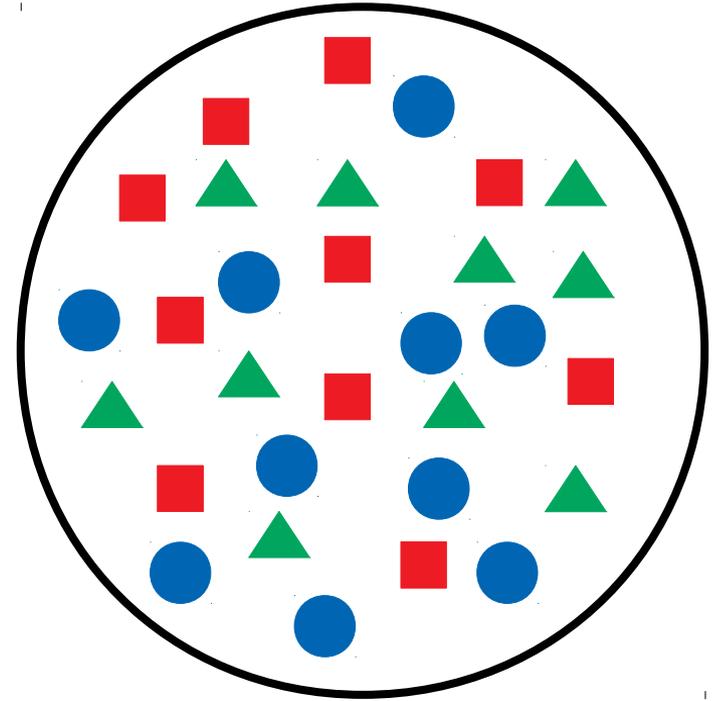
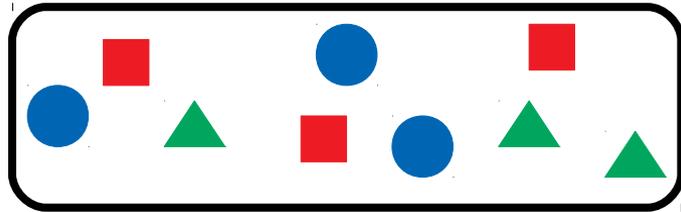
Probability



Nonprobability

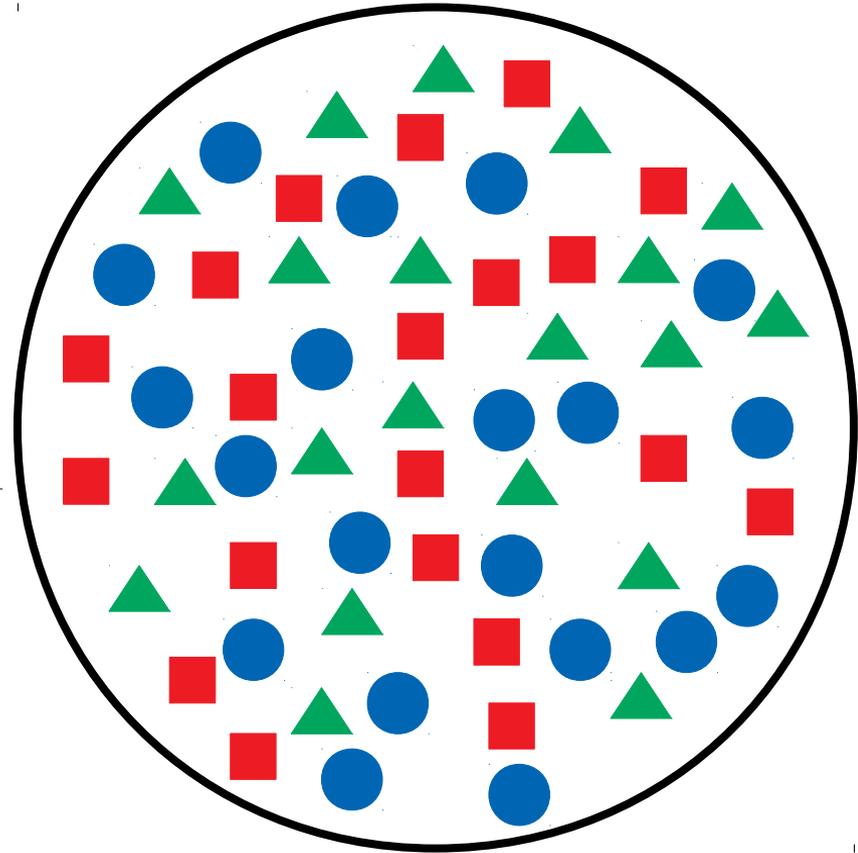
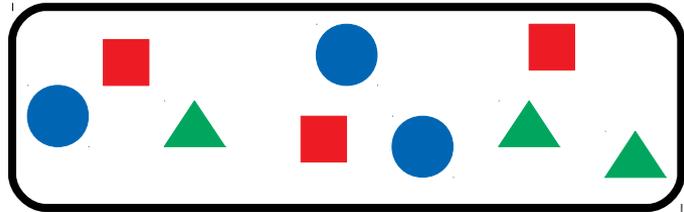
Probability Sampling

- Simple Random Sampling



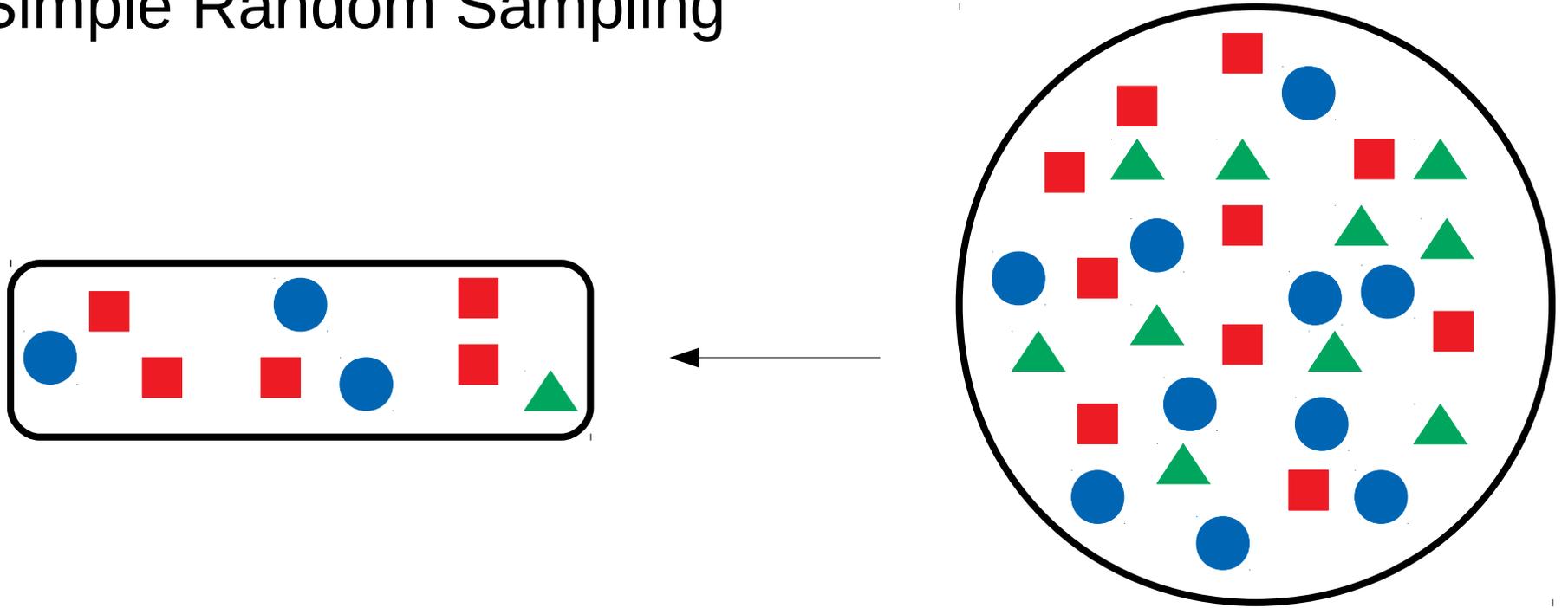
Probability Sampling

- Simple Random Sampling



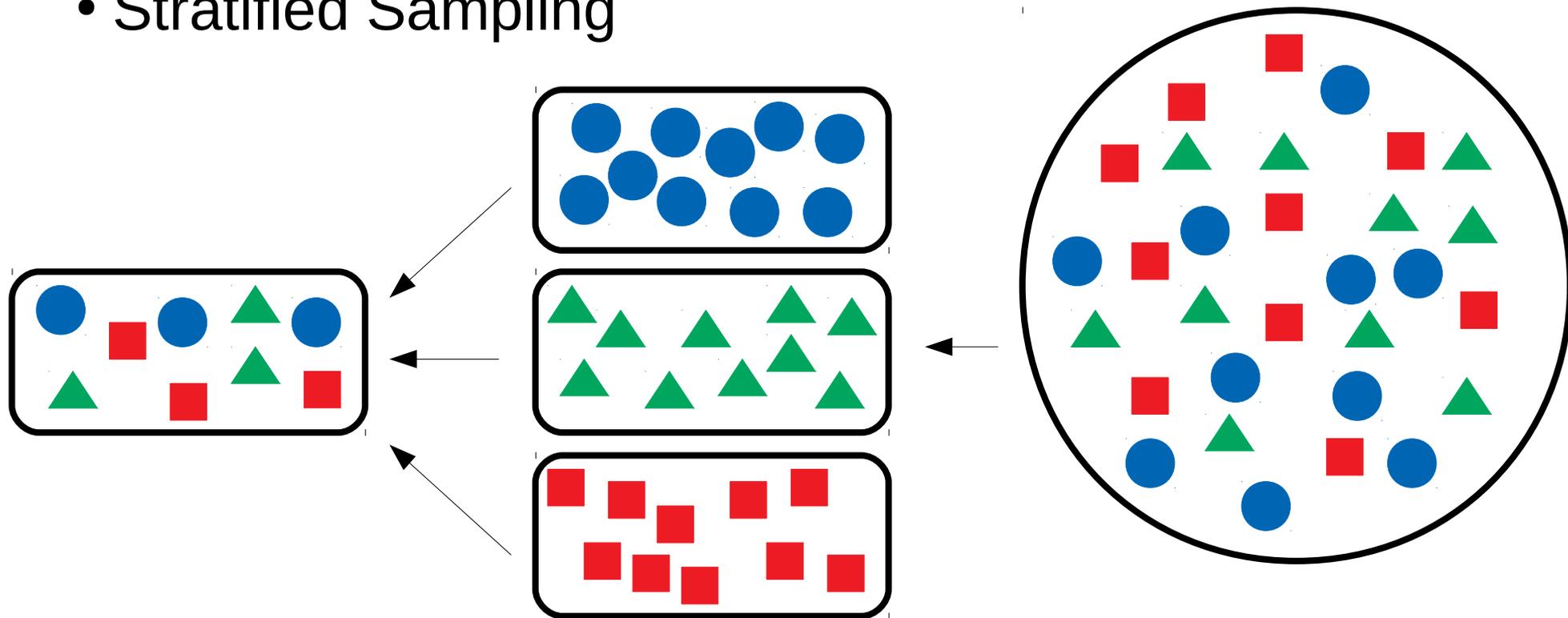
Probability Sampling

- Simple Random Sampling



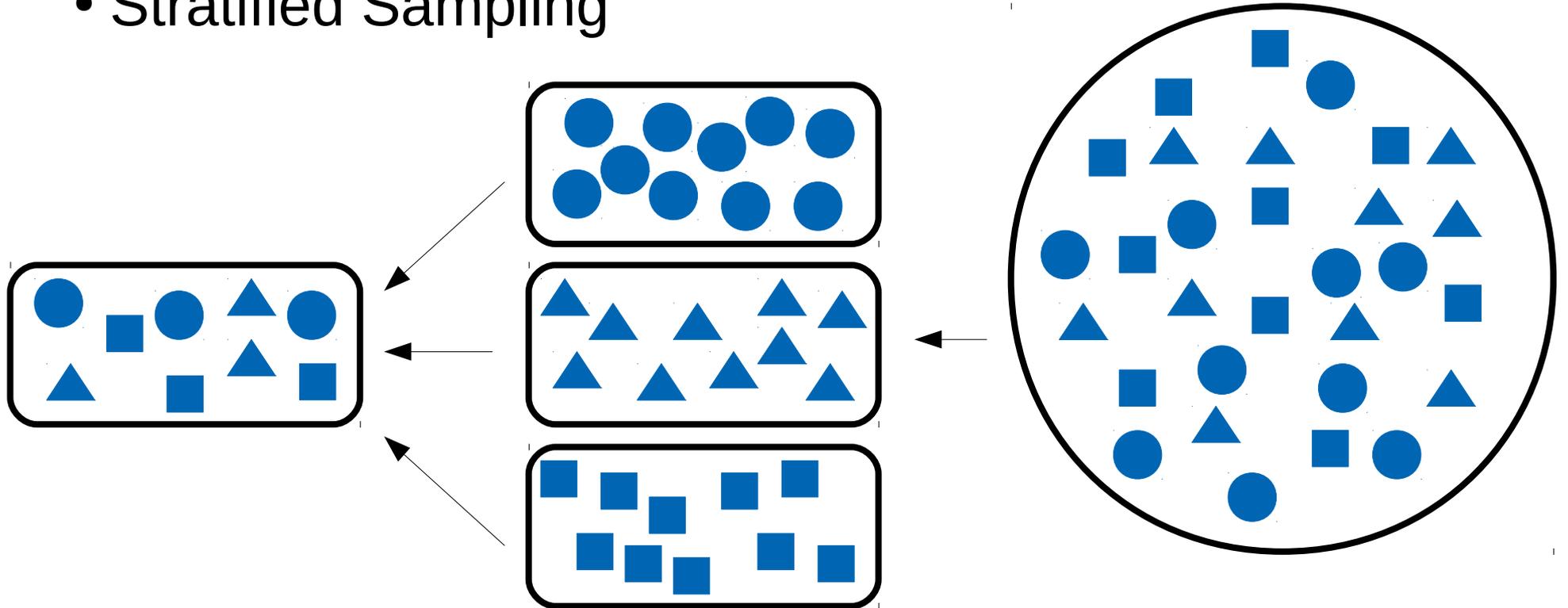
Probability Sampling

- Stratified Sampling



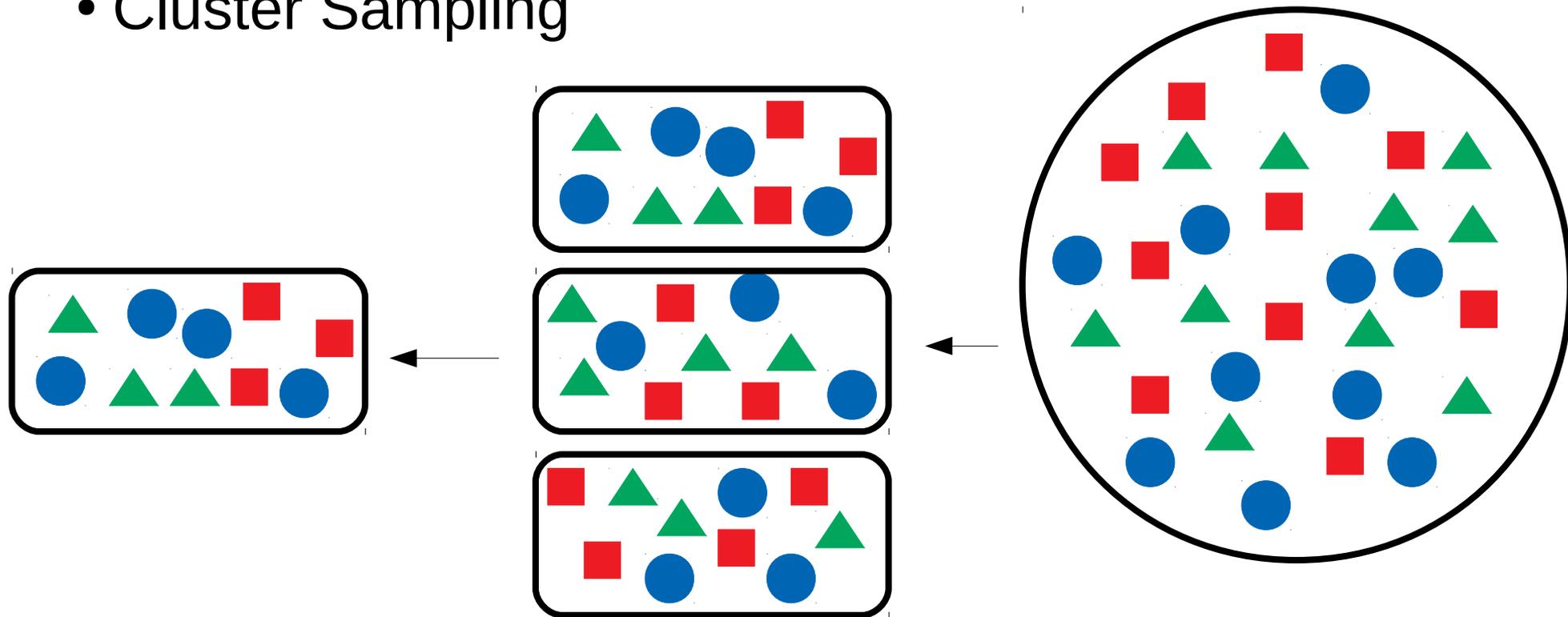
Probability Sampling

- Stratified Sampling



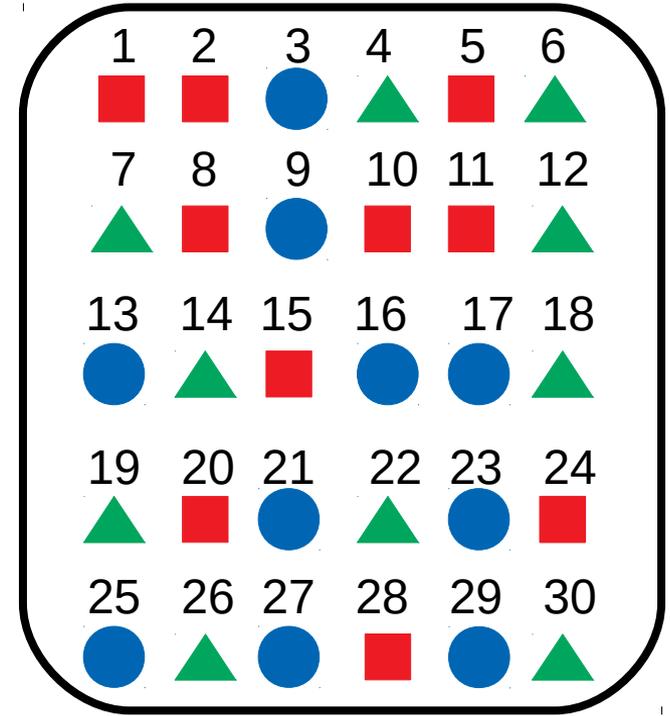
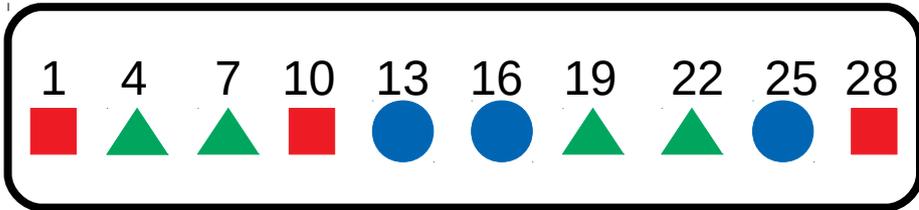
Probability Sampling

- Cluster Sampling



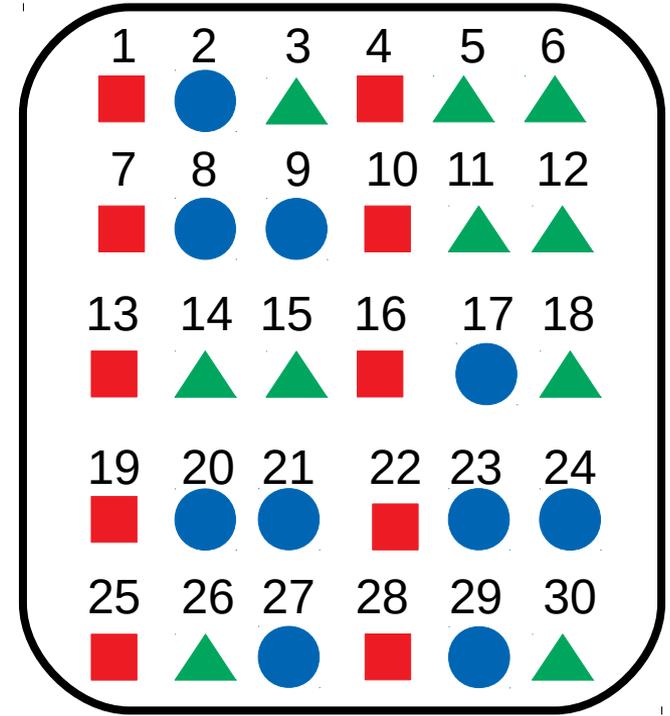
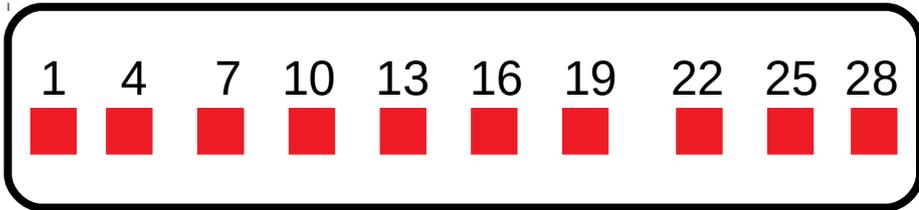
Probability Sampling

- Systematic Sampling



Probability Sampling

- Systematic Sampling



Nonprobability Sampling

Nonprobability Sampling

- Convenience Sampling

Nonprobability Sampling

- Convenience Sampling



https://www.pss-interservice.com/files/img/content/referenzen/Mathematikon%2C%20Heidelberg/PSS_DE_Matematicon_Heidelberg_06.jpg

Nonprobability Sampling

- Convenience Sampling
- Snowball Sampling



https://www.pss-interservice.com/files/img/content/referenzen/Mathematikon%2C%20Heidelberg/PSS_DE_Matematicon_Heidelberg_06.jpg

Nonprobability Sampling

- Convenience Sampling
- Snowball Sampling



https://www.pss-interservice.com/files/img/content/referenzen/Mathematikon%2C%20Heidelberg/PSS_DE_Matematicon_Heidelberg_06.jpg



https://img-aws.ehowcdn.com/340x221p/cpi.studiod.com/www_ehow_com/photos.demandstudios.com/getty/article/152/172/123076592_XS.jpg

Nonprobability Sampling

- Convenience Sampling
- Snowball Sampling
- Judgmental/Purposive Sampling



https://www.pss-interservice.com/files/img/content/referenzen/Mathematikon%2C%20Heidelberg/PSS_DE_Matematicon_Heidelberg_06.jpg



https://img-aws.ehowcdn.com/340x221p/cpi.studiod.com/www_ehow_com/photos.demandstudios.com/getty/article/152/172/123076592_XS.jpg

Nonprobability Sampling

- Convenience Sampling
- Snowball Sampling
- Judgmental/Purposive Sampling
- Quota Sampling



https://www.pss-interservice.com/files/img/content/referenzen/Mathematikon%2C%20Heidelberg/PSS_DE_Matematicon_Heidelberg_06.jpg



https://img-aws.ehowcdn.com/340x221p/cpi.studiod.com/www_ehow_com/photos.demandstudios.com/getty/article/152/172/123076592_XS.jpg

Nonprobability Sampling

- Convenience Sampling
- Snowball Sampling
- Judgmental/Purposive Sampling
- Quota Sampling
- ...



https://www.pss-interservice.com/files/img/content/referenzen/Mathematikon%2C%20Heidelberg/PSS_DE_Matematicon_Heidelberg_06.jpg



https://img-aws.ehowcdn.com/340x221p/cpi.studiod.com/www_ehow_com/photos.demandstudios.com/getty/article/152/172/123076592_XS.jpg

Sampling



https://upload.wikimedia.org/wikipedia/commons/1/1c/FDR_in_1933_2.jpg

Franklin D.
Roosevelt



<https://upload.wikimedia.org/wikipedia/commons/d/db/LandonPortr.jpg>

Alf Landon



<https://upload.wikimedia.org/wikipedia/commons/a/a4/LiteraryDigest-19210219.jpg>

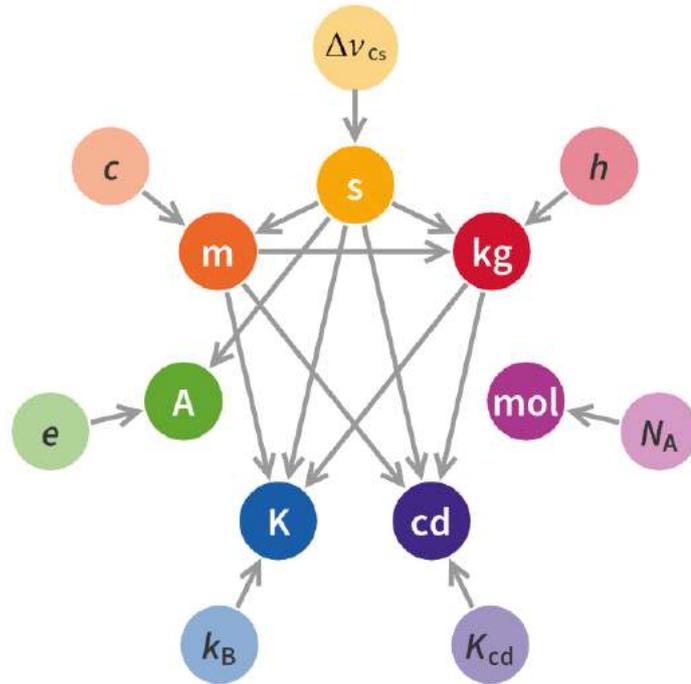
Measurement



<http://www.businessnewsdaily.com/images/i/000/001/482/original/TAPE-MEASURE-ART.jpg?1326819398>

Measurement

- Definition of measured quantities



Measurement

- Definition of measured quantities

Agency Preparing Estimate

The National Industrial Conference Board

Government Committee on Economic Security

The American Federation of Labor

National Research League

Labor Research Association

Estimate of Number Unemployed

9,177,000

10,913,000

10,077,000

14,173,000

17,029,000

Measurement

- Equipment precision
- Lost data



https://www.opticscentral.com.au/media/catalog/product/cache/1/image/9df78eab33525d08d6e5fb8d27136e95/m/o/motic_ba81b_professional_biological_binocular_microscope_1.jpg

Measurement

- Spurious Precision

„An automobile advertisement caught the reader’s attention with the assertion that on a certain day an estimated 262,825,033.74 tons of snow fell upon the United States.“



Measurement

- Imperfect proxy

„Smythe’s Elixir corrects a variety of scalp diseases and stops the hair loss they cause. Smythe’s has been used by over half-a-million people on our famous Double-Your-Money-Back-Guarantee. Only 1% of those men and women were not helped by Smythe’s and asked for a refund. This is truly an amazing performance.“

Example from the beginning...

- Survey about University Heidelberg students
- Love for mathematics
- Ask random people in the Mathematikon:
„Do you love mathematics?“ Yes/No
- Result: 223/302 said YES and the rest said NO
- I report my astonishing results:
„...with this, we were able to show that 73.8410596% of Heidelberg students love math. The Heidelberg student is truly a mathematically inclined person!“



Sources

- Tyson H. Holmes, Ten categories of statistical errors: a guide for research in endocrinology and metabolism, 2004
- David J. Slutsky, Statistical Errors in Clinical Studies, 2013
- Stephen K. Campbell, Flaws and Fallacies in Statistical Thinking, 1974
- Robert M. Groves et al, Survey Methodology, 2009