

# University Mohamed Khider Biskra

Faculty of Exact Sciences  
Department of Mathematics

## Descriptive Statistics

### Chapter 1: Statistical Vocabulary, Tables and Graphical Representation

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## 1 Statistical Vocabulary

**Statistical experiment:** An investigation producing variable observations.

**Population:** The complete set of individuals under study.

**Individual (Statistical unit):** A single element of the population.

**Sample:** A subset of the population selected for analysis.

**Statistical variable:** A measurable or observable characteristic studied on each individual.

**Observation:** The value taken by the variable for one individual.

**Absolute frequency:**  $n_i$

**Relative frequency:**

$$f_i = \frac{n_i}{N}$$

**Cumulative absolute frequency:**

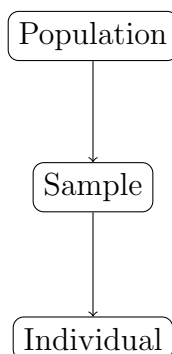
$$N_i = \sum_{j=1}^i n_j$$

**Cumulative relative frequency:**

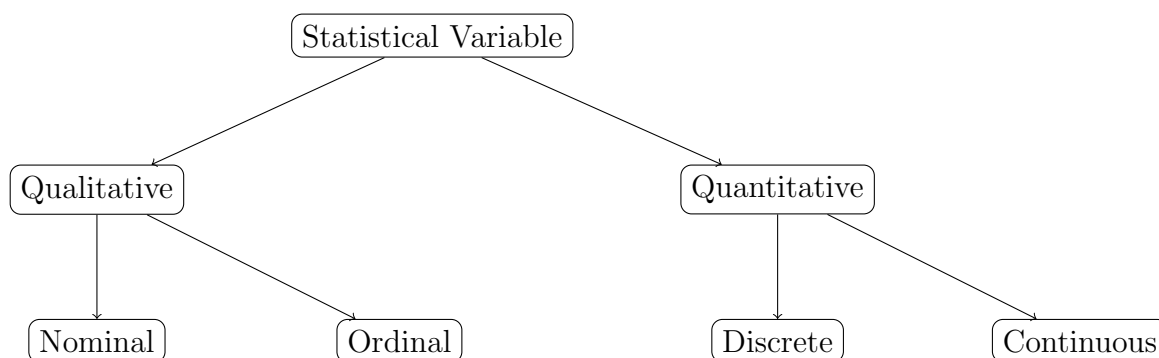
$$F_i = \sum_{j=1}^i f_j$$

## 2 Schemas

### Population – Sample – Individual



### Types of Statistical Variables



## 3 Tabular Representation

### 3.1 Definition of a Statistical Table

A statistical table is an organized presentation of data including: modalities or values, absolute frequencies, relative frequencies, and cumulative frequencies when necessary.

### 3.2 Qualitative Variable Table

**Definition:** A qualitative table lists modalities and their frequencies.

Modality	$n_i$	$f_i$	$N_i$	$F_i$
A	12	0.40	12	0.40
B	9	0.30	21	0.70
C	6	0.20	27	0.90
D	3	0.10	30	1.00
Total	30	1.00	–	–

### 3.3 Discrete Quantitative Table

**Definition:** A discrete quantitative table presents distinct numerical values and their frequencies.

$x_i$	$n_i$	$f_i$	$N_i$	$F_i$
0	5	0.25	5	0.25
1	8	0.40	13	0.65
2	4	0.20	17	0.85
3	3	0.15	20	1.00

### 3.4 Grouped Quantitative Table

**Definition:** A grouped quantitative table organizes continuous data into class intervals.

Class	$n_i$	$f_i$	$N_i$	$F_i$
[150, 160[	4	0.20	4	0.20
[160, 170[	7	0.35	11	0.55
[170, 180[	6	0.30	17	0.85
[180, 190[	3	0.15	20	1.00

## 4 Determination of the Number of Classes

### Sturges' Rule

$$k = 1 + 3.3 \log_{10}(N)$$

### Yule's Rule

$$k = \sqrt{N}$$

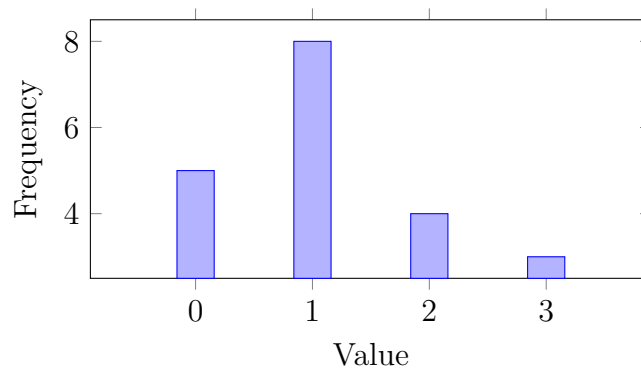
For large samples:

$$k = 2.5 \sqrt[4]{N}$$

## 5 Graphical Representations

### 5.1 Bar Chart

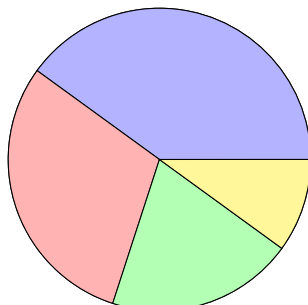
**Definition:** Graph used for qualitative and discrete variables. Bars are separated and height proportional to frequency.



## 5.2 Pie Chart

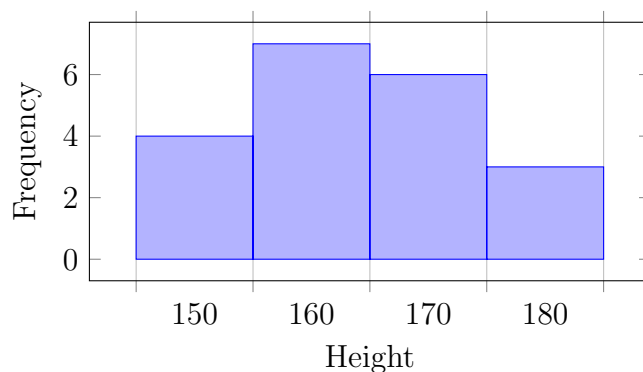
**Definition:** Circular graph used for qualitative variables. Sector angle proportional to relative frequency.

$$\theta_i = f_i \times 360^\circ$$



## 5.3 Histogram

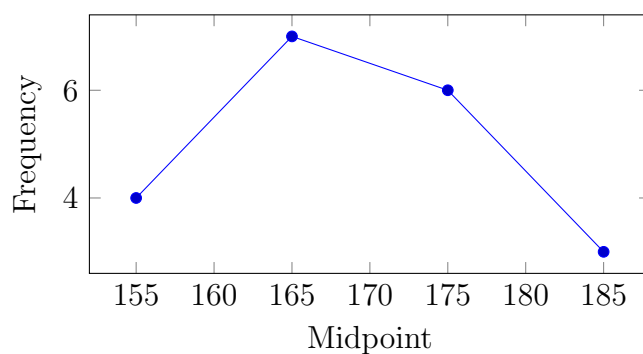
**Definition:** Graph used for continuous grouped data. Bars touch and area proportional to frequency.



## 5.4 Frequency Polygon

**Definition:** Line graph connecting midpoints  $(m_i, n_i)$ .

$$m_i = \frac{a_i + b_i}{2}$$



### 5.5 Ogive

**Definition:** Cumulative frequency curve using  $(b_i, N_i)$ .

