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Module : Probabilities-Statistics

Worksheet n°1

(Basic definitions - One-variable statistical series)

Exercice n°1 : (The different types of statistical variables)

1) Classify the variables below according to their type :

a) Number of people per household b) Height (cm) c) Sex.
d) marital status e) Weight (kg) f) Level of education
g) Mode of transport

2) Specify the modalities or values they can take.

Exercice n°2 : : (qualitative variable) The following table shows the blood groups of 2^{nd} year ST students

B	AB	A	A	O	A	A	B	AB	O	A	B	O	AB	B	O	O	A
A	O	B	O	A	A	O	O	O	O	O	A	A	AB	B	A	A	A
A	O	O	A	AB	B	B	A	A	B	AB	AB	B	A	A	AB	A	O

1) Indicate the population studied, the statistical unit, the character studied and its nature .

2) Draw up the table of the absolute frequencies n_i representing this statistical serie, calculating the relative frequencies f_i and percentages p_i.

3) Give two graphical representations suitable for this type of characteristic.

4) What is the mode of the series ?

Exercice n°3 : Show that :

i) The sum of the deviations from the mean is 0 :
$\Sigma_{i=1}^{k} n_i(x_i - \bar{x}) = 0$

ii) Linearity property : If
$\forall i \in \{1, 2, ..., k\}, a, b \in \mathbb{R}$ we have : $y_i = ax_i + b$, then :$\bar{y} = a\bar{x} + b$.

iii) * Property of partial means : Consider two statistical series with respective means $\bar{x_1}$ and $\bar{x_2}$ and respective numbers N_1 and N_2.
The mean of the two series is

$$\bar{x} = \frac{N_1\bar{x_1} + N_2\bar{x_2}}{N_1 + N_2}$$

Exercice n°4 :

The variance is the quantity :

$$V(x) = \Sigma_{i=1}^{k} \frac{n_i(x_i - \bar{x})^2}{N} = \Sigma_{i=1}^{k} f_i(x_i - \bar{x})^2 \quad (1)$$

Show that :

1) $V(x) = \Sigma_{i=1}^{k} \frac{n_i x_i^2}{N} - \bar{x}^2 = \Sigma_{i=1}^{k} f_i x_i^2 - \bar{x}^2$

2) If $\forall i \in \{1, 2, ..., k\}, a, b \in \mathbb{R}$ we have : $y_i = ax_i + b$, $a, b \in R$, then :
$V(y) = a^2 Vx$,
$\sigma_y = |a|\sigma_x$.

3) $V(x) \geq 0$.

Exercice n°5 : We are interested in the age of each of the 50 employees in a company. We have the following raw data : 36 ; 30 ; 30 ; 56 ; 58 ; 47 ; 30 ; 45 ; 47 ; 18 ; 47 ; 33 ; 26 ; 51 ; 41 ; 33 ; 45 ; 39 ; 36 ; 41 ; 51 ; 21 ; 33 ; 30 ; 18 ; 56 ; 24 ; 26 ; 41 ; 26 ; 37 ; 26 ; 33 ; 39 ; 51 ; 56 ; 33 ; 24 ; 51 ; 37 ; 24 ; 37 ; 41 ; 41 ; 45 ; 33 ; 45 ; 33 ; 30 ; 37.

1. Indicate the population studied, the statistical unit, the character studied and its nature ;
" 2. Represent the data in a statistical table, calculating the frequencies, percentages and ascending cumulative frequencies ;
3. Determine the arithmetic mean of the age, the mode , the median, ;
4. Group these results into classes of the same widths, then draw up a table of the frequencies, specifying the central of the classes, the percentages and the ascending cumulative frequencies ;
5. Construct a histogram for frequency distribution ;
6. Determine the mode (by calculation and graphically), median and mean ;
7. Compare the two means and comment on the results.

Exercice n°6 : A taxi company is interested in the mileage performed by its vehicles. To this end, it recorded the mileage of 50 of its taxis for a morning's work.

Classes	[10; 20[	[20; 30[	[30; 40[	[40; 60[	[60; 90[	Σ
frequencies	8	12	20	6	4	50

1. Indicate the population, its size, the variable and its type.
2. Draw the histogram of this distribution.
3. Give the modal class, median, mean and standard deviation of the distribution.

***Exercice n°7 :** We consider two groups of students. We record their exam marks in the following two tables :

Group A marks	8	9	10	11
frequencies	6	6	3	3

Group B marks	6	8	9	13	14
frequencies	6	6	3	3	3

1) Calculate the mean and standard deviation for each group.
2) Compare the two groups.

***Exercice n°8 :** In a city, 45 families were surveyed for the number of cell phones they used. Prepare a discrete frequency array based on their replies as recorded below. 1 ; 3 ; 2 ;2 ; 2 ; 2 ; 1 ; 2 ; 1 ; 2 ; 2 ;3 ; 3 ; 3 ; 3 ; 3 ; 3 ; 2 ;3 ;2 ;2 ;6 ; 1 ; 6 ; 2 ; 1 ; ;5 ; 1 ; 5 ; 3 ; 2 ; 4 ; 2 ; 7 ; 4 ; 2 ; 4 ; 3 ; 4 ; 2 ; 0 ; 3 ; 1 ; 4 ; 3.
1. Indicate the population studied, the statistical unit, the character studied and its nature ;
2. Represent the data in a frequency table, calculating the frequencies, percentages and ascending cumulative frequencies ;
3. Determine the mean of the number of cell phones, the mode, the median and standard

deviation ;
4. Give the appropriate graphical representation for this type of characteristic.