Series of exercises n° 02

Two-variables statistical series

Exercice 1.
Draw a bat chart for each of the following tables :

1. Here are the scores obtained by a group of students :

$Score x_i$	7	9	10	11	13	15	17	18
n_i	4	6	10	5	3	3	2	1

2. In a group of 30 people, we recorded the number of brothers and sisters of each person :

Number of brothers and sisters : x_i	0	1	2	3	4	5
$Frequency : n_i$	6	11	5	4	1	3

3. Amount of rainfall in Medea in a year

$Month$	J	F	M	A	M	J	J	A	S	O	N	D
Rain (in mm)	60	30	150	70	75	30	60	55	45	105	45	30

Exercice 2.
We recorded the number of books borrowed each day of a week in library

Day	SA	SU	MO	TU	WE
Number of books	210	115	600	60	550

Calculate the relative frequencies and construct the sector diagram (pie chart).

Exercice 3. Here is the average number of books read in one month by persons registered at the public library

Book's number	1	2	3	4	5	6
$frequency$	10	20	60	5	4	1

1. Use the suitable graph to represent this statistical series.
2. What is the character study ?
3. What is the population study ?
4. Complete the statistical table below.
5. How many persons are registered in the library ?
6. How many persons read 4 or less then for books by month ?
7. How often do people read exactly 3 books a month ?
8. How often do people read 3 books or less a month ? month ?

Exercice 4.
Draw a histogram the following tables :

1. We measured the distance 150 children swam in 4 minutes.

distance d covered in m	$0 \leq d < 50$	$50 \leq d < 100$	$100 \leq d < 150$	$150 \leq d < 200$
Number of children	22	14	50	4

2. The salary of 400 employees of a company

salary S in euros	$400 \leq s < 800$	$800 \leq s < 1200$	$1200 \leq s < 1600$	$1600 \leq s < 2000$
number of employees	50	125	150	75

Use the suitable graph to represent the following statistical series :

Exercice 5.

A petrol station owner records the number of cars which visit his premises on 10 days. The numbers are :

$$204, 310, 279, 314, 257, 302, 232, 261, 308, 217$$

1. Find the mean number of cars per day.
2. The owner hopes that the mean will increase if he includes the number of cars on the next day. If 252 cars use the petrol station on the next day, will the mean increase or decrease ?

Exercice 6.

This table shows the distribution of 110 households by income group

Salary classes	$frequency$
[0,1500[	20
[1500,3000[	40
[3000,5000[	45
[5000,10000[	5
	110

1. Give the statistical table. The table should contain the following columns :

$Classes$	$Centers : c_i$	$Frequency : f_i$	cumulate FrequenciesF_i	$f_i.c_i$	$f_i.c_i^2$

2. Calculate the mode M_o, the medean M_e, the mean $\overline{X}$ and standard deviation σ_X.
3. Calculate the quartiles Q_1, Q_2 and Q_3.
4. Determine graphically M_o and M_e.

Exercice 7.

A gardener buys 10 packets of seeds from two different companies. Each pack contains 20 seeds and he records the number of plants which grow from each pack.

$CompanyA$	20	5	20	20	20	6	20	20	20	8
$CompanyA$	17	18	15	16	18	18	17	15	17	18

1. Find the mean, median and mode for each company's seeds.
2. Which company does the mode suggest is best ?
3. Which company does the mean suggest is best ?
4. Find the range for each company's seeds.

Exercice 8.

A zootechnician set out to study the relationship between injection of growth hormone (GH) in UL/kg and weight gain in kg in a group of 20 sheep. Measurements were taken on each sheep. The results of these measurements were reported in the following table :

X/Y	25	30	35	40
20	4	2	1	0
25	5	1	0	0
30	3	2	1	1

1. Calculate the marginal means of the variables X and Y.
2. Calculate the marginal variances and marginal standard deviations of X and Y.
3. Calculate the covariance between these two variables.
4. Calculate the linear correlation coefficient.

Exercice 9.
We are going to study the evolution of body weight (kg) in single lambs after weaning. The weight, which we will call X (kg), is considered to be a continuous variable and the age Y (days) is considered as a discrete variable. The data are in the following table :

X/Y	150	170	190
[30,33[	3	4	0
[33,36[	0	3	2
[36,39[	2	1	0
[39,42[	3	0	2

1. The same questions as the previous exercise.

Exercice 10.
A typhoid epidemic has broken out in a certain region and every day the number of new cases is counted. The following table shows the first ten days.

X	1	2	3	4	5	6	7	8	9	10
Y	4	12	35	109	320	3	10	27	81	243

X denotes the number of days, Y denotes the number of new cases.

1. Calculate the arithmetic means of the two variables X and Y.
2. Calculate the variance of X.
3. Calculate the covariance between X and Y.
4. Fit the variable Y by the variable X using an equation of the form Y=aX+b.
5. What is the number of new patients (according to the linear model) that we must expect on the the 20th day after the start of the epidemic ?