

Self-Evaluation Test

PART1 :

1.

For each of the following, identify the population and the variable of interest and classify each variable as qualitative or quantitative. If quantitative, determine whether the variable is discrete or continuous.

- a) Distribution of the taxable income of Quebec rate-payers in 2001
- b) Distribution of the marital status of all HEC students in 2002
- c) Distribution of the quantity of gasoline sold daily at a certain gas station in May 2002
- d) Distribution of the number of children per family for all the families living in Montreal

2.

For each of the following statistics, indicate whether it measures central tendency, location, symmetry, variation, or dependence :

Mode ; Mean ; Median ; Standard deviation ; first quartile ; coefficient of correlation

3.

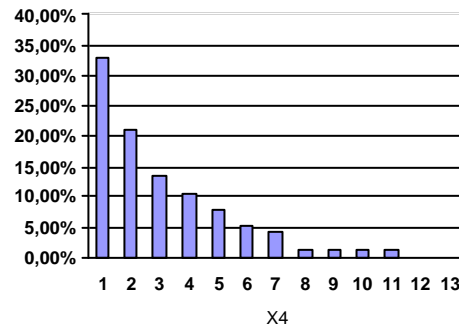
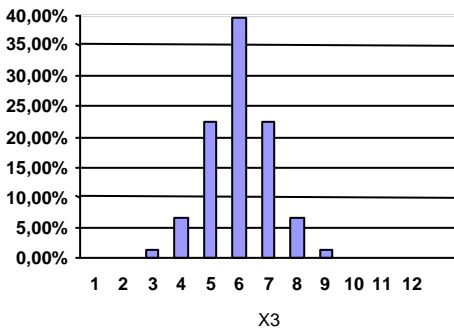
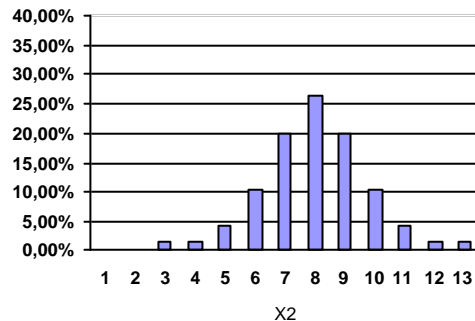
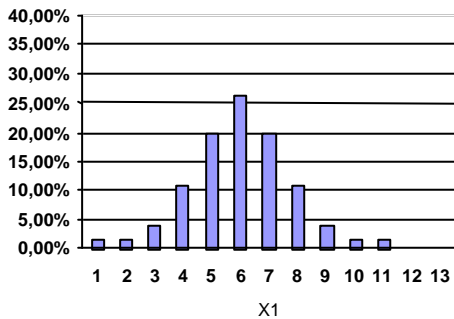
a) Calculate the mean, the median, the mode, the first quartile, the range and the variance for the following data:

10 7 6 11 10 9 8 10 7 10 6

b) What will happen to those statistics if the same positive constant is added to each value of the preceding data set?

4.

The following bar graphs represent the distribution of four (4) discrete variables X1, X2, X3 et X4 :



Which one of these distributions has the largest mean? The largest median? The largest mode? The smallest standard deviation?

5.

In the case of a continuous, symmetric and unimodal distribution, with a mean value of 10 and a standard deviation of 2, indicate whether the following statements are always true:

- a) 50% of the data values are smaller than or equal to 10
- b) 95% of the data values are smaller than or equal to 12
- c) Almost all data values are between 4 and 16

6.

A salesperson contacts ten (10) potential customers per day. From past experience we know that the probability of a potential customer making a purchase is 0,15.

- a) What is the probability that the salesperson makes at least two sales in a day?
- b) On what percentage of the days will the salesperson not make a sale?
- c) What is the expected number of sales per day?

7.

The total amount of money that customers withdraw from an automatic teller machine (ATM) each day is believed to be approximately normally distributed with a mean of \$ 8600 and a standard deviation of \$ 2500.

- a) At the beginning of a day, the bank puts \$10 000 into the automatic teller machine. What is the probability that the ATM becomes empty before the end of the day.
- b) How much should the bank put in the ATM each day in order to satisfy daily demand 99% of the time?

PART 2 :

This part of the test is related to the data file "employees.xls". You should obtain the results called for using Microsoft Excel.

The file «**employees.xls** » contains the data collected for each of 100 employees of a certain company. The detailed content of the file and the description of the measured variables are as follows:

Column	variable	description
A	Salary	Annual salary of the employee (\$)
B	Gender	0 : female 1 : male
C	Experience	Number of years of experience
D	Diploma	Highest diploma or degree earned : 0 : high school not completed 1 : high school 2 : college 3 : university

1 :

- a) Provide the frequency and relative frequency distributions of the highest diploma of the employees.
- b) Construct a bar graph showing the preceding distribution.

2 :

- a) Provide the frequency, relative frequency and cumulative relative frequency distributions for the salaries using classes [25000, 30000), [30000, 35000), [35000, 40000) and so on.
- b) Construct a histogram for this distribution.
- c) Identify the classes which contain the mode, the median and the first and third quartiles.
- d) Obtain the exact values of the mean, the median, the standard deviation, the minimum and the maximum of the salary for the male and female employees respectively.

3 :

- a) Construct a contingency table cross-classifying highest diploma earned with gender.
- b) What proportion of the employees are women whose last diploma was a college degree ?
What proportion of the employees whose last diploma was a high school degree are women?
What proportion of men have not completed high school?

4 :

- a) Set up a scatter diagram of the salary and experience for the employees of the company and determine the equation of the regression line.
- b) Compute the coefficient of correlation between salary and experience.

ANSWERS

PART 1 :

1.

- a) population : Quebec rate-payers in 2001
variable : taxable income (quantitative - continuous)
- b) population : all HEC students in 2002
variable : marital status (qualitative)
- c) population : the 31 days of May 2002
variable : the daily quantity of gasoline sold at the gas station (quantitative - continuous)
- d) population : all the families living in Montreal
variable : number of children (quantitative - discrete)

2.

Central tendency : mode, mean and median

Location : first quartile

Variation : standard deviation

Dependence : coefficient of correlation

3.

- a) Mean = 8,545 ; Median = 9 ; Mode = 10 ; First quartile = 7 ; range = 5 ; Variance = 2,975
- b) The mean, median and mode will increase by the same value. No effect on the range and the variance.

4.

Largest mean : X2 ;

Largest median: X2

Largest mode : X2 ;

Smallest standard deviation: X3

5.

- a) true b) false c) true

6.

- a) 0,5443 b) 0,1969 c) 1,5

7.

- a) 0,2877 b) \$14 415.86

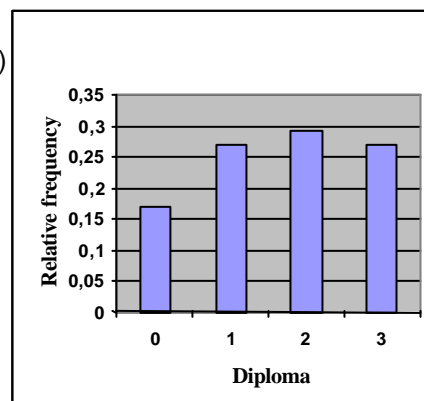
PART 2 :

1

a)

Diploma	Frequency	Relative frequency
0	17	0,17
1	27	0,27
2	29	0,29
3	27	0,27
total	100	1

b)

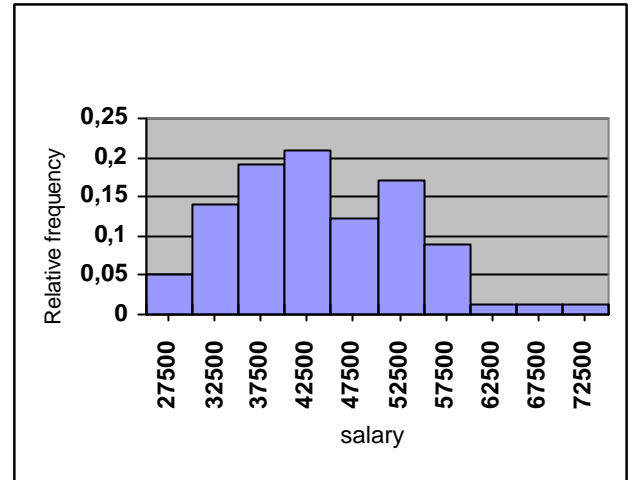


2.

a)

Salary	Freq	Relative freq	Cumul rel freq
[25000,30000)	5	0,05	0,05
[30000,35000)	14	0,14	0,19
[35000,40000)	19	0,19	0,38
[40000,45000)	21	0,21	0,59
[45000,50000)	12	0,12	0,71
[50000,55000)	17	0,17	0,88
[55000, 60000)	9	0,09	0,97
[60000, 65000)	1	0,01	0,98
[65000, 70000)	1	0,01	0,99
[70000, 75000)	1	0,01	1
total	100	1	

b)



c) Mode : [40000, 45000)
First quartile : [35000, 40000)

Median : [40000, 45000)
third quartile : [50000, 55000)

d)

	FEMALE	MALE
Mean	\$ 40 729.79	\$ 46 046.15
Median	\$ 40 535	\$ 45 925
Standard deviation	\$ 8050.30	\$ 9778.11
Minimum	\$ 26 070	\$ 25 250
Maximum	\$ 65 720	\$ 71 800

3.

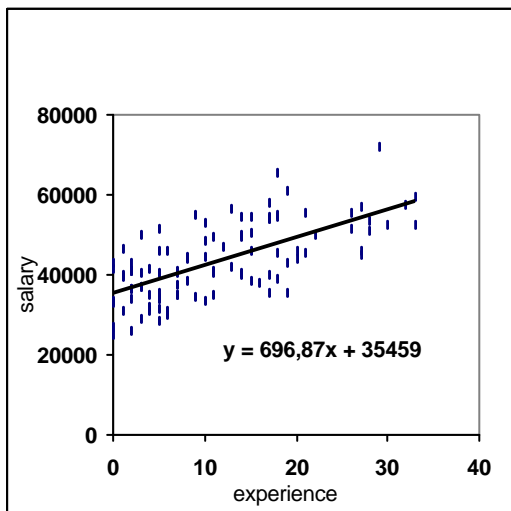
a)

	Diploma				
Gender	0	1	2	3	Total
0	6	18	10	14	48
1	11	9	19	13	52
Total	17	27	29	27	100

b) i) $10/100 = 10\%$ ii) $18/27 = 66,67\%$ iii) $11/52 = 21,15\%$

4.

a)



b)

0,6674.
(Employees having the most experience tend to have higher salaries)