STATISTICS - M1 APE/PPD

EXERCICE 1

The table below gives the distribution of age and sex in a firm. Age is given by the random variable X that takes three values : less than 3 ($X = 1$), between 31 and 40 ($X = 2$) and more than 40 ($X = 3$). Sex is given by the random variable Y, that takes 1 for men and 0 for women.

	Sex		
Age	Men	Women	Total
Less than 30 years	1200	1700	2900
31-40	2600	4200	6800
More than 40 years	4000	2300	6300
Total	7800	8200	16000

1. Derive in three separate tables the marginal distributions of X and Y, as well as their joint distribution.
2. What is the conditional distribution of Y, given the event $X = 2$.
3. When $Y = 0$, what is the probability that $X \geq 2$.
4. Are X and Y independents.

EXERCICE 2

A manufacturer of video games puts new game machines in 10 university bars randomly selected. The population is normal. Note X_i the gain in euros obtained from the game of the bar i. The mean gain given by $\overline{x} = \frac{1}{10}\sum_{i=1}^{10} x_i$ is 112 and the quantity $\frac{1}{10}\sum_{i=1}^{10}(x_i - \overline{x})^2$ is 450.

1. Give the probability distribution of the sample variance.
2. Give its point estimation.
3. Derive a 95% confidence interval of this variance.

EXERCICE 3

A survey institute conducts an opinion poll among a sample of 1050 Canadian adults concerning the general situation of their country. Each individual is invited to say is he is satisfied or not with the social and political climate in the country. The results give 126 persons satisfied, 851 persons not satisfied. 73 individuals are unable to answer.

1. Give the point estimation of the proportion of unsatisfied persons.
2. With an error risk of 5%, give a confidence interval of the true proportion of satisfied Canadians.

EXERCICE 4

In Disneyland, we observe the time spent by children to cross a labyrinth. Half of the sample are dressed up as Mickey and half are dressed up as Donald. We

suppose that the time spent in the labyrinth is normally distributed. Children with Mickey costume take in average 8.40 minutes with a corrected standard deviation of 0.6mn. Children with Donald costume take in average 9.10 minutes with a corrected standard deviation of 0.9mn. Disney wants to test if these two means are significantly different.

1. Explicit the null and alternative assumptions.
2. What is the statistic needed for this test and how is it distributed.
3. Give the decision rule and conclude.