STATISTICS – EXERCISES SESSION N° 1

SOLUTIONS

TD1 – 1 :

1. Median 4
2. Harry's score : 7
3. The sample mean and the sample median, both decrease, but the mean decreases even more. This result is explained by the fact that the mean, unlike the median, is sensitive to extreme and outlier values.

TD1 – 2 :

1) Mean 5.1, median and mode 5.
2) Mean 1.405, median 1.36.
3) Concerning the mode, if all the frequencies are equal, the mode must correspond to the zone (if it exists) where the values are the closest to each other.

TD1 – 3 :

1) Mean 99.3, standard deviation 13.41.
2) Q1 = 90.41 ; Q2 = 99.34 ; Q3 = 108.14 and I = 8.86
3) Coefficient of symmetry $\gamma_1 \approx 0{,}012$. For a symmetric distribution like the standard normal distribution we have $\gamma_1 = 0$. Here $\gamma_1 > 0$, so the curve is slightly right skewed.

   The the coefficient of kurtosis $\gamma_2 \approx 0{,}556$. For a standard normal distribution, we have $\gamma_2 = 0$. Here $\gamma_2 > 0$ Leptokur1c: distribution with heavy tails and a peak.

STATISTIQUES – TRAVAUX DIRIGES N° 2

SOLUTIONS

TD2 – 1

1) $\hat{a} = \frac{\sum_i x_i}{n}$; $E(\hat{a}) = a$; $I(a) = \frac{n}{a^2}$; $Var(\hat{a}) = \frac{a^2}{n}$ the cramer-Rao bound is reached. The estimator is eficiente, that is **MVUE** (Minimum-variance unbiased estimator).
2) $\hat{p} = \frac{\sum_i x_i}{n}$; $E(\hat{p}) = p$; $I(p) = \frac{n}{p(1-p)}$; $\mathrm{Var}(\hat{p}) = \frac{p(1-p)}{n}$. the cramer-Rao bound is reached. The estimator is eficiente, that is **MVUE** (Minimum-variance unbiased estimator).

TD2 – 2

Confidence interval 95% : [0.58 ; 0,82]

Confidence interval 99.73% : [0.52 ; 0.88]

TD2 – 3

1) $\bar{x} = 72.369$; $s = 0.117$.
2) The intervals are : $[72.285; 72.453]$ et $[72.296; 72.441]$.
3) 2%.

TD2 – 4

$\overline{x} = 1.405$; $s^2 \approx 0.281$; $s \approx 0.53$

Confidence interval for the expected value [1.03 ; 1.78].

Confidence interval for the variance $[0.13; 0.93]$.

Confidence interval for the standard deviation $[0.36; 0.97]$.

STATISTIQUES – TRAVAUX DIRIGES N° 3

SOLUTIONS

TD2 – 1 :

H0 : the person does not possess extrasensory perception the probability that he guesses the color of a card is equal to ½.

H1 : the person possesses extrasensory perception to guess the color of the cards drawn, so the probability that he guesses the card is greater than ½.

Conclusion :

At 1% significance level, does not possess extrasensory perception. In contrast, at 5% significance level the person does have extrasensory perception.

TD2 – 2 :

1)

H0 : the average lifetime is 1 600 hours

H1 : the average lifetime is different from 1 600 hours

At the level of significance equal to 5% the null hypothesis is not rejected

2)

H0 : the average lifetime is 1 600 hours or greater.

H1 : the average lifetime is less than 1600 hours.

The hypothesis H0 is not rejected at the level of significance α=5%. Therefore, the difference found between the sample mean and the specification is not significant and may be attributed to sampling fluctuations.

TD3 – 3 :

1) The probability is 5% (the error of 1st kind)

Conclusion of the test: At the 5% significance level, there is no reason to think that the proportion of owners favoring the "Consumption" criterion is significantly different from 0.4.

2) [0.25 ; 0.42]
3) Hypothesis :

H_0 : μ = 7 liters / 100 km

H_1 : $\mu \neq 7$ liters / 100 km

Conclusion : At the 5% significance level, the average fuel consumption is not equal to 7 liters / 100 km. So, the consumption announced by the manufacturer is not correct.

TD3 – 4 :

1)

H0 : mA = mB

H1 : mA > mB

Conclusion : We do not reject the H0 hypothesis at the 1% threshold.

2)

Conclusion : We reject the H0 hypothesis at the 1% threshold (the serum seems to be effective).

In this example we see the impact of the sample size on the final decision.