

Homework 1

STAT 105

Dateline : April, 1, at 00 am

Exercise 1 (7 marks)

In a poultry center, previous studies have shown that the mass of an egg chosen at random can be considered as the realization of a random variable X , with mean μ and variance σ^2 . We assume that the egg masses are independent each other. We select a sample of $n = 36$ eggs that we weigh it. The measurements are data (in ascending order) in the following table :

50,34	52,62	53,79	54,99	55,82	57,67
51,41	53,13	53,89	55,04	55,91	57,99
51,51	53,28	54,63	55,12	55,95	58,10
52,07	53,30	54,76	55,24	57,05	59,30
52,22	53,32	54,78	55,28	57,18	60,58
52,38	53,39	54,93	55,56	57,31	63,15

- 1) Compute the sample mean \bar{X} and the sample standard deviation S of this data.
- 2) Give the point estimation of μ and σ .
- 3) Find at the 95% confidence interval of μ .
- 4) Find at the 95% confidence interval of σ .
- 5) Use a 0.05 level of significance, test the following hypothesis

$$\begin{cases} H_0 : \mu = 50 \\ H_1 : \mu > 50. \end{cases}$$

Exercise 2 (8 marks)

We want to study the proportion of people who go to the cinema every month. We take a sample of size $n = 100$. Let N be the number of people in the sample who go to the movies every month.

- 1) What is the law of N .
- 2) Give an approximation of the law of the proportion $p = \frac{N}{n}$ with justification.
- 3) We observe a proportion \hat{p} of people who go to the cinema every month. Give the form of the confidence interval for p , at level of significance $1 - \alpha$.
- 4) Application $\hat{p} = 0.1$ and $1 - \alpha = 90\%$.
- 5) Application $\hat{p} = 0.1$ and $1 - \alpha = 95\%$.
- 6) Application $\hat{p} = 0.1$ and $1 - \alpha = 98\%$.