

Requirements for Statistics

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Exercise 1

Verify that the following function $f(x/\vartheta)$ is a valid probability density function. Compute expected value and variance of the random variable distributed in according to $f(x/\vartheta)$

$$f(x|\vartheta) = \vartheta^2 x \exp(-\vartheta x) \quad x > 0$$

Exercise 2

Let (X_1, X_2, X_3, X_4) be a Normal r.v. with $\mu=0, \sigma^2=1$, Specify the distribution of the following variable:

$$Y = X_1 - 2 \times X_2 + X_3 - X_4$$

under the hypothesis of independence of the X_i .

Exercise 3

From past experience, it is known that the number of tickets purchased by a student standing in line at the ticket window for the football match of Roma against Milan follows a distribution that has mean $\mu = 2.4$ and standard deviation $\sigma = 2.0$. Suppose that few hours before the start of one of these matches there are 100 eager students standing in line to purchase tickets. If only 250 tickets remain, what is the probability that all 100 students will be able to purchase the tickets they desire?

Exercise 4

Suppose that a book publisher is interested in the number of fiction paperbacks adult consumers purchase per month. The publisher conducts a survey. In the survey, each adult is asked the number of fiction paperbacks he/she has purchased the previous month. The results are below

Number of books	n_j
0	10
1	12
2	16
3	12
4	8
5	6
6	2
8	2

Compute:

- the mean, the median, the mode and the variance of Number of books purchased
- the frequency of adult consumers purchasing less than 4 books in a months

Exercise 5

Given X a Normal r.v. with $\mu=10, \sigma^2=9$, find

- $P(X>12)$
- $P(X>8)$
- $P(X<15)$
- $P(9<X<13)$