University of Biskra
Biology Department
Module: Math-stat

First year license
2025/2026

Interrogation

Exercise 1 ***(7 pts)***

1. Let X be a r.v with distribution $N(0,1)$. Calculate :
   $3)P(X \leq -1)$ $\quad$ $4)P(|X| \geq 1.45)$.

2. Let Y be a r.v following a Student's distribution with n degrees of freedom, determine the value of t:
   $n = 20$ et $P(T \geq t) = 0.25$.

3. Let X be a r.v with distribution $N(1,9)$. Calculate :
   $P(X \geq 4)$.

Exercise 2 ***(8 pts)***

The following table shows a sample of the glycemia (mg/dL) of adult persons grouped in 5 classes having the same width:

Class	n_i	Middle point x_i	$n_i x_i$	$n_i x_i^2$
$[65,75[$	15	.	.	.
$[75,85[$	20	.	.	.
$[85,95[$	30	.	.	.
$[95,105[$	20	.	.	.
$[105,115[$	15	.	.	.
Total	.			

1. Determine the variable studied and its nature.
2. Complete the table.
3. Draw the histogram of data with frequency polygon.
4. Calculate mean, mode and variance of the given sample.

Good luck

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Solution

Exercise 3 ***(7 pts)***

1. Let X be a r.v with distribution $N(0,1)$. Calculate :

$$P(X \leq -1.45) = P(X \geq 1.45) = 1 - P(X \leq 1.45) = 0.07356 \text{ (1}p\text{)}$$
$$P(|X| \leq 1.45) = 2 * P(X \leq 1.45) - 1 = 2 * 0.92647 - 1 = 0.85294. \text{ (2}p\text{)}$$

2. Let Y be a r.v following a Student's distribution with n degrees of freedom, determine the value of t:
   $n = 40$ et $P(T \leq t) = 0.80$.
   $1 - \frac{p}{2} = 0.8 \Rightarrow p = 0.4$.
   $t = 0.842$. (2p)

3. Let X be a r.v with distribution $N(1,9)$. Calculate :

$$P(X \geq 4) = P(\frac{X-1}{\sqrt{9}} \geq \frac{4-1}{\sqrt{9}}) = P(\frac{X-1}{\sqrt{9}} \geq 1)$$

   So,

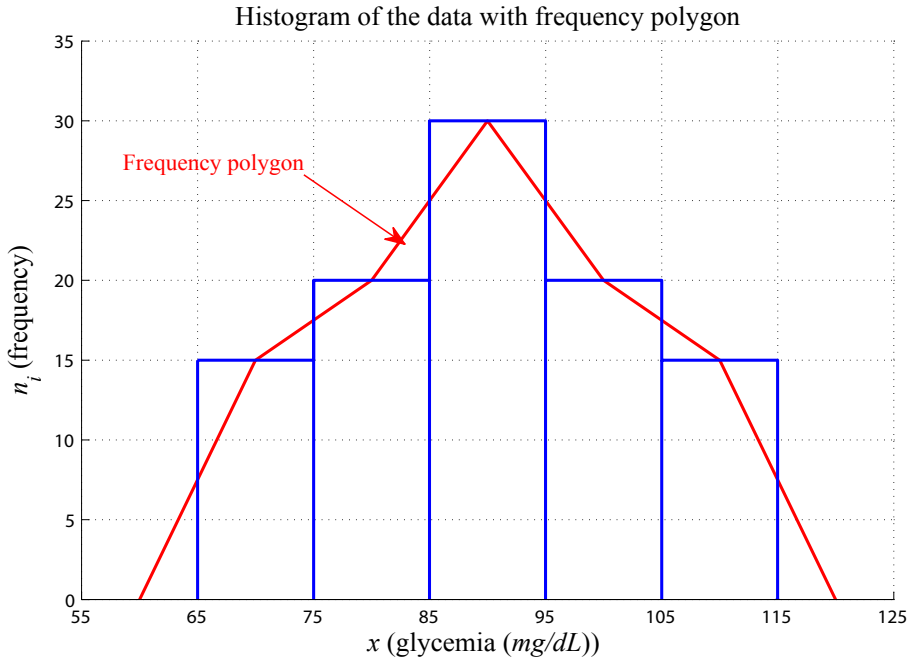
$$P(Y \geq 1) = 1 - P(Y \leq 1) = 0.15866. \text{ (2}p\text{)}$$

Exercise 4 ***(8 pts)***

1. the variable studied is the glycemia of adult persons and its nature is continuous variable. (1p)
2. Complete the table. (2p)

Class	n_i	Middle point x_i	$n_i x_i$	$n_i x_i^2$
$[65, 75[$	15	70	1050	73500
$[75, 85[$	20	80	1600	128000
$[85, 95[$	30	90	2700	243000
$[95, 105[$	20	100	2000	200000
$[105, 115[$	15	110	1650	181500
Total	100			

3. Draw the histogram of data with frequency polygon. (2p)



4. Calculate mean, mode, variance, standard deviation and range of the given sample.
   The arithmetic mean: (1p)

$$\overline{x} = \frac{1}{n}\sum_{i=1}^{k} n_i x_i = \frac{1}{100}\sum_{i=1}^{5} n_i x_i = \frac{1}{100}(1050 + ... + 1650) = 90$$

   Mode: (1p)
   the modal class is $[85, 95[$.

$$M_o \in [85, 95[$$

$$M_o = e_{i-1} + a_i \frac{\Delta_1}{\Delta_1 + \Delta_2} = 85 + 10\frac{10}{10+10} = 90.$$

   where $a_i = 10$ is the class width, $\Delta_1 = 30 - 20$, $\Delta_2 = 30 - 20$.
   Note: We can also calculate the mode graphically.

   Variance: (1p)

$$V(X) = \frac{1}{n}\sum_{i=1}^{k} n_i (x_i - \overline{x})^2 = \frac{1}{n}\sum_{i=1}^{k} n_i x_i^2 - \overline{x}^2 = \frac{1}{100}(73500 + ... + 181500) - 90^2 = 160.$$

Good luck