

Second Midterm

Instructions

- The use of a mobile phone, or any other means of communication, is forbidden.
- Give all the results with a two decimals' precision.
- Write answers on a separate sheet of paper.

1 Mushroom Cup - 2 points

Mario, a young plumber, is doing a karting tournament, the Mushroom Cup, consisting in 4 races. The following table shows his average speed in the different circuits.

	Peach Circuit	Sky Guy Beach	Riverside Park	Bowser Castle
Mario	42	54	48	37

1. All the circuits have the same length. What is Mario average speed during the Mushroom Cup ?

Mario and Luigi are comparing their ranks during the Mushroom Cup, reported in the following table.

	Peach Circuit	Sky Guy Beach	Riverside Park	Bowser Castle
Mario	3	2	9	2
Luigi	2	5	4	1

2. Who has the best average rank ?

2 Leafy Lakes - 12 points

Seven employees of Leafy Lakes, an amusement park in British Columbia, are comparing their wages and years of schooling at the coffee break. Here are their wages and years of study :

	Wages	Years of study
Alice	18000	8
Bob	15000	4
Craig	9000	1
Dave	15000	5
Eve	16000	5
Frank	17000	7
Wendy	20000	11

1. What is the median, the arithmetic mean and the mode of this set of wages ?
2. What is the standard deviation of this set of wages ?

Interesting in the link between years of study and wages we compute a simple regression between wages and years of study. We found the following result :

$$\begin{aligned} \text{Wages in k\$} &= 1.03 * \text{Years of study} - 9.68 \\ \rho &= 0.95 \end{aligned}$$

3. Interpret the correlation coefficient.
4. What is the R^2 ?
5. Oscar, 9 years of study, and Wallet, 3 years of study, are joining the conversation at the coffee break. Give a forecast of their wages.

In order to prepare the annual meeting, Roller Coaster Union, an union gathering some Leafy Lakes employees want to assess what is the level of inequality within Leafy Lakes. The following table present the wages distribution

Wages (in k\$)	Frequencies
10 - 20	4
20 - 30	10
30 - 40	16
40 - 50	18
50 - 60	24
60 - 70	12
70 - 80	10
80 - 90	4
90 - 100	2

6. What is the median class ? the modal class ?
7. What are the first and last quartile class ?
8. What is the medial ?

In order to compute the Gini coefficient, Roller Coaster Union decides to reduce the number of bins. Thus, it uses the following wages distribution :

Wages (in k\$)	Frequencies
10 - 40	30
40 - 70	54
70 - 100	16

9. Draw the Lorenz Curve of the wages' distribution.
10. What is the Gini coefficient ?

3 Alice and Bob hold up the bank - 6 points

Alice had invested 1,000\$ for 45 days at the annual rate of 3.5%.

1. How many euros will she get in 45 days ?
2. How many years would be necessary so that she double her capital ?
3. At which rate should have she invested so that she earns 10\$ of interests at the end of the 45 days ?

Bob has the choice between two investments - an investment with simple interests at the annual rate of 5% - an investment with simple interests checked-off at the annual rate of 4.5%

4. What is the best choice for Bob ?
5. For which checked-off simple interest rate does both investments are the same ?

Alice had invested 1,000\$ for one year at the annual rate of 5%.

At the end of the year, she decides to reinvest all her money for one year. But the annual rate has changed and is now 4%. She did the same at the end of the second year at the rate of 3%.

6. How many \$ will Alice have at the end of the three years ?
7. What is the annual simple interest rate so if she invest now 1,000\$, she will have the same amount (= the one found at the previous question) in three years ?
8. (bonus + 1pt) Back at the first question, what is the average annual interest rate (hint : remind that Alice is reinvesting all the money at the end of each year) ?