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|  | **S5 B test, June 2023**  **Professors:** P. ALBANO, S. CHOUDHARY,  B. DUROYON-MARCHAND, C. FOLMER JENSEN,  S. KWASNY, J. LEEB, H. PÁSZTOR, L. SÁNCHEZ BLÁZQUEZ, H. SIENIAWSKA, S. F. SOLANDER, R. SOUISSI. |

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|  | **Mathematics 6 periods**  **Part B** |  |

**Date: June** 14, 2023

Last name, First name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Class: S5MA6ENA

Marks : \_\_\_\_\_ / 41

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| **Duration of the test:**  1h30 minutes (90 minutes) : 10h00 - 11h30  **Authorized Equipment:**  Exam with technological tool: Casio Graph 90+E,  Numworks or TI-83 Premium CE Python calculator in exam mode.  Pencil for graphics  Ruler  **Special remarks:** |  |

* The subject consists of 6 mandatory exercises.
* The answers must be accompanied by the explanations with relevant steps.
* All the points cannot be attributed to a correct answer in the absence of the reasoning and explanations that make it possible to arrive at this answer.
* The candidate must answer on the subject: empty spaces are left in each exercise to do this.

Stay calm and focused.

Good job and good success.

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| **Exercise B1** | **Points** |
| The side view of the ramp represented by the image below is of a parallelogram shape. The vertical sides are 80 cm , their distance is 115 cm. The length of the other two sides is 125 cm. (We use the notation in the figure.) |  |
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| 1) The angle φ is the angle formed by the horizontal and the lower side of the parallelogram. **Prove** with a calculation that φ= 23° (rounded to the nearest integer). | 1.5 points |
| 2) **Calculate** the length of the diagonal of the parallelogram. | 2 points |
| 3) A reed windbreak is installed on the ramp. **Calculate** the area of the reed breakthrough covering the parallelogram-shaped part.  **Discuss** whether the area of the reed windbreak is less than 1 m2. | 2.5 points |

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| **Exercise B2** | **Scale** |
| 40% of a dentist's patients are men. The agenda of this dentist shows that 20% of men and 10% of women who make an appointment do not come to this appointment.  A person makes an appointment. |  |
| 1) **Determine** the probability of: |  |
| (a) that person is a woman present at the appointment. | 2 points |
| (b) that person comes to the appointment. | 2 points |
| (c) that person is a man given that this person does not come to the appointment. | 2 points |
| 53% patients of another dental practice are under 18 years old,  71% of patients wear glasses of which 47% are 18 years of age or older.  The following events are considered:  A: " The patient is 18 years of age or older"  L: " The patient wears glasses" |  |
| 2) **Determine** whether events A and L are independent. **Justify** your answer. | 2 points |

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| **Exercise B3** | | **Scale** |
| On the social media Twitter, we study the likes of three tweets during a period of time.  At the beginning of the study, the first tweet has 210 likes, and then, the number of its likes grows by 25% per hour. | |  |
| 1) **Explain** why the increase is exponential and why it can be modelled by the formula:  Where t indicates number of hours after the starting time. | | 1 point |
| 2) **Compute** the number of likes that the tweet has after 24 hours. | | 1.5 points |
| 3) On the millimeter paper provided, **draw** the graph of the function T1 for the first twenty hours after the tweet has been written. | | 1 point |
| 4) According to the model, **compute** the number of hours it takes for the tweet to reach 10 000 likes. | | 3 points |
| The number of likes for a second tweet, *t* hours after the starting time. is given by the formula: | |  |
| 5) **Determine** when the first tweet overtakes the second tweet, in number of likes. | | 2.5 points |
| A third tweet has at the same starting time 421 likes, and its number of likes increases by 8% per hour. | |  |
| 6) **Find** the expression of the number of likes for this third tweet as a function of t, the number of hours after the starting time. | | 1.5 points |

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| **Exercise B4** | **Points** |
| Let be a real number. We consider the vectors: and . |  |
| 1) **Find** the parameter , so the vectors and are colinear. | 1.5 points |
| 2) **Find** the parameter , so the vectors and are orthogonal. | 1.5 points |
| From now on, we take . |  |
| 3) **Find** the measure of the angle between the vectors and . | 1.5 points |
| 4) **Express** vector as a linear combination of vectors  and . | 2.5 points |
| 5) **Find** the coordinates of the vertices of the parallelogram ABCD , knowing *.*  . | 2.5 points |

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| **Exercise B5** | **Scale** |
| Consider a triangle whose points have the coordinates: , and . |  |
| 1) **Calculate** the coordinates of the vectors and . | 1 point |
| 2) **Show that** the angle at the vertex of the triangle is 72.9° rounded to the nearest tenth. | 1 point |
| 3) **Calculate** the area of the triangle. | 1 point |

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| **Exercise B6** | **Points** |
| 1) **Solve** the equation . | 1.5 points |
| 2) **Solve** the equation . | 2.5 points |

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**END OF THE EXAMINATION**