|  |  |
| --- | --- |
|  | **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. |

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

**Date: June** 14, 2023

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

Class: S5MA6ENA

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

|  |  |
| --- | --- |
| **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 graphicsRuler**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.

|  |  |
| --- | --- |
| **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.) |  |
|  |  |
| 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 |

|  |
| --- |
|  |

|  |
| --- |
|  |

|  |  |
| --- | --- |
| **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 |

|  |
| --- |
|  |

|  |
| --- |
|  |
| **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:$$T\_{1}\left(t\right)=210 (1.25)^{t}$$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:$$T\_{2}\left(t\right)=1240(1.025)^{t}$$ |  |
| 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 |

|  |
| --- |
|  |

|  |  |
| --- | --- |
| **Exercise B4** | **Points** |
| Let $k$ be a real number. We consider the vectors: $\vec{u}=\left(\begin{matrix}1\\2k-3\end{matrix}\right)$ and$ \vec{v}=\left(\begin{matrix}k-1\\3\end{matrix}\right)$ . |  |
| 1) **Find** the parameter $k$, so the vectors $\vec{u}$ and $\vec{v}$ are colinear. | 1.5 points |
| 2) **Find** the parameter $k$, so the vectors $\vec{u}$ and $\vec{v}$ are orthogonal. | 1.5 points |
| From now on, we take $k=5$. |  |
| 3) **Find** the measure of the angle between the vectors$ \vec{u}$ and $\vec{v}$. | 1.5 points |
| 4) **Express** vector $\vec{w}=(-10, 5) $ as a linear combination of vectors$\vec{u}$ and $\vec{v}$. | 2.5 points |
| 5) **Find** the coordinates of the vertices of the parallelogram ABCD , knowing$A=\left(-2,1\right)\vec{,AB}=\vec{u} and \vec{AD}=\vec{w}$*.*. | 2.5 points |

|  |
| --- |
|  |

|  |  |
| --- | --- |
| **Exercise B5** | **Scale** |
| Consider a triangle $ABC$ whose points have the coordinates: $A\left(0,0\right)$, $B\left(-2,4\right)$ and $C\left(4,5\right)$. |  |
| 1) **Calculate** the coordinates of the vectors $\vec{BA}$ and $\vec{BC}$. | 1 point |
| 2) **Show that** the angle at the vertex $B$ of the triangle $ABC$ is 72.9° rounded to the nearest tenth. | 1 point |
| 3) **Calculate** the area of the triangle$ ABC$. | 1 point |

|  |
| --- |
|  |

|  |  |
| --- | --- |
| **Exercise B6** | **Points** |
| 1) **Solve** the equation $log\_{5}x+log\_{5}3=log\_{5}6$. | 1.5 points |
| 2) **Solve** the equation $log\_{2}x+log\_{2}\left(x-1\right)=2log\_{2}x$. | 2.5 points |

|  |
| --- |
|  |

**END OF THE EXAMINATION**