S5 B test, June 2023

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MATHEMATICS 6 PERIODS

PART B

DATE: JUNE 14, 2023

Last name, First name: _____

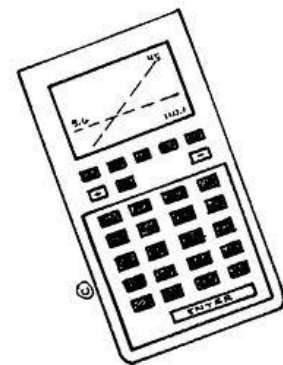Class: S5MA6ENA

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.
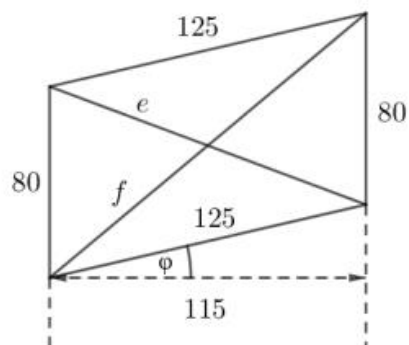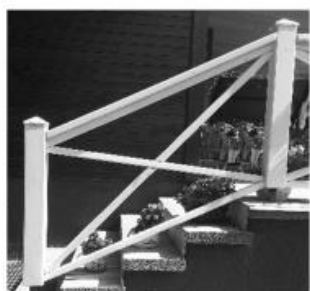Pencil for graphics

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.

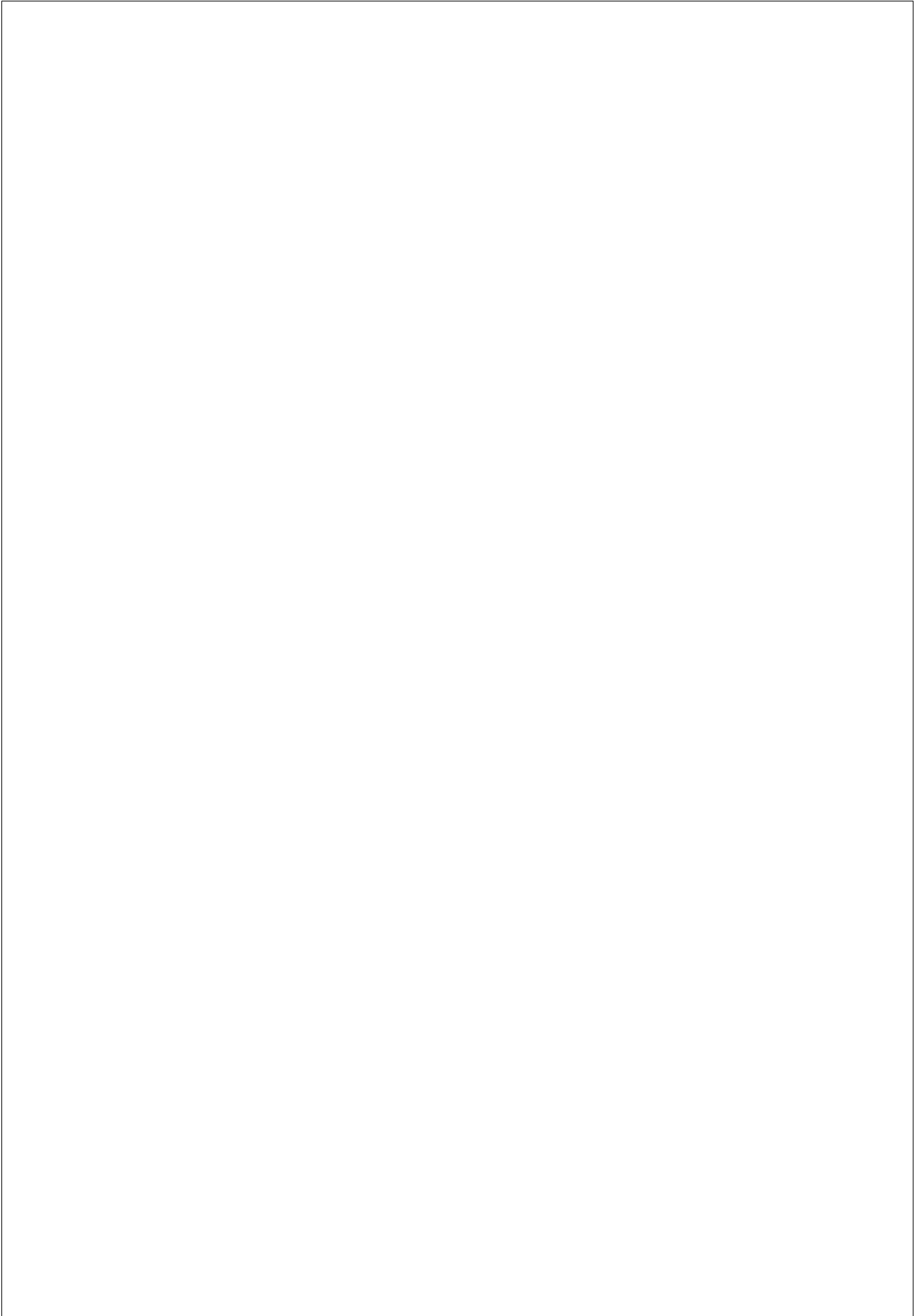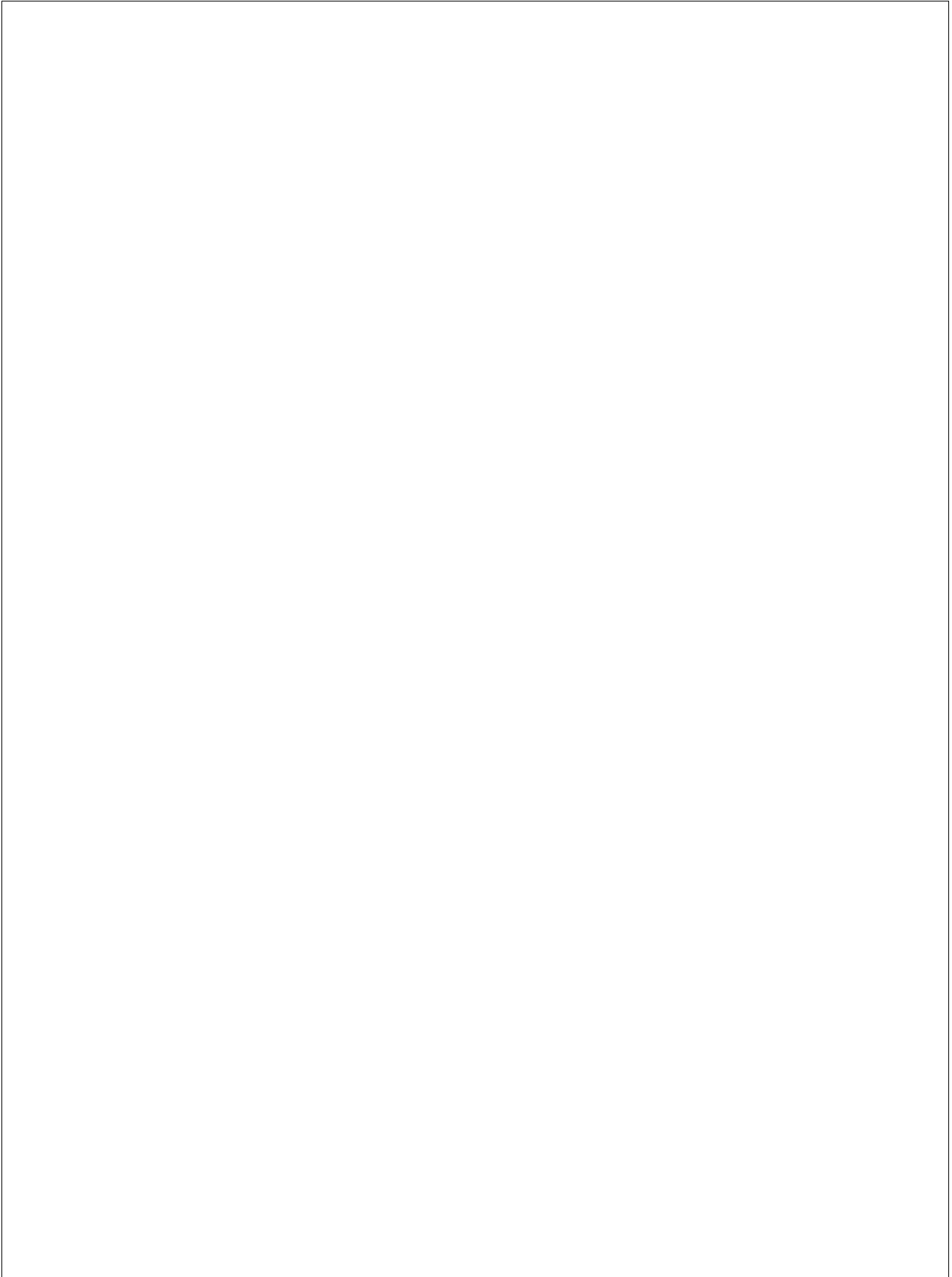| Exercise B1	Points
The side view of the ramp represented by the image below is of a parallelogram shape. The vertical sides are 80 cm , their distance is 115 cm. The length of the other two sides is 125 cm. (We use the notation in the figure.)	
1) The angle φ is the angle formed by the horizontal and 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. (b) that person comes to the appointment. (c) that person is a man given that this person does not come to the appointment. 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 2 points 2 points 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: $$T_1(t) = 210\,(1.25)^t$$ 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 T_1 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: $$T_2(t) = 1240(1.025)^t$$	
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: $\vec{u} = \begin{pmatrix} 1 \\ 2k-3 \end{pmatrix}$ and $\vec{v} = \begin{pmatrix} k-1 \\ 3 \end{pmatrix}$.	
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 $A = (-2,1), \overrightarrow{AB} = \vec{u}$ and $\overrightarrow{AD} = \vec{w}$. .	2.5 points

Exercise B5	Scale
Consider a triangle ABC whose points have the coordinates: $A(0,0)$, $B(-2,4)$ and $C(4,5)$.	
1) **Calculate** the coordinates of the vectors $\overrightarrow{BA}$ and $\overrightarrow{BC}$.	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 $log_2 x + log_2(x - 1) = 2log_2 x$.	2.5 points

END OF THE EXAMINATION