BACCALAURÉAT GÉNÉRAL
ÉPREUVE SPÉCIFIQUE DES SECTIONS EUROPÉENNES
MATHÉMATIQUES – ANGLAIS

SUJET 14

Polygons

Ce sujet comporte 2 pages. L'usage de tout modèle de calculatrice, avec ou sans mode examen, est autorisé.

Carl Friedrich Gauss's precocity

There are several stories of his early genius. According to one, his gifts became very apparent at the age of three when he corrected, mentally and without fault in his calculations, an error his father had made on paper while calculating finances.

Another story has it that in primary school after the young Gauss misbehaved, his teacher, J.G. Büttner, gave him a task : add a list of integers in arithmetic progression ; as the story is most often told, these were the numbers from 1 to 100. The young Gauss reputedly produced the correct answer within seconds, to the astonishment of his teacher and his assistant Martin Bartels.

Gauss's presumed method was to realize that pairwise addition of terms from opposite ends of the list yielded identical intermediate sums : 1 + 100 = 101, 2 + 99 = 101, 3 + 98 = 101, and so on, for a total sum of 50 × 101 = 5050. However, the details of the story are at best uncertain ; some authors, such as Joseph Rotman in his book A first course in Abstract Algebra, question whether it ever happened.

Source : Wikipedia

Vous devez restituer le sujet à la fin de l'épreuve

I. Explain what the text deals with and comment on it.

II. Exercise 1: the polygon

A polygon has 10 sides. The lengths are named in increasing order : $a_1;a_2;a_3;a_4;....a_{10}$.

Knowing that :

- The perimeter of the polygon is 675 cm
- The length of the longest side is twice that of the shortest side.
- $a_1+a_2+a_3+...+a_{10}=5(a_1+a_{10})$,
- $a_2-a_1=a_3-a_2=a_4-a_3=....=a_{10}-a_9$

Find all the lengths of the polygon,

III. Exercise 2: cycling

Richard is sponsored to cycle 1 000 miles over a number of days. He cycles 10 miles on day 1, and increases this distance by 10 % daily.

1. How long will Richard cycle on day 2? on day 3?
2. Assuming that the distance Richard cycles for *n* days is given by $100\times(1.1^n-1)$, how long will it take him to complete the challenge?
3. What will be the greatest number of miles completed in a single day?

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