

**BACCALAURÉAT GÉNÉRAL
ÉPREUVE SPÉCIFIQUE DES SECTIONS EUROPÉENNES
MATHÉMATIQUES – ANGLAIS**

SUJET 21

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

Zero, the number that's not a number.

Mental calculation

You could be forgiven for thinking that zero is not a proper number. After all, numbers are the things we use to count, and you can't count nothing.

We have evidence for counting going back five millennia, but the history of zero only began with the Babylonians in about 1800 BC. Even then, it was not a fully fledged¹ number. The point of zero for them was like the zero in our modern representation of a number like 3601- it's a position-setting symbol that distinguishes the number from 361.

The Babylonians' symbol was two diagonal arrows; the familiar squashed² egg shape only came into being around 800 AD, still as an accounting symbol. It was the work of Indian mathematicians that sparked the genesis of zero as a number, when they first appreciated that numbers can have an abstract existence distinct from counting physical objects. The astronomer Brahmagupta, for example, laid out a number line that included positive and negative numbers and zero.

From NewScientist 26 August 2017

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

II. Exercises:

1. Some examples and a conjecture

- a. Knowing that $137 \times 1,001 = 137,137$ and $249 \times 1,001 = 249,249$, can you foresee the value of the product $572 \times 1,001$?
- b. Conjecture a rule for working out the product of a 3-digit number a by 1,001.

2. Proof of this conjecture

Using the equality $1,001 = 1,000 + 1$, explain how to prove the conjecture.

¹ **Fully fledged:** *completely developed or trained.*

² **To squash:** *to crush something into a flat shape.*

3. Mental calculation trick

- a.** Simplify the expression $((7 \times a) \times 11) \times 13$.
- b.** Deduce a mental calculation trick you can perform to impress your friends.

4. Generalisation

- a.** Try to guess a rule we can use for multiplying a 4-digit number by 10,001 mentally.
- b.** What about 100,001?