NB: pour gagner du temps, traitez les parties A, B et C directement sur l'énoncé et placez-le à l'intérieur de la copie qui vous a été remise

A. Structures de la langue (4 points – niveau B1)

1°) Usage des articles: *corrigez 5 erreurs d'article dans ce petit texte:*

Modern symbol for zero was invented by a Indian mathematician named Brahmagupta. It was first adopted by Persian and Arab merchants then used for doing the mathematical research. It arrived in the Western Europe during Middle Ages.

2°) Questions et réponses *compléter à gauche avec des questions ou à droite avec des réponses:*

– ….. ? Yes, the Mayas invented it

– Was zero used as a placeholder ? …........................... (*négative courte*)

– ….. ? It took several centuries

– …............................…... ? Its first inventors were the Babylonians

3°) Données quantitatives *écrivez dates, valeurs et symboles en toutes lettres:*

Since 1800 BC (…..) symbols have been used for numbers,

which represents a duration of 3800 (…..) years.

$2012 = 2 \times 10^3 + 0 \times 10^2 + 1 \times 10 + 2$ (…..
…..)

4°) Possessifs et pronoms relatifs *corrigez les erreurs de forme dans le texte qui suit:*

The early mathematicians which worked without any symbol for representing they zero experienced difficulties for conducting the complex calculations who were necessary for there astronomy. Zero is really an important number and his importance cannot be overestimated.

B. Décomposition et prononciation des mots (3 points – niveau B1)

Indiquer la catégorie (N=nom, V=verbe, A=adjectif, AV=adverbe) et la prononciation en notation API des mots suivants du texte (après les avoir éventuellement décomposés en écrivant les préfixes et suffixes EN MAJUSCULES et en parenthésant au besoin les étapes de la décomposition)
catégorie finale : mot = décomposition des préfixes et suffixes => /prononciation déduite/
notez les catégories avec N pour nom, V pour verbe, A pour adjectif et AV pour adverbe
par exemple: N : synthesizer = V: (N: (SYN- + N: thesis) + -IZE) + -ER => /'sɪnθəsɑizər/

…. : essential = …... => /................................./

…. : bartered = …... => /................................./

…. : placeholder = ... => /................................./

….. : entirely = …... => /................................./

Dans l'extrait qui suit, soulignez toutes les occurrences des diphtongues /ai/ (comme dans « why ») et /ei/ (comme dans « play ») :
The first positional number system was used to calculate the passage of the seasons and the years in Babylonia, modern-day Iraq, from around 1800 BC onwards. Its base was not 10, but 60. It didn't have a symbol for every whole number up to the base, unlike the "dynamic" system of digits running from 1 to 9 that is the bread-and-butter of our base-10 system.

C. Compréhension écrite élémentaire (4 points – niveau B1)

Les justifications doivent être de très courts extraits du texte judicieusement choisis

a) Ce texte est un extrait d'un livre sur l'histoire des nombres VRAI – FAUX

Justification: . . . .

. . . .

b) proposez un synonyme ou une définition en anglais de "bartered"

. . . .

c) le symbole du zéro est apparu il y a plus de 2500 ans VRAI - FAUX

Justification: . . . .

. . . .

d) proposez un synonyme en anglais de "worth"

. . . .

e) proposez trois synonymes en anglais de "clump"

. . . .

f) avoir un symbole pour noter zéro était une condition nécessaire et suffisante pour développer le calcul positionnel dans les opérations arithmétiques VRAI - FAUX

justification: . . . .

. . . .

D. Reformulation et synthèse (3 points – niveau B2)

Answer each question in English in 5 to 10 lines ; carefully summarise and rephrase, and don't just copy-paste whole sentences from the original text: any select citation should be explicit (enclosed within quotation marks)

1°) Explain the title of the article: “From zero to hero”

2°) How many different representations of zero are described in this text ?

3°) reformulate the sentence below into modern mathematical language (using relevant technical words, but without any mathematical symbols):

“Adding zero to itself does not result in any increase in its size, as it does for any other number. Multiply any number, however big, by zero and it collapses down to zero. And let’s not even delve into what happens when we divide a number by zero.”

D. Production écrite élémentaire (3 points – niveau B1)

Describe the differences between the Roman notation of numbers and the modern one (NB: you are expected to discuss their intrinsic technical properties, not the way these two notations are used today)

F. Production écrite avancée (3 points – niveau B2)

In the 3rd century BC, Ancient Greeks began representing numbers owing to the 27 letters of their archaic alphabet: the first nine letters represented numbers from 1 to 9, the next nine ones represented tens and the last nine ones represented hundreds. The first 9 letters preceded by a stroke denoted thousands and the uppercase letter M (standing for the word « myriad ») denoted a multiplication by ten thousand. Discuss the merits and limitations of this system compared with the Roman notation.

From zero to hero

A concept of zero is essential for arithmetic to work smoothly — why then did the idea take so long to catch on?

Richard Webb follows its convoluted path

« I used to have seven goats. I bartered three for corn; I gave one to each of my three daughters as dowry; one was stolen. How many goats do I have now? »

This is not a trick question. Oddly, though, for much of human history we have not had the mathematical wherewithal to supply an answer. There is evidence of counting that stretches back five millennia in Egypt, Mesopotamia and Persia. Yet even by the most generous definition, a mathematical conception of nothing— a zero — has existed for less than half that time. Even then, the civilisations that discovered it missed its point entirely. In Europe, indifference, myopia and fear stunted its development for centuries. What is it about zero that stopped it becoming a hero?

This is a tangled story of two zeroes: zero as a symbol to represent nothing, and zero as a number that can be used in calculations and has its own mathematical properties. It is natural to think the two are the same. History teaches us something different.

Zero the symbol was in fact the first of the two to pop up by a long chalk. This is the sort of character familiar from a number such as the next year in our calendar, 2012. Here it acts as a placeholder in our ”positional” numerical notation, whose crucial feature is that a digit's value depends on where it is in a number. Take 2012, for example: a “2” crops up twice, once to mean 2 and once to mean 2000. That's because our positional system uses “base” 10— so a move of one place to the left in a number means a digit's worth increases by a further power of 10.

[…]

The first positional number system was used to calculate the passage of the seasons and the years in Babylonia, modern-day Iraq, from around 1800 BC onwards. Its base was not 10, but 60. It didn't have a symbol for every whole number up to the base, unlike the “dynamic” system of digits running from 1 to 9 that is the bread-and-butter of our base-10 system. Instead it had just two symbols, for 1 and 10, which were clumped together in groups with a maximum headcount of 59. For example, 2012 equates to $33 \times 60 + 32$, and so it would have been represented by two adjacent groups of symbols: one clump of three 10s and three ones; and a second clump of three 10s and two ones.

This particular number has nothing missing. Quite generally, though, for the first 15 centuries or so of the Babylonian positional numbering system the absence of any power of 60 in the transcription of any number was marked not by a symbol, but (if you were lucky) just by a gap. What changed around 300 BC we don't know; perhaps one egregious confusion of positions too many. But it seems to have been at around this time that a third symbol, a curious confection of two left-slanting arrows ↗↗, started to fill missing places in the stargazers' calculations.

This was the world's first zero. Some seven centuries later, on the other side of the world, it was invented a second time. Mayan priest-astronomers in central America began to use a snail-shell-like symbol to fill gaps in the (almost) base-20 positional “long-count” system they used to calculate their calendar.

Zero as a placeholder was clearly a useful concept, then. It is a frustration entirely typical of zero's vexed history, though, that neither the Babylonians nor the Mayans realised quite how useful it could be.

In any dynamic, positional number system, a placeholder zero assumes almost unannounced a new guise: it becomes a mathematical “operator” that brings the full power of the system's base to bear. This becomes obvious when we consider the result of adding a placeholder zero to the end of a decimal number string. The number 2012 becomes 20120, magically multiplied by the base of 10.

We intuitively take advantage of this characteristic whenever we sum two or more numbers, and the total of a column ticks over from 9 to 10. We “carry the one” and leave a zero to ensure the right answer. The simplicity of such algorithms is the source of our system’s supple muscularity in manipulating numbers.

We shouldn’t blame the Babylonians or Mayans for missing out on such subtlety: various blemishes in their numerical systems made it hard to spot. And so, although they found zero the symbol, they missed zero the number.

Zero is admittedly not an entirely welcome addition to the pantheon of numbers. Accepting it invites all sorts of logical wrinkles that, if not handled with due care and attention, can bring the entire number system crashing down. Adding zero to itself does not result in any increase in its size, as it does for any other number. Multiply any number, however big, by zero and it collapses down to zero. And let’s not even delve into what happens when we divide a number by zero.

Classical Greece, the next civilisation to handle the concept, was certainly not keen to tackle zero’s complexities. Greek thought was wedded to the idea that numbers expressed geometrical shapes; and what shape would correspond to something that wasn’t there?

[…]

Eastern philosophy, rooted in ideas of eternal cycles of creation and destruction, had no such qualms. And so the next great staging post in zero's journey was not to Babylon's west but to its east. It is found in Brahmaphutasiddhanta, a treatise on the relationship of mathematics to the physical world written in Indian in around AD 628 by the astronomer Brahmagupta.

[…]

Indian mathematician had dared to look into the void – and a new number had emerged. It was not long before they unified it with zero the symbol. While a Christian Syrian bishop writes in 662 that Hindu mathematicians did calculations “by means of nine signs” an inscription of dedication at a temple in the great medieval fort at Gwalior, south of Delhi in India, shows that two centuries later the nine had become ten. A zero – a squashed-egg symbol recognisably close to our own – had been incorporated into the canon, a full member of a dynamic positional number system running from 0 to 9.

[…]

Richard Webb is a feature editor for New Scientist

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