BACCALAURÉAT GÉNÉRAL
ÉPREUVE SPÉCIFIQUE DES SECTIONS EUROPÉENNES
MATHÉMATIQUES – ANGLAIS

SUJET 20

Magical Multiplying Method
Sequences

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

I well remember the wonder that I experienced when I learned **"MULTIPLY by ADDING"**, using a much simpler, arithmetic basis. Before we can proceed, we must introduce triangular numbers.

1 = **1** 1+2 = **3** 1+2+3 = **6** 1+2+3+4 = **10**

So, 1, 3, 6 and 10 are the first four triangular numbers. And with these few examples we can see a short cut for finding other triangular numbers.

We will call T_n the nth triangular number. So $T_1 = 1$, $T_2 = 3$, $T_3 = 6$….

Finally we're ready to show you the magical way to multiply without multiplying anything. We call it the "Magical Multiplying Method" (or the "3M" way). Let's take as an example 15 × 9.

1. Take the larger factor 15 and find T_{15}.
2. Subtract 1 from 9, the smaller factor, getting 8. Find T_8.
3. Subtract the two factors, 15 - 9; that's 6. Find T_6.
4. Add the results of Steps 1 and 2, then subtract the result from Step 3. That's your product!

Adapted from http://www.trottermath.net/algebra/3mgame.html

I. Explain what the texts deal with and comment on it.

II. Exercises:

1. Without using the text, explain how to complete the following table:

n	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**

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

T_n	**1**	**3**	**6**	**10**	*15*	*21*	*28*	*36*	*45*	*...*	*...*	*...*	*...*	*...*	*...*

2. Check the magical multiplying method works with the example given in the text.

3. Use this method to calculate 6 × 14.

4. Explain why for each integer $n>0$: $T_{n+1} = T_n + n$.

5. Assuming that $T_n = \frac{n(n+1)}{2}$, prove the "3M" method by showing that for any whole numbers *a* and *b* with *a* greater than *b*: $T_a + T_{b-1} - T_{a-b} = a \times b$

6. What happens if *a* is equal to *b*?

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