BACCALAURÉAT GENERAL
EPREUVE SPECIFIQUE DES SECTIONS EUROPENNES
MATHEMATIQUES – ANGLAIS

SUJET 11

Mathematics and inspiration. Fibonacci Sequences

Sujet comportant deux pages. L'usage de tout modèle de calculatrice, avec ou sans mode examen est autorisé.

So why do we learn mathematics? Essentially, for three reasons: calculation, application, and last, and unfortunately least in terms of the time we give it, inspiration. Mathematics is the science of patterns, and we study it to learn how to think logically, critically, and creatively. But too much of the mathematics that we learn in school is not effectively motivated, and when our students ask : "Why are we learning this? " then they often hear that they'll need it in an upcoming math class or on a future test.

But, wouldn't it be great if, every once in a while, we did mathematics simply because it was fun or beautiful or because it excited the mind? Now, I know many people have not had the opportunity to see how this can happen, so let me give you a quick example with my favorite collection of numbers, the Fibonacci numbers. Now these numbers can be appreciated in many different ways. From the standpoint of calculation, they're as easy to understand as one plus one, which is two. Then, one plus two is three, two plus three is five, three plus five is eight, and so on. In terms of applications, Fibonacci numbers appear in nature surprisingly often. In fact, there are many applications of Fibonacci numbers, but what I find most inspirational about them are the beautiful number patterns they display.

Extracted from a conference of Arthur Benjamin in Edinburgh (Scotland), June 2013

Dégager les idées essentielles du texte ci-dessus.

EXERCISE

Let's consider the Fibonacci sequence:

$F_1 = 1$, $F_2 = 1$, $F_3 = 2$, $F_4 = 3$, $F_5 = 5$, $F_6 = 8$, $F_7 = 13$ ….

1. What is the pattern of the Fibonacci sequence?

2. Calculate the eighth and the ninth terms of the sequence.

3. Let's label S_n the sum of the squares of the first n term of the Fibonacci sequence ($n \geq 2$). Calculate S_2, S_3, S_4 , and check that $S_5 = 40$

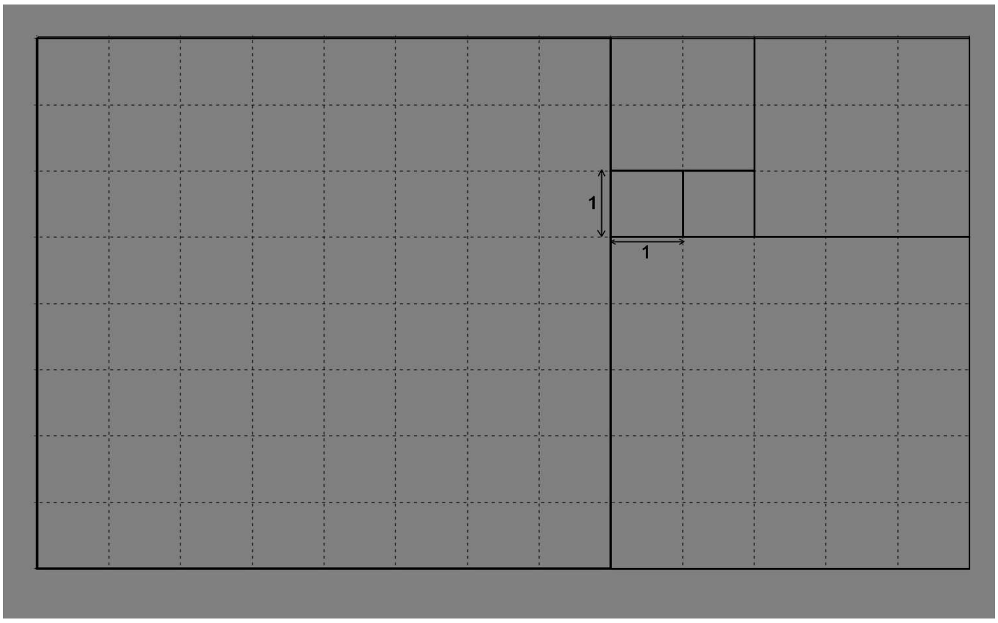
4). (U_n) is defined by $U_n = F_n \, . \, F_{n+1}$ ($n \geq 2$).

a. Calculate the four first terms of this sequence.

b. What can be noticed?

5. Using the shape below and calculating the area of the largest rectangle with two

- methods, prove that $S_6 = U_6$.



6. Using a simple multiplication, calculate S_7.