

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

SUJET 18 - Irrationality of $\sqrt{2}$

Thème : arithmétique

Ce sujet comporte 1 page. L'usage de la calculatrice est autorisé.

- 5 Hippiasus of Metapontum was an ancient Greek philosopher of the Pythagorean school of thought. Supposedly, he tried to use his teacher's famous theorem to find the length of the diagonal of a unit square. This revealed that a square's sides are incommensurable with its diagonal, and that this length cannot be expressed as the ratio of two integers. The other Pythagoreans believed dogmatically that only positive rational numbers could exist. They were so horrified by the idea of incommensurability that they threw Hippiasus overboard on a sea voyage, and vowed to keep the existence of irrational numbers an official secret of their sect. However, there are good reasons to believe Hippiasus's demise is merely an apocryphal myth. Historical documents
- 10 referencing the incident are both sparse and written 800 years after the time of Pythagoras and Hippiasus.

<https://brilliant.org/wiki/irrational-numbers/>, 2015

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

II. Exercise.

1. What is an even number, an odd number.
2. Assuming that an odd number can be written as $2k+1$, where k is a whole number :
 - a) Prove that the square of an odd number is also an odd number.
 - b) Prove that the square of an even number is also an even number.
3.
 - a) Compute the square of 1.4, 1.41 and 1.41.
 - b) How many digits are there in the decimal part of the square of 1.41421356?
 - c) Is $\sqrt{2}$ a decimal number? Explain why.