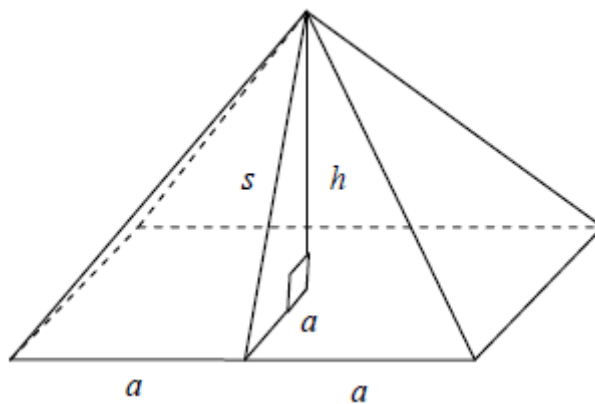


Epreuve de discipline non linguistique : mathématiques en anglais.**The Great Pyramid**

Most recently, in 1999, French author (...) Midhat J. Gazalé writes (...): « It was reported that the Greek historian Herodotus learned from the Egyptian priests that the square of the Great Pyramid's height is equal to the area of its triangular lateral side ». Why is this statement so crucial? For the simple reason that it is equivalent to saying that the Great Pyramid was designed so that the ratio of the height of its triangular face to half the side of the base is equal to the Golden Ratio!



The Golden Ratio is $\varphi = \frac{1+\sqrt{5}}{2} \approx 1.62$: it was given a mystical meaning in the Greek antiquity, and has ever since been regarded by some as a very special number, appearing in art, architecture, nature...

Extract from « The Golden Ratio », by Mario Livio (Broadway Books, 2002)

Questions:

We'll assume that the base of the pyramid is a square.

1. Prove that, if the statement attributed to Herodotus is correct, $s^2 - a^2 = s \times a$.
2. Let $x = \frac{s}{a}$: dividing both sides in the previous identity by a^2 , show that x is a solution of the quadratic equation $x^2 - x - 1 = 0$.
3. Find the value of x . Is Mario Livio's conclusion valid?
4. Actually, according to Mario Livio, $2a = 755.79$ feet and $h = 481.4$ feet.

Calculate s and $\frac{s}{a}$ to two decimal places. Is Herodotus' statement consistent with the actual dimensions of the Great Pyramid?

5. It turns out that Herodotus never said that « the square of the Great Pyramid's height is equal to the area of its triangular lateral side »! This is merely a translator's misinterpretation...

Other authors claim that «the ratio of the circumference of the base to the pyramid's height is equal to 2π ». Is this theory consistent with the actual dimensions of the Great Pyramid?

Which one do you prefer: the φ theory or the π theory? ... Or neither?