Sujet n°12

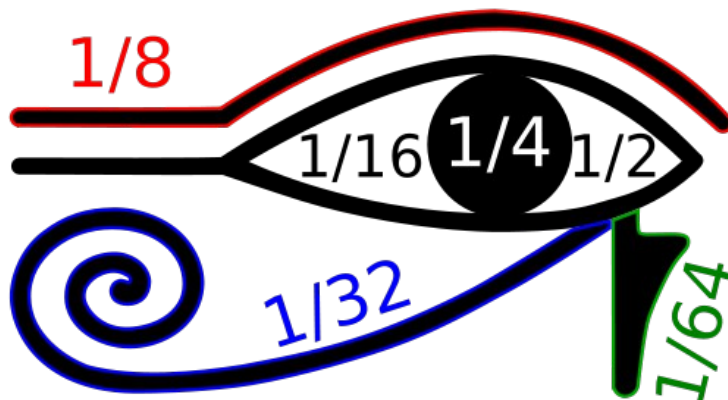**SEQUENCE**

Please do not write on the subject paper and don't forget to give back the examination paper at the end of the test.

According to the legend, when Set and Horus were fighting for the throne after Osiris's death, Set gouged out Horus's left eye and threw it into the Nile. Most of the eye was restored by Thoth, except for one last portion.

1. Calculate the sum of the fractions you can see on the picture above.

2. The missing fraction to complete the unit was supplied magically by Thot.

   What is the value of that fraction ?

3. The Egyptians used to decompose any fraction $\dfrac{a}{b}$ (with a and b being two integers not equal to 0) in a sum of inverses of integers.

   For example : $\dfrac{5}{12}=\dfrac{4+1}{12}=\dfrac{4}{12}+\dfrac{1}{12}=\dfrac{1}{3}+\dfrac{1}{12}$

   a) According to this example, decompose $\dfrac{15}{16}$ in a sum of inverses of integers.

   b) Calculate the sum $\dfrac{1}{2}+\dfrac{1}{2^2}+\dfrac{1}{2^3}+\ldots+\dfrac{1}{2^n}$.

   c) Give the Egyptian way of writing the number $\dfrac{2^n-1}{2^n}$.

Formula : $1+q+q^2+\ldots+q^n=\dfrac{1-q^{n+1}}{1-q}$ \qquad\qquad NB : to gouge out : extraire