03

The Egyptian fractions

Topic: Calculation
Theme: Fractions
Abilities: Use fractions - simplification
Material: None
Level: Age 14/18

Math Reality

In ancient times, the Egyptians calculated with natural numbers and fractions. Regarding fractions, they only used $\frac{2}{3}$ and the inverses of integers (for instance, the inverse of 4 is $\frac{1}{4}$).

Let's calculate like an Egyptian !

Writing numbers in hieroglyphs

Powers of ten decimal writing	1	10	100	1000	10000	100000	1000000
Powers of ten hieroglyphic writing							

It is an additive system. Thus, 23 was written 2 tens plus 3 units, as follows:

$\frac{1}{3}$ $\frac{1}{21}$

The fraction $\frac{1}{3}$ and $\frac{1}{21}$ were written:

$= \frac{1}{3}$ $= \frac{1}{21}$

(The sign  is put above the 3 to denote its inverse)

Write these fractions in hieroglyphs :

$\frac{1}{5} =$

$\frac{1}{36} =$

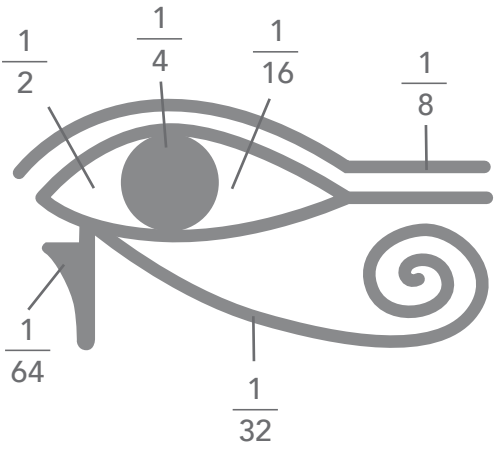
$\frac{1}{1532} =$

The Eye of Horus

In Egyptian mythology, Seth (the god of violence) snatched an eye from his nephew Horus (the falcon-headed god).

He divided it into 6 pieces and threw them into the Nile.

This eye is called Oudjat



The six pieces can be :

- The left side of the eye $\frac{1}{2}$
- The pupil $\frac{1}{4}$
- The eyebrow $\frac{1}{8}$
- The right side of the eye $\frac{1}{16}$
- The curved tail $\frac{1}{32}$
- The teardrop $\frac{1}{64}$

It is said that Thot (human God) restored the eye, symbol of good against evil, but the sum of these parts is not equal to 1 (the whole eye). He granted the missing part to any scribe seeking and accepting his protection.

Calculate the sum A of the fractions of the Oudjat and give the missing part!

Writing fractions

The Egyptians expressed other fractions by combining these kinds of fractions, all different ones.

For example, for $\frac{47}{60}$ =

$$\frac{47}{60} = \frac{20}{60} + \frac{15}{60} + \frac{12}{60} = \frac{1}{3} + \frac{1}{4} + \frac{1}{5}$$

Check that: $\frac{2}{2n+1} = \frac{1}{(n+1)} + \frac{1}{(n+1)(2n+1)}$

Apply this formula to $\frac{2}{7}$ =

$\frac{2}{7}$ =

Multiply numerator and denominator by 2, then complete the calculation to obtain a sum of distinct Egyptian fractions :

$\frac{4}{5}$ =

$\frac{5}{9}$ =

$\frac{6}{11}$ =

Write $\frac{25}{26}$ as a sum of distinct Egyptian fractions.

$\frac{25}{26}$ =