



LESSON SCENARIO 03: THE EGYPTIAN FRACTIONS

Topic: Fractions

Level: Age 14 -18

Foreknowledge: Use fractions - simplification

Correlation: History, Geography

Time: 45 minutes



LEARNING OUTCOMES

- Calculation with Egyptian fractions
- Write in hieroglyphs

TEACHING METHODS

- VR technology
- Individual work and pair work

KEY WORDS

- Fraction
- History
- Calcul
- Egypt

RESOURCES

- Pencil
- Paper
- VR headsets

ACTIVITIES

INTRODUCTION: RULES OF CONDUCT WHEN USING VR IN THE CLASSROOM (5 min)

The teacher starts discussion with the students asking them about the use of VR and their expectations in using VR in classroom.

After the discussion the teacher defines the work methods and rules of conduct for students regarding safety precautions for using VR headsets in the classroom and learning in virtual environment:

- listen to the teacher carefully
- remove physical obstacles before using VR
- always work in pair - never alone
- keep the device clean.

INTRODUCTION TO THE EGYPTIAN NUMERATION (15 MIN)

INTRODUCTION

The teacher explains how Egyptians calculated. It can be recalled what a natural number and a fraction are.

In ancient times, the Egyptians calculated with natural numbers and fractions.

Regarding fractions, they only used $\frac{2}{3}$ and unit fractions, i.e. the inverses of integers (for instance, the inverse of 4 is $\frac{1}{4}$).

A discussion can follow on what hieroglyphs are and where they can be found: the teacher can show some photos.

In Ancient Egypt the two first writing systems were the Hieroglyphic (from about 3200 B.C.) and Hieratic scripts; the last one was a cursive script derived from Hieroglyphs, which was used by scribes, while Hieroglyphic script became largely restricted to monumental inscriptions.



HIEROGLYPHS ON THE TEMPLE OF KÔM OMBO.

Then, the teacher can discuss the historical theme; then he/she explains how the Egyptians wrote numbers and gives instructions on what to do:

The numbering system was decimal and additive: each power of 10 was represented by a specific sign, as can be seen in the table below.

Powers of ten (decimal writing)	1	10	100	1000	10000	100000	1000000
powers of ten (hieroglyphic writing)		∩	⊙	☪	𐍑	𐍓	𐍕

For instance, 213 is represented by:



There is no strict rule for the arrangement of the numerical signs.

To represent $\frac{1}{n}$, we represent n and add a sort of oval somewhere which denotes the inverse. It can be seen above in the picture on the right.

For example :

$\frac{1}{5}$: 

ACTIVITY 1

- the teacher divides the students into pairs - in each pair there is a student A and a student B; student A has a VR headset, and student B assists him
- student A carefully puts on his VR headset and starts the task in the VR application
- student A finds and selects the Fraction exercise on the exercise shelf
- after completing ACTIVITY 1, students A and B change roles

WORKSHEET FOR STUDENTS:

Exercise 1: Write in hieroglyphs fractions (10 min)

The student A has to answer to questions with the support of the student B and click on the button "*Check the answer*".

Attention, the oval sign which represents the fraction is not to be written, the student must just write the number of the denominator and this sign appears.

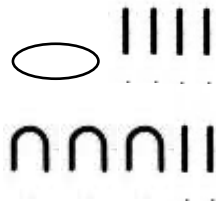
Write in hieroglyphs fractions $\frac{1}{5}$:

solution:

|||||

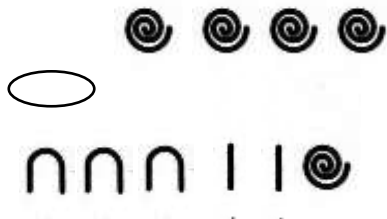
Write in hieroglyphs fractions $\frac{1}{36}$:

solution:



Write in hieroglyphs fractions $\frac{1}{1532}$:

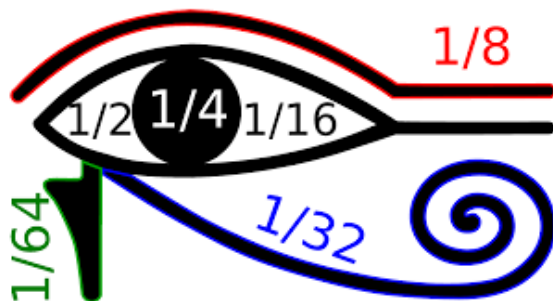
solution:



Exercise 2: Eye oudjat (5 min)

Give the missing part

The student A take off the headset et together (A + B) they have to calculate the missing part of the eye Oujdat on table (for this purpose, he first has to sum up the fractions of the pieces restored).



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 are:

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

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.

The student A input the solution in the application:

solution:

$$A = \frac{1}{2} + \frac{1}{4} + \frac{1}{16} + \frac{1}{8} + \frac{1}{64} + \frac{1}{32} = \frac{32}{64} + \frac{16}{64} + \frac{4}{64} + \frac{8}{64} + \frac{1}{64} + \frac{2}{64} = \frac{63}{64}$$

$$\begin{aligned} \text{The missing part} &= \frac{64}{64} - \frac{63}{64} \\ &= \frac{1}{64} \end{aligned}$$

After that ACTIVITY, the students switch places.

Student B who now has VR headset solves the task in the following exercise:

ACTIVITY 2:
Exercise 1: DEFINE A SUM OF DISTINCTS EGYPTIAN FRACTIONS (10 min)

The teacher gives instructions on what to do and gives advices:

The Egyptians expressed fractions by combining the unit fractions $\frac{1}{n}$ and $\frac{2}{3}$, all different ones.

If it is necessary, multiply numerator and denominator by 2, then complete the calculation to obtain a sum of distinct Egyptian fractions: The purpose of this exercise is to reveal fractions as the egyptians would have written it.

First, we recommend to multiply by 2 the numerator and the denominator of the following fractions.

To answer correctly, once the student B decomposed the fraction, the student B have to input the different fractions obtained from the lowest denominator to the highest. They do not have to use $\frac{2}{3}$ fraction.

solution:

$$\frac{6}{11} = \frac{12}{22} = \frac{11}{22} + \frac{1}{22} = \frac{1}{2} + \frac{1}{22}$$

For example here A student have to answer "2" (in hieroglyphs), then click on the button *Next* to finally answer "22" (in hieroglyphs).

solutions:

$$\frac{5}{9} = \frac{10}{18} = \frac{9}{18} + \frac{1}{18} = \frac{1}{2} + \frac{1}{18}$$

$$\frac{4}{5} = \frac{8}{10} = \frac{5}{10} + \frac{1}{10} + \frac{2}{10} = \frac{1}{2} + \frac{1}{10} + \frac{1}{5}$$

$$\frac{25}{36} = \frac{50}{72} = \frac{36}{72} + \frac{12}{72} + \frac{2}{72} = \frac{1}{2} + \frac{1}{6} + \frac{1}{36}$$

EVALUATION

1. I like the way of work in this lesson.	1	2	3	4	5
2. This lesson was interesting.	1	2	3	4	5
3. It is clear what I was supposed to learn in this lesson.	1	2	3	4	5
4. The subject matter was clearly explained.	1	2	3	4	5
5. I have learned the subject matter.	1	2	3	4	5
6. I think I actively participated in this lesson.	1	2	3	4	5
7. I was more active in this lesson than usually.	1	2	3	4	5
8. By being active I contributed to the quality of the lesson.	1	2	3	4	5
9. I was motivated for work in this lesson.	1	2	3	4	5
10. I prefer using VR in lessons.	1	2	3	4	5
11. Name two things you liked in this lesson.					
12. Name two things you didn't like in this lesson.					

INCLUSIVENESS GUIDELINES

Every student is different and their needs for the material might vary. Below you will find several tips that could make mathematics lesson more inclusive for students who struggle with learning disorders.

- When giving assignments to classroom try to break them into small pieces of information. Avoid the double tasks in the instructions. Remember that in case of operations/exercises with multiple steps, it is critical to help learners decompose the steps.
- You can use checklists for your students to make sure they have done all the steps
- Make sure the font, line spacing, and alignment of your document is accessible for students with learning disorders. It is recommended to use a plain, evenly spaced sans serif font such as Arial and Comic Sans. Others: Verdana, Tahoma, Century Gothic and Trebuchet. Spacing should be 1.5 and try to avoid justification in the text.
- At the end of each activity, take some time to ask the students what they have learnt to acknowledge every step in their learning process
- Make sure that the material the students manipulate is easy enough to grasp
- While using different media (paper, computer and visual aids) choose different background than white which can be too bright for students with learning disorders. The best choice would be cream or soft pastel but try to test different colours to learn more about student's preference.
- To stimulate short and long-term memory prepare for all the students in the classroom an outline describing what they are going to learn on this lesson and finish it with a resume of what has been taught. In this way they will strengthen the ability to remember information.

EXAMPLE:

1. Start every lesson with a short "CHECK-IN"

- Today, we will study the topic (name of the topic)
- I will tell you about: (name 3 keywords connected with the topic)
- Then I will present exercises: (name the exercises form the student book)
- Then we will do exercises (explain the way student will be working: ex. together with teacher / in pairs /individually)
- Once the exercises will be done [To continue]

2. Then finish lesson with a short "CHECK-OUT"

- During the lesson we learn about (topic of the lesson)

- The most important things were: (name 3 keywords connected with the topic)
- We were able to do... (tell about the work student done during the lesson)
- We will explore the topic next time when we will learn about (name the following topic)

It is a small adjustment that will take 5 min from the lesson but can make a great difference in the way that the material will be remembered. Try to create this as a routine habit.