



LESSON SCENARIO 07: ALGEBRAIC EXPRESSIONS

Topic: Algebra

Level: Age 13 - 14

Foreknowledge: Elementary mathematics operations

Correlation: Everyday life, Geometry

Time: 55 minutes



LEARNING OUTCOMES

- The student researches and analyses the problem task, writes the solution of the problem as an Algebraic Expression

TEACHING METHODS

- VR Activity
- Work in pairs

KEY WORDS

- Variables
- Algebraic expressions
- Numerical expressions

RESOURCES

- 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.

ACTIVITY 1 (35 min): ALGEBRAIC EXPRESSIONS IN VR APPLICATION

The teacher assigns the task to the students:

In the ALGEBRAIC EXPRESION virtual application, explore how the number of matches depends on the length of a given geometric display composed of matches.

Activity outcomes:

Student:

- finds and selects the ALGEBRAIC EXPRESION exercise on the exercise shelf
- solves tasks in VR application
- investigates how the number of matches depends on the length of a given geometric representation composed of matches





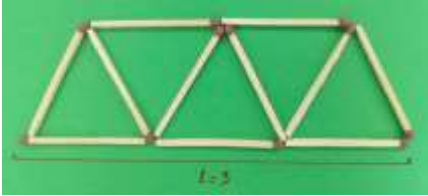

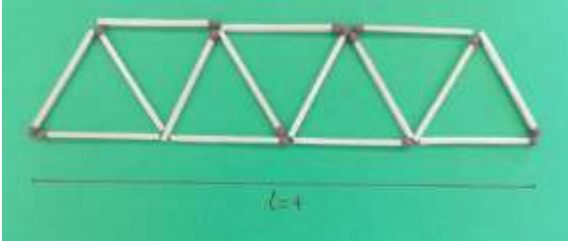

Form of work: work in pairs

Required accessories: VR headset

CORUSE OF ACTIVITY:

The teacher divides the students into pairs. student A carefully puts on his VR headset, opens the ALGEBRAIC EXPRESION exercise in a virtual library in a VR application and solves tasks in a virtual environment. Student B assists him. This is followed by a swap of roles.

During the VR exercise, the student selects the answers as in the table:

	NUMBER OF MATCES		NUMBER OF SAMPLES
	3		1
	7		2
	11		3
	15		4
for l=5	19		5

ACTIVITY 2 (15 min): FORMULATION OF AN ALGEBRAIC EXPRESSION

After both students do the exercise, a discussion follows.

The teacher projects the questions on the board and after each answer projects images that are answer to questions.

Activity outcomes

Student:

- writes in the form of an algebraic expression the dependence of the number of matches on the length of a given geometric representation

Form of work: frontal

Required accessories: prepared PowerPoint presentation or some other form of presentation with questions, images or answers.

QUESTION 1: Is there a certain element (or elements) that appears on all the geometric shapes you saw in the exercise?

ANSWER 1:

There are two elements built into all the patterns: a final triangle (only one in each sample) and a triangle with an added match at the top (appears multiple time in samples of length greater than two or equal two).

QUESTION 2: How many matches are needed for the basic component






BASIC COMPONENT OF THE PATTERN


ANSWER 2: 4 matches in each basic component

QUESTION 3: How many times is the basic component being repeated in each of the cases?

ANSWER 3: The basic component is being repeated as many times as the length of the sample was, but an additional match was missing in the last element.

QUESTION 4: Your answers in the VR exercise were as in the table:

PATTERNS	NUMBER OF REPETITIONS OF THE BASIC COMPONENT OF THE PATTERN	NUMBER OF MATCHES	SAMPLE LENGTH l
	1	3 $* 3 = 4 - 1$	1
	2	7 $* 7 = 4 + (4 - 1)$ $= (4 + 4) - 1$	2
	3	11 $* 11 = 4 + 4 + (4 - 1)$ $= (4 + 4 + 4) - 1*$	3

	4	<p style="text-align: center;">15</p> $* 15 = 4 + 4 + 4$ $+ (4$ $- 1)$ $= (4 + 4 + 4 + 4)$ $- 1$	4
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Can you identify a systematic correlation between the number of repetitions of the basic component of a pattern and the variable l ?

ANSWER 4: Yes, there is a specific correlation. Sample length l is always equal with the number of repetitions of the basic pattern. In other words, the number “4” appears within the equation as many times as is being denoted by the value of length, , e.g. 1 time when the length = 1, twice when the length = 2, 3 times when the length=3, and so on. On the other hand, we shouldn’t forget to subtract the one match from the final number of matches, inasmuch there is one “-1” that shows up in all the cases.

QUESTION 4: Can you express a fomula that gives the number of matches for ANY value of sample length?

ANSWER 4: Number of matches : $m = 4l - 1$

FORMULATION AN ALGEBRAIC EXPRESSION (teacher):

Algebraic expression $m = 4l - 1$ describes the number of matches m depending on the sample length variable l . Today, you used numerical expressions, but you also used variable ang algebraic expression.

- ✓ **NUMERICAL EXPRESSION**-mathematical espression with algebric operations between numbers –you used it to calculate the number of matches
- ✓ **VARIABLE**-variable value which we denote by letters or symbols – your variable is length of the sample: as the length of the sample changed, se did the total number of matches
- ✓ **ALGEBRAIC EXPRESSION**- mathematical expression with algebric operations between variables and numbers or just variables :you have expressed a fomula that relates the number of matches to the length of the sample

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
111. 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.