



# LESSON SCENARIO 15: SPECIAL PRODUCTS

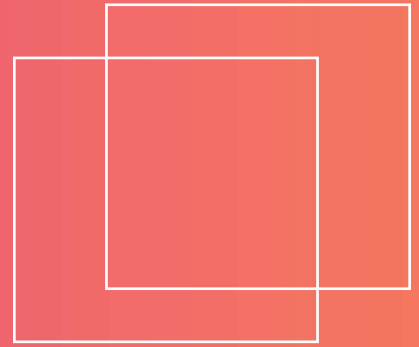
Topic: Algebra

Level: Age 14 -15

Foreknowledge: Monomials and polynomials; operations with monomials and polynomials; area of quadrangles; volume of parallelepipeds

Correlation: None

Time: 60 minutes



## LEARNING OUTCOMES

- Recognize special products
- Learn how to calculate them
- Understand the origin of factors in a special product

## TEACHING METHODS

- VR technology
- Individual work
- Work in pairs

## KEY WORDS

- Binomial
- Trinomial
- Squared
- Cubed

## 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. Sanitize it after use.

### REVIEW (5 minutes)

In a discussion with the teacher, students review the special products; the teacher points out the importance of special products in algebra. Then the teacher asks each students to write down in their worksheet the formula of the cube of a binomial (or at least what they remember of this formula).

### INTRODUCTION TO THE LESSON (5 minutes)

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
- after completing the task, students A and B change roles and student B start the task, after having sanitized the headset.

**FIRST TASK (10 minutes)**

Student A finds and selects the Special products exercise on the exercise shelf. He watches at the cube and, as soon as the laser beam divides the cube, he reports to student B: the type of solid obtained (cube or parallelepiped); the dimensions of the solid (length, height and width); the volume of each solid; the total volume obtained. Student B notes all this data in A's worksheet.

**SECOND TASK (10 minutes)**

Same as first task, but student B wear headset, while student A assists him/her. Student B lists all the info about solids while student A writes his/her note on B's worksheet.

**WORKSHEET**

<b>Student name</b>				
<b>FORMULA (cube of a binomial)</b>				
<b>PARTS OF THE CUBE</b>				
<b>Type of solid</b>	<b>Length</b>	<b>Height</b>	<b>Width</b>	<b>Volume</b>
<b>Sum all terms of last column:</b>				

### CONCLUSION (10 minutes)

The students (both A and B) compare their notes with the formula previously written. They discuss whether: the two formulas overlap; they forgot some terms, etc.

### ANSWERS:

Student name				
FORMULA (cube of a binomial)	$a^3 + b^3 + 3a^2b + 3ab^2$			
PARTS OF THE CUBE				
Type of solid	Length	Height	Width	Volume
cube	a	a	a	$a^3$
parallelepiped	a	b	a	$a^2b$
parallelepiped	a	b	a	$a^2b$
parallelepiped	a	b	a	$a^2b$
parallelepiped	a	b	b	$ab^2$
parallelepiped	a	b	b	$ab^2$
parallelepiped	a	b	b	$ab^2$
cube	b	b	b	$b^3$
Sum all terms of last column:	$a^3 + a^2b + a^2b + a^2b + ab^2 + ab^2 + ab^2 + b^3 =$ $a^3 + 3a^2b + 3ab^2 + b^3$			

## 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.