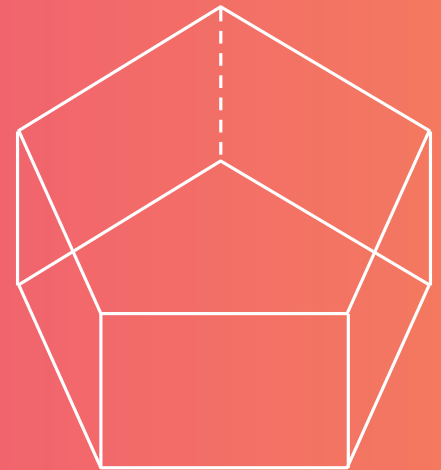# LESSON SCENARIO: PRISMS

Topic: Geometry

Level: Age 15 -16

Foreknowledge: Base of a prism, side of a prism, right prisms, oblique prisms, right regular prism

Correlation: Physics, Architecture, Construction, Art

LEARNING OUTCOMES

- **Find examples of prisms from real life**
- **Distinguish the base of the prism from the side of the prism**
- **Recognize n-sided prism**
- **Distinguish between right and oblique prism**
- **Create a prism**
- **Describe and define a prism**

TEACHING METHODS

- **Practical work**
- **Hands-on activity**
- **Group work**
- **Digital Tools**

KEY WORDS

- **Prisms**
- **Translation**
- **Vector**

RESOURCES

- **styrofoam**
- **skewers**
- **marker**

ACTIVITIES

ACTIVITY 1 (10 minutes)

PRISMS IN REAL LIFE

OUTCOMES:

Student:

- **Searches the internet for examples of prisms in real life**

- **Uploads at least two pictures of prisms to online tool Padlet**

- **Describes a prism in discussion with the teacher**

Organization of work: working in teams of three students

Material: worksheet with instructions, QR code:

Procedure: The teacher puts the students into teams of three. The students then search the net for models of prisms in real life. After choosing two models, they post the pictures to an online tool Padlet. All the students can see what the other teams have posted. Discussion between students and the teacher follows, as well as remembering the definition of a prism that they have learnt in primary school.

WORKSHEET

ACTIVITY 1

Rules:

   I.   The teacher gives names to the teams: GREEN, MAGENTA, PEACH, LIME, BLUE, DARK

   II.   Working in a team, search the net for models of prisms from real life and choose at least two that you like.

   III. Scan this code:

   IV. Post your examples of prisms to the open online tool Padlet under the name of your team. Now, you can observe the examples of other teams, too.

   V.   Answer the following questions:

       1. Where can we see prisms?
         - architecture, construction, art, household…

       2. How are the prisms in the pictures you have found different?

         - students recognize triangular, quadrilateral, pentagonal, hexagonal prisms…, n-sided prisms

       3. Are all the models you have posted prisms?
       It is possible some students have posted a picture of a pyramid, a cylinder or some other solid shape with bases in parallel planes, but with lateral faces that are not parallelograms.

   VI. Look at the prisms that the teacher has posted.
       How are they different from the prisms you have observed previously?

       The prisms the teacher has posted are oblique prisms.
       It is possible some of the students will also find an example of an oblique prism, but if they have presented only right prisms, the teacher discusses oblique prisms with the students.

ACTIVITY 2 (30 minutes)

HOW PRISMS ARE MADE

Outcomes:

Student:

- Creates a prism

- describes and defines a prism

Organization of work: collaboration in teams of three

Material: worksheet, styrofoam, skewers, marker

Procedure:

The students work in the same teams as in Activity 1. The tacher hands out worksheets with the questions and material needed to make a prism. Each team is given two congruent polygons made of Styrofoam, cca 15 skewers and a marker.

The teacher gives instructions to students. They will make right and oblique prisms and have a class discussion where they will observe how a prism is made and how we describe it. They will take photos of their prisms and post them to online tool Padlet in their group fromActivity 1.

TEAM GREEN gets two congruent equilateral triangles	**TEAM MAGENTA** gets two congruent squares	**TEAM PEACH** gets two congruent right hexagons
TEAM LIME gets two congruent triangles	**TEAM BLUE** gets two congruent quadrilaterals	**TEAM DARK** gets two congruent pentagons

WORKSHEET

HOW PRISMS ARE MADE

Follow these instructions:
- ✓ draw lines around lower bases of the congruent polygons
- ✓ mark about a dozen points on the lower base, as well as on its vertex
- ✓ stick the skewers into marked points so that they are parallel to each other and orthogonal to the polygon
- ✓ answer the following questions:

1. **What do skewers represent?**

Skewers represent line segments.

2. **Can we stick more of such skewers?**

We could stick an infinite number of such skewers because a polygon consists of an infinite number of points.

3. **What are the lengths of these skewers?**

All the skewers are the same length.

4. **What is the position of the skewers in relation to each other?**

They are parallel.

5. **We distinguish the starting and ending point of each skewer. What do we call such line segments with characteristics described above?**

We call them vectors.

6. **What can you notice, what have we actually been doing?**

We have been translating the points of the polygon by the same vector.

7. **What is the result of this translation?**

By this translation a polygon congruent to the starting polygon has been made.

8. **Which solid shape has been made by this translation? Take a picture, name the shape and post it online in your group.**

TEAM GREEN: A right regular triangular prism has been made.

TEAM MAGENTA: A regular quadrilateral prism has been made (cuboid).

TEAM PEACH: A regular hexagonal prism has been made.

TEAM LIME: A right triangular prism has been made.

TEAM BLUE: A right quadrilateral prism has been made.

TEAM DARK: A right pentagonal prism has been made.

9. What will happen if the vectors are not orthogonal to the plane of the polygon? Take a picture and post it online in your group!

An obligue prism will be made.

10. Is a prism made if the points of the polygon are translated by a vector that is collinear to the polygon? Take pictures and post them online in your group!

No. We can see that a solid shape has not been made because all the points have remained in the plane of the polygon.

NOW HOW WOULD YOU DESCRIBE A PRISM?

A prism is a union of all the line segments that are formed by translation of all the points that belong to a convex polygon (including its sides) by the same vector, which does not belong in the plane of the base of the prism.

After the students have answered the questions, they analyse the answers with the teacher. If they have not come up with a precise definition of the prism, they try to define it with the help of the teacher. All the teams` works can be seen by other students and the teacher at any time and used for further discussion in online tool.

EVALUATION

ACTIVITY 3– LEARNING OUTPUT (5 minutes)

OUTCOMES

Student:

- self-evaluates acquiring of the outcomes
- uses the knowledge acquired to describe prisms
- recognizes the definition of prism

Organization of work: individual work in online tool Socrative or worksheet

ACTIVITY:

The students use the given link: https://b.socrative.com/login/student/, enter the virtual room with the given password 2019MATH, write their name and answer the questions:

1. How well did you understand today's materials?

2. What did you learn in today's class?

3. Are all the solids in the picture prisms?

Only the first solid is a prism. The sides of the other solids are not parallelograms.
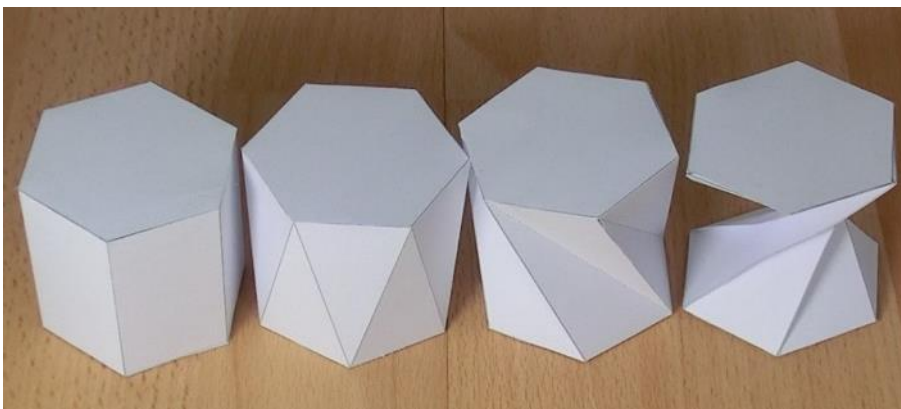
The teacher and other students in the class can get the feedback immediately, and further discussion can be conducted on any of the questions.

The teacher can also conduct the final activity by using the worksheet in appendix.

WORKSHEET

Evaluation - How prisms are made   Score: _____

1. How well did you understand today's material?

  (A) Totally got it

  (B) Pretty well

  (C) Not very well

  (D) Not at all

2. What did you learn in today's class?

_____

_____

_____

_____

3. Are there all the prisms in the picture?

  (A) True

  (B) False

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 to 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.