SCENARIO	
Title	**Geometric shapes and animations in Scratch**
Summery	Students will recall geometric figures and their properties. In addition, they get acquainted with the creation of animations in the environment.
Author/s	Edyta Michaluk

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Didactic objectives

General objectives:
- drawing figures using Scratch tools,
- calculation of perimeter and figure areas,
- creating animations,

Specific objectives:
- reminding of geometric figures and their properties,
- learning to draw geometric figures, calculating areas and perimeters,
- introducing the concept of a variable,
- getting to know the concept of animation,
- costumes as the basis for creating animations

Physics☐　　　Mathematics☒　　　Information Technology☒　　　Robotics☐　　　Programming☒

Education Level: 　　　10-12 years☒　　　12-14 years☐

Problem Statement

What geometric shapes do you know? Can you calculate their areas and perimeters?
What is a variable?
What is animation? Where can animations be used? Where can you find animations?

BOM (Bill Of Materials needed)

- computer for each student
- Scratch environment installed
- multimedia board with a projector for presentation
- sheets of paper, rulers, pencils
- Internet access

Activity description

Scenario is planned for 4 lessons.

Course of classes:

1. Organization in the classroom, assigning computer workstations to students, creating a folder on the computer disk for saving projects named student's name_class, for example Adam_IIA.

2. Reminding known geometric figures, drawing figures on sheets of paper, writing patterns on the perimeter and area of figures.
3. Introduction of the concept of a variable.
4. Add the Pen extension in the Scratch environment and discuss / present the functions.
5. Overview of blocks from the Sensors and Operators category.
6. Exercise 1. Geometric figures
   a. giving the length of side / sides / angles of the figure, calculating the area and perimeter, drawing the figure,
   b. square, rectangle, equilateral triangle,
   c. during the exercise will be used: Pen function, the ask and wait function, say, repeat loop,
   d. after adding new commands, run the script to check if it works correctly and discuss the steps,
   e. the exercise involves the development of a square and a triangle together with the teacher's instructions and the development of a rectangle by the students themselves,
   f. projects should be saved as *project1* (square), *project2* (rectangle), *project3* (triangle).
7. Exercise 2. Animations.
   a. creating your own sprite - presentation of the possibility of creating a sprite in the Paint program,
   b. importing a sprite created in Paint,
   c. creating costumes for the sprite (ultimately 5 costumes)
   d. choosing the order of the costumes,
   e. arranging blocks using the repeat loop, next costume and wait ... s (pay attention to using the wait block and simulating an animation without this command to show the difference),
   f. the project should be saved as a *project4*.
8. Summary. Self-evaluation of students.

Resources

Exercise 1

Square	Rectangle

Square

```
when clicked
erase all
ask  Lenght of side of the square is...  and wait
set  a  to  answer
say  Square area is  for  2  seconds
say  a * a  for  2  seconds
say  Square circuit is  for  2  seconds
say  4 * a  for  2  seconds
say  Now, I will draw your square.  for  2  seconds
pen down
repeat  4
    move  a  steps
    turn  90  degrees
pen up
change x by  -207
change y by  -147
stop  this script
```

Rectangle

```
when clicked
erase all
ask  Lenght of first side of the rectangle is...  and wait
set  a  to  answer
ask  Lenght of second side of the rectangle is...  and wait
set  b  to  answer
say  Rectangle square is  for  2  seconds
say  a * b  for  2  seconds
say  Rectangle circuit is  for  2  seconds
say  2 * a + 2 * b  for  2  seconds
say  Now, I will draw your rectangle.  for  2  seconds
pen down
move  a  steps
turn  90  degrees
move  b  steps
turn  90  degrees
move  a  steps
turn  90  degrees
move  b  steps
turn  90  degrees
pen up
change x by  -170
change y by  -147
stop  this script
```

Ćwiczenie nr 1
Trójkąt

```
when [flag] clicked
erase all
ask (Lenght of side of the triangle is...) and wait
set [a] to (answer)
say (triangle square is) for (2) seconds
say (((a) * (a)) * ((sqrt) of (3)) / (4)) for (2) seconds
say (Triangle circuit is) for (2) seconds
say ((3) * (a)) for (2) seconds
say (Now, I will Draw your triangle.) for (2) seconds
go to x: (0) y: (0)
pen down
go to x: (a) y: (0)
go to x: ((a) / (2)) y: (30)
go to x: (0) y: (0)
pen up
change x by (-170)
change y by (-147)
stop [this script]
```

Exercise 2
Animation
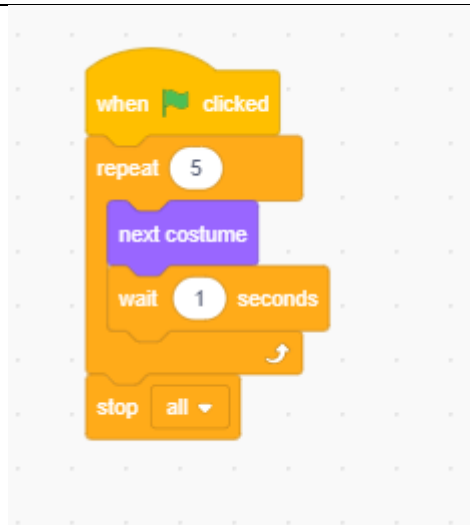
Video:

Students' Evaluation

Evaluation tools:

- observation of students' work and their activities,

- students' self-assessment - what I have learned, what I can, what I would like to know, what algorithm I can create,

- program feasibility.

Bibliography

https://scratch.mit.edu/

R. Kulesza, S. Langa, D. Leśniakiewicz, P. Pełka „Młodzi giganci programowania. Scratch" wyd. Helion

Scalability
An extension of the triangle exercise can be to create an algorithm that will draw any triangle. Note the condition concerning the sides of the triangle and the sum of the angles. When creating such an algorithm, it is reasonable to use the function *if*.

More information
Scenario was created as part of the project "InnoExperiment - Innovative Approach to Teaching through Experiment" carried out under Key Action 2. Erasmus +. The scenario will be made available on the project platform.