Subject: Geometry

Topic: Types of triangles, based on its angles.

Description: This example lesson offers an activity for the math/geometry subject on the three types of triangles, based on its angles. The activity uses machine learning to strengthen the learning of the learners, as well as other soft skills such as critical thinking, communication and argumentation skills, among others.

Age(s): 5^{th} - 12^{th} class

Time: 1h or 2h (depending on if using pre-uploaded image set or if learners have to create it on their own)

Goals:

- Learn the three types of triangles, based on according to its angles.

Competences:

- Know the types of triangles
- Be able to identify their main characteristics
- Promote critical thinking when using AI in the classification of the respective capitals

Situation before: This class is a generic one and does not require any particular knowledge besides being able to work with a computer.

Type of instruction, organisation: Indirect instruction where students work in groups and discuss and solve problems guided by the teacher.

Tool used: LearningML, in particular its Image functionality: https://learningml.org/editor/model/image

Required technical infrastructure: Good network connection is required if you ask students to upload images

Intro: An **obtuse triangle** is a triangle with one interior angle measuring greater than 90 degrees. In geometry, triangles are considered as 2D closed figures with three sides of the same or different lengths and three angles with the same or different measurements. Based on the length, angles, and properties, there are six kinds of triangles that we learn in geometry i.e. scalene triangle, right triangle, acute triangle, obtuse triangle, isosceles triangle, and equilateral triangle. If one of the interior angles of the triangle is more than 90°, then the triangle is called the obtuse-angled triangle.

An **acute triangle** is a triangle in which all the three interior angles are less than 90º. Although the three interior angles of the acute triangle lie within 0° to 90°, their sum is always 180 degrees.

A **right angled triangle** is a triangle with one of the angles as 90 degrees. A 90-degree angle is called a right angle, and hence the triangle with a right angle is called a right triangle. In this triangle, the relationship between the various sides can be easily understood with the help of the Pythagoras rule. The side opposite to the right angle is the largest side and is referred to as the hypotenuse. Further, based on the other angle values, the right triangles are classified as an isosceles right triangle and a scalene right triangle. Also, the lengths of the sides of the right triangle, such as 3, 4, 5 are referred to as Pythagorean triples.

Teacher guide:

Step 1: Gather pictures from the three types of triangles (5 minutes / 30 minutes)

a) Use a pre-stored LearningML environment where 3 pictures from each of the type have been stored. (5 minute)
b) Ask students to locate over the Internet 3-10 images from each of the three triangles. The Google Image Search engine can be of great help for this task. (30 minutes)

All images should be uploaded to LearningML, having at the end of this step three classifications, one for each triangle.

Step 2: Let the model learn (15 minutes)

In this step, LearningML learns to classify images, based on the input provided in Step 1. At this point it is a good opportunity to present the most important concepts of the different triangles. Learners should already be aware of the most significant differences, based on the pictures from Step 1. The most important concepts and keywords should be presented at this stage.

Step 3: Test & discuss (30-60 minutes)

- Ask learners to upload pictures of columns from the Internet and upload them to see the results. Alternative: We provide a set of images which can be used.
- For each uploaded picture, learners should answer following questions:
    - Are the results correct? (i.e., is the most probable triangle the one you think it is?)
    - Why are the results not 100%?
    - If the result is not correct, what do you think is the reason for it?
    - What are the most relevant way in your opinion to identify a triangle?

- Ask learners to upload a picture of the Pythagorean Theorem and to use it as test images.
    - Are the results correct?
    - Why are the results not 100%?
    - What type is it?
    - What's the most significant detail to identify its type?
    - If the result is not correct, what do you think is the reason for it?

- Could you explain the reason for the limitations of AI in this case?