Constructing triangles with Geogebra

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Subject: Mathematics.
Country of creation: Austria.
Countries of testing: Portugal, the Czech Republic and France.

Aims of the GP

Students will learn about:

- Classifying triangles (scalene, equilateral, isosceles and equiangular; obtuse, right-angled and acute).
- Construct triangles using “GeoGebra”.
- Constructing flags with GeoGebra using triangles and rectangles.

Age of the students

11-18

Preparation and teaching time

Preparation: about 50 min (if the teacher is trained to use GeoGebra).
Working with the resource will require about 150 min.

Teaching material

GeoGebra: http://www.geogebra.org/cms/

Slide presentation, Internet.

Worksheet describing how to construct triangles with GeoGebra.

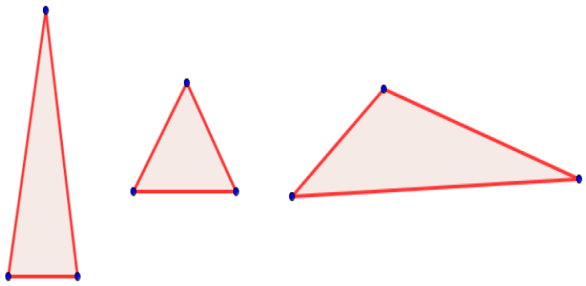
Lesson plan

1. Students read the worksheet “How to construct Triangles with GeoGebra” and figure out how to construct triangles (50 min).
2. Students open the Website: http://flagsourceunlimited.com
3. Each pair of students chooses one flag that contains a triangle and constructs this flag with GeoGebra (50 min).
4. Work with a partner: students design a short presentation (3 to 5 slides) about the ways of solving the task (different possibilities of finding a solution are possible). (50 min).
5. Students compare their various solutions in class and discuss the different possibilities of constructing triangles.

Extract from worksheet

Student Activity 1 : Groupwork (of 3 students per group)

Show to students below the three triangles.



Groupwork: Ask students to describe the triangles. Focus on their differences.

Ask one representative from each group to report their output.

Record the description on the board. Write all the responses needed to meet the requirements for the three classifications (scalene, equilateral, and isosceles).

Tell students that the class is now going to give

Software Section:

Constructing a Triangle

Press  and click on the drawing pad to produce three points. Close the figure by clicking the first point.

Moving the figure

Press  and click the figure. When figure is highlighted, hold and drag.

Changing the color of the line and the thickness

Press  and click the figure.

Student Activity 3: Assessment

Using a geogebra software:
A) construct one triangle for each of the classification: Scalene, Equilateral, Isosceles and Equiangular, Obtuse, Right and Acute

B) Show the measurement of the angles in all triangles.

C) Label the triangles with its classification.

D) Save file using the format:
construction of triangles acc to sides and angles_complete name

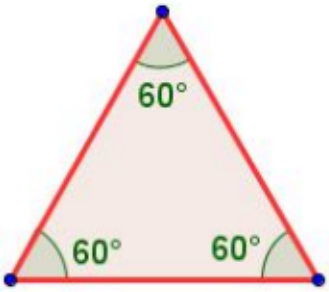
Student Activity 4: Investigation

Using a geogebra software, investigate whether it is possible to construct the following triangles: If it is not possible, write NOT POSSIBLE.

A) equilateral and equiangular
B) right and scalene
C) obtuse and equilateral
D) obtuse and isosceles
E) right and equilateral
F) acute and scalene

Possible answers:

A) equilateral and equiangular



Questionnaire

An isosceles triangle has two equal sides.

Yes / No

An equilateral triangle has two equal sides.

Yes / No

A scalene triangle has no equal sides.

Yes / No

An oblique-angled rectangle consists of (minimum)

2 equilateral triangles.
6 equilateral triangles.
4 equilateral triangles.

A right-angled triangle has two right angles

Yes / No

Remember: Is it possible to construct the following triangles?

Right-angled and scalene	Yes	No
Obtuse and isosceles	Yes	No
Obtuse and equilateral	Yes	No
Right-angled and equilateral	Yes	No
Equilateral and equiangular	Yes	No

The sum of all the angles in a triangle is 360°.

Yes / No

Teacher reviews

For some of the teachers who implemented this GP the programme GeoGebra was new, which meant that they had to familiarize themselves with it before the implementation. Other teachers already knew GeoGebra and had the possibility to get to know it better through this GP. The teachers who had never worked with GeoGebra in class needed more preparation time with the students, as they had to take time to show the programme to them. Once the students started creating the flags themselves, they were motivated to be able to construct a mathematical figure in the shape of an object that they knew from everyday life.

The teachers stated that they will continue using this GP and they will use the programme GeoGebra for more mathematics lesson, as they noticed that the students enjoyed constructing mathematical figures on the computer.

The SPICE project

SPICE was a two-year project (December 2009 – November 2011) carried out by **European Schoolnet** (http://europeanschoonet.org) together with **Direção Geral de Inovação e Desenvolvimento Curricular** (http://sitio.dgidc.min-edu.pt/Paginas/default.aspx) from Portugal and **Dum Zahranicnich Sluzeb MSMT** (http://www.dzs.cz/) from the Czech Republic.

The primary objective of the SPICE project was to collect, analyse, validate and share innovative pedagogical practices, particularly those using inquiry-based learning, whilst enhancing pupils' interest in the sciences. SPICE supported this objective by singling out, analysing and validating good practice pedagogies and practices in maths, science and technology (mostly ICT-based) and disseminating them across Europe. SPICE involved 24 teachers from 16 different educational systems (from 15 different countries). This teachers' panel helped the SPICE partners in defining good practices that were then tested in classes by 41 teachers during the school year 2010-2011.

For more information see: **http://spice.eun.org**

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