More and more triangles

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Subject: Mathematics.
Country of creation: Portugal.
Country of testing: France.

Aims of the GP

Students learn about Pythagoras' theorem and they develop their algebraic thinking.

Teaching material

Computers connected to the Internet.

Spreadsheets.

Age of the students

13-15

Preparation and teaching time

Preparation: 60 min. Class time: 90 min.

Lesson plan

In the maths class Cristina and Eduardo are working with triangles.

Cristina found a triangle whose angles are 30°, 60° and 90° and the dimensions of the sides are 3, 4 and 5.

Eduardo said he had found another triangle with angles of the same magnitude but with other dimensions to the sides.

1) What are the possible dimensions of the sides of Eduardo's triangle?
2) What relationship exists between the corresponding sides of the two triangles?
3) What can we say about the two triangles?

In the classroom other students said they had also found triangles with the same angles but with other measures to the sides. Is it possible?

- Use a spreadsheet and build a table with five triangles having these conditions.
- Discover a relationship between the longer side of the triangle and the other two sides.

Example of students' work

An empty spreadsheet

a	b	c	a^2	b^2	c^2
3	4	5			

(Triangle labeled with sides 4, 5, 3)
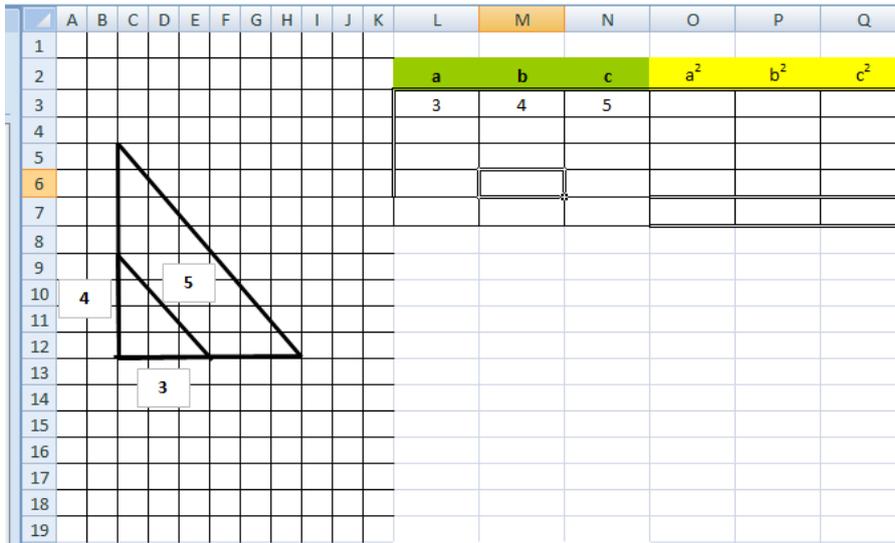
A spreadsheet with values

a	b	c	a^2	b^2	c^2
3	4	5	9	16	25
6	8	10	36	64	100
1.5	2	2.5	2.25	4	6.25
9	12	15	81	144	225
12	16	20	144	256	400

(Triangle labeled with sides 4, 5, 3)
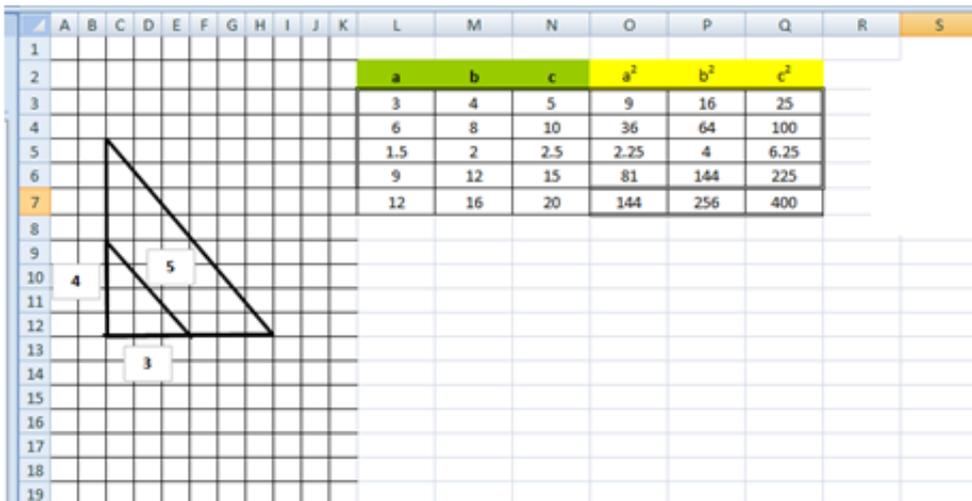
Questionnaire

In a right-angled triangle the longest side is opposite to the right angle.

    Yes

    No

It is not possible to construct a right-angled triangle which is

    Equilateral.

    Scalene.

    Isosceles.

The values of the sides in a right-angled triangle are 6, 8 and

    9

10
12

The sum of the measure of the two smaller sides of the right-angled triangle is equal to the measure of the longest side.

Yes

No

The sides of a right-angled triangle are related by 625 = 225 + 400. The measures of the sides of this triangle are

15, 20, 25

15, 20, 20

25, 15, 16

The measures of the sides of a right-angled triangle are 3, 4 and 5. The sides of this triangle are related by

$4^2 = 5^2 - 3^2$

$5^2 = 4^2 + 3^2$

$4^2 = 5^2 + 3^2$

The value of the measure of the longest side of a right-angled triangle is 15. The measures of the two others sides are

11, 12

9, 12

9, 11

The value of the measure of a side of a right-angled triangle is 12. The measures of the two others sides are

8, 11

9, 16

16, 20

Teacher reviews

According to the teachers who implemented this GP, the method of letting the students construct many different triangles to allow them to find out the relationship between the corresponding sides of two triangles was very effective, as it allowed them to internalize and understand the concept. One of the French teachers said "my colleagues really like this GP (about Pythagoras' theorem) and will implement it again next year."

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**