

The Theorem of Pythagoras (Theorem of Pythagoras)

Class: 4eA

3 lessons (x 55 minutes)

My goals: make the pupils discover the Theorem of Pythagoras, use the Theorem of Pythagoras as a tool of recognizing a right triangle, practical use of the Theorem of Pythagoras

Pre-requisites: square, square root, equation $a+x=b$ (taught by M.Renaud)

Extract from the French Maths curriculum:

Characterization of a right triangle, from two lengths of sides of a right triangle, find the third one (use of a calculator). It's expected from the pupils to use the Theorem of Pythagoras in situations, it's not necessary to distinguish formally the Theorem of Pythagoras from its converse

1st lesson

Goal: Introduction of the Theorem of Pythagoras (constructions)

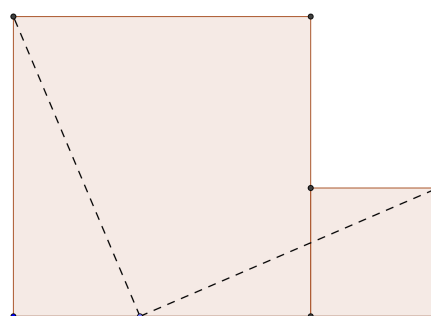
Revision: to count squares and square roots of some numbers

Planning:

1. Construction of a right triangle and three squares upon its sides
 2. Count the areas of these squares and make hypothesis about their relations
 3. Hypothesis manipulation (textbook 203/3 A, B, C)
 4. Formulation of the Theorem of Pythagoras
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Problems

1.
 - a) Construct a triangle with the right angle in C so that $BC = 7$ cm, $AC = 3$ cm. Construct three squares at the sides AB, AC and BC.
 - b) Construction of a puzzle. Construct two squares with the length of the sides 7 cm and 3 cm. Cut the figure to obtain five pieces of a puzzle



Manipulation:

1. Place the pieces of the puzzle in order to cover two smaller squares from exercise a).
2. Place the pieces of the puzzle in order to cover the largest square from exercise a).
3. Make a hypothesis about the areas of the squares.

Homework: to construct and cut out 8 right triangles (lengths of the shorter sides are a and b) for a proof of the Theorem of Pythagoras

Materials: Mathématiques 4e - Programme 2007, (Collection Phare), Hachette Livre 2007

Modifications and comments:

It was too much for one lesson, and the pupils worked more slowly than I expected, so we did only items 1 and 2 from the plan. At the end, we formulated together the Theorem of Pythagoras but we didn't manage to write it together, so the pupils had to copy the theorem from their books at home. They didn't have to cut out the triangles.

2nd lesson

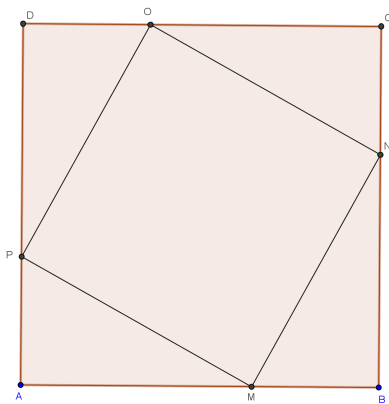
Goal: Proof of the Theorem of Pythagoras

Revision: formulation of the Theorem of Pythagoras, discussion of how we found out this property

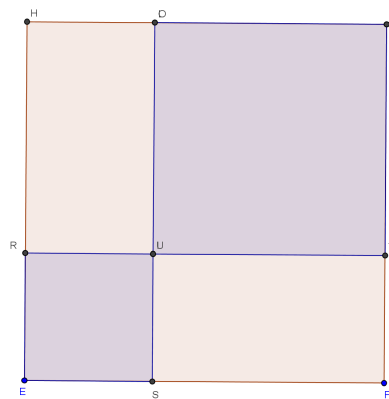
Planning:

1. Proof of the Theorem of Pythagoras (textbook 204/4)
2. The converse of the Theorem of Pythagoras (textbook 204/5)

Problems:



Picture 1



Picture 2

A) We have drawn a square ABCD of the length of a side $a + b$.

- 1) Show that it is possible to stick four triangles on the square as in the picture 1.
- 2) Show that MNOP is a parallelogram.
- 3) a) What can we say about the angles $\angle APM$ and $\angle PMA$?
b) Show that $|\angle AMP| + |\angle BPN| = 90^\circ$
c) With a help of exercises a) and b) , show that MNOP is a square.

B) We have drawn a square EFGH of the length of a side $a + b$.

- 1) Show that it is possible to stick four triangles on the square as in the picture 2 (blue part)
- 2) Describe the quadrilaterals RUSE and OGTU

C) Conclusion

- 1) Show that the area of MNOP is the same as the area of RUSE and OGTU together.
- 2) Write down this equality with the numbers a, b and c.
- 3) Write down the general property.

Homework: textbook 205/6AB (use of the converse of the Theorem of Pythagoras)

Materials: Mathématiques 4e - Programme 2007, (Collection Phare), Hachette Livre 2007
Triangle and squares cut out to show the proof by manipulation

Modifications and comments:

In order to make the proof, we had to construct two squares and then, put inside four identical right triangles. The pupils worked again much more slowly than I expected, so we did only the constructions, we discussed the proof but we didn't write down the proof. This was for the next lesson. We didn't talk about the converse.

3rd lesson

Goal: The converse of the Theorem of Pythagoras

Revision: discussion about the theorem

Planning:

1. Discussion about the homework
2. Formulation of the converse of the Theorem of Pythagoras
3. Examples of the use of the Theorem of Pythagoras, its converse (textbook 208, 209)

Problems:

MNP is triangle with the right angle in M, $MN = 7$ cm, $MP = 3$ cm-
Find the length of the 3rd side of the triangle MNP.

Homework: textbook 211/(26,27) 28 (use of the Theorem of Pythagoras)

Materials: Mathématiques 4e - Programme 2007, (Collection Phare), Hachette Livre 2007

Modifications and comments:

Actually, we finished the proof of the Theorem of Pythagoras and, then, we did two examples of its use. I tried much more to write things and less to comment themselves, because it seemed to me that it would be easier to go on more quickly this way. We didn't formulate the converse of the Theorem of Pythagoras.

I expected to teach 4 lessons but I taught only 3, so we didn't do any other activities.