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TECHNIQUE FOR CONSTRUCTING A MODEL OF A TETRAHEDRON USING A COMPASS AND RULER

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ANNOTATION

This article presents the geometric construction of a tetrahedron model using a compass and ruler. Gluing plane figures.

Keywords. Stages of construction, gluing, thinking, logical chain, reasoning, equilateral triangle, side.

It is well known that the task as such has a triune essence: firstly, these are the formulated necessary and sufficient conditions, the use of which, when following the rules, you can get an answer to the question posed; secondly, an archived form of the conditions given for the resolution; thirdly, the goal is formulated in an understandable grammar and language with a given system of signs, the achievement of which is the solution to the problem.

If we assume that the interpretation of the problem, "according to A.N. Leontiev, a task is a goal given under certain conditions (in a specific situation) [1,2], which can be achieved by implementing certain actions on the part of the learner and the teacher", then the teaching methodology can be represented as a set of techniques necessary to solve a particular problem. a different task, and learning is a system of features that must be applied specifically for this task, and the art of the teacher is to ensure that the individual accepts these sets of techniques, features.

This simplification of the understanding of the problem occurred in the last quarter of the twentieth century. During this period in the history of mathematics education, there was a fascination with algorithmic methods, followed by a transition to wholesale testing of all possible educational material. We now have the results of this period in the general education school and the higher pedagogical school.

The question is natural - given the described teaching methodology in the last period of the history of the development of mathematical education (the last quarter of the twentieth century) - what is the mechanism that triggers the student's interest in self-development?

How do cognitive tasks arise in the process of a routine system of education, how does a person who follows instructions emerge from a person who asks questions? The goal is good in teaching

to teach to think independently, and not to achieve the goals formulated in the tasks. But where is this mechanism leading to independent thinking? Obviously, it is in discourses, in the built educational environment, and is only partly related to the content of the educational material.
"Thus, since the logic of personality formation does not coincide with the logic of educational cognition, since it is to a much greater extent mediated by the inner world of the emerging personality and various external influences falling on the personality, it is not actually the fundamental in the structure of the pedagogical process that the subject educational task in itself, but its relation to the inner world of the individual (the relation of the educational task to the individual as the initial one), as well as the relation of the results of solving the problem to the individual (the relation of the process and objective results of the activity to the ideas, assessments, motives that the educated person has). Apparently, the decisive role here is played by the relation of the requirement contained in the pedagogical (educational) and educational tasks to the leading motive of activity at the level reached by the emerging personality. Therefore, the "cell" of the process of personality development must be sought in the contradiction between the meaning of the objective task and its meaning, which are revealed in the process and result of its solution, in the influence of activity aimed at solving the problem, primarily on the meaning of the motives that form" [2, p . 293; 3, p. 140-159].
"The "cell" of the pedagogical process is the educational situation organized by the teacher, containing the indicated contradiction" [4], but note that a contradiction is a problem situation, but not a task. The task is a much more complex concept. And above all - a formulated proposal, expressed in images, arousing interest or stimulating action to activity, requiring the formulation of questions, awakening a number of associations and stimulating memory.
The purpose of learning determines its strategy, the participants in the learning process at best study the subject, in this case the Teacher is in the position of a mentor leading others, i.e. students. Tasks that are specially selected can be grouped according to their main content areas, the "pilot" determines the path and corrects it, sometimes replacing it with suitable tasks that are more difficult for this stage of learning. Problems in geometry can be classified in various ways. In our case, as we have already noted, the main idea is the development of figurative thinking, as the very first thinking for children of primary school age. Therefore, we can allocate a special place for construction tasks. In fact, instrumental mathematics arose from the practice, human activity in Egypt, for example, due to the need to restore the boundaries of crop fields after the flood of the Nile. Tools and compasses, and rope were the most in demand in ancient Egypt. In other words, the so-called construction tasks are based on an ancient root. These tasks can be attributed to the ancient habit of human civilization to use instruments in their reasoning, measurements, explanations, which later were sent to be called mathematical instruments. In later times, they began to study the deep connection between devices, for example, Mascheroni's theorem : Any problem that can be solved with a compass and a ruler can be solved with one compass. The cycle of construction tasks has its own algorithm, developed since ancient mathematics. As we all know, "Solving construction problems involves four steps: analysis, construction, proof, and exploration.
In our methodology, at the first stage of problem solving activity, we assign a special role to 1, 2 points of problem solving activity for construction, then proof and justification (research) are

essential, significant points in it, since they (points) are necessary for verbalization of students' mental activity.

In modern programs geometric constructions are not singled out as one of the content and methodological lines in difference from lines: geometric shapes and their properties, geometric quantities.

Geometric constructions only accompany the study of geometric figures.

The role of geometric constructions

Teaching Functions:

Expansion, deepening, fixing theoretical knowledge;

Formation of graphic skills and skills.

Development value:

Development of spatial thinking;

Representation of abstract concepts in the visual and vice versa;

Development of creative thinking;

Development of constructive abilities.

Solving any construction problem requires students of drawing skills tools and perform the simplest construction.

As we all know, the stages of construction consist of the following stages: analysis, construction, proof and research.

Let's give an example where the main goal in building a model of polyhedra is:

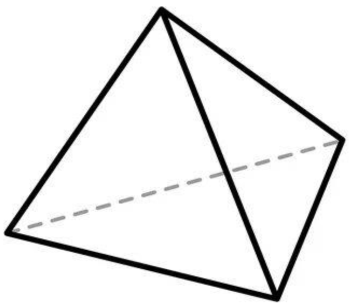
improvement of construction methods using a compass and ruler;

the ability to represent the construction of a sweep of a spatial figure using a compass and a ruler;

transition from plane figures to space figures;

transformation of abstract concepts into visual ones;

representation of an orthogonal projection of a spatial figure on a plane;



Task 1. Construct a model of a tetrahedron whose edge is equal to a

Solution

1- Stage . ANALYSIS. Finding a solution tasks by establishing links between the desired elements and task data.

Imagine what parts a tetrahedron consists of. Define the properties of the figure. The simplest polyhedron is the tetrahedron. Its four faces are made up of equilateral triangles. All polyhedral coal tetrahedrons are equal to each other. You can build a model of a tetrahedron by unfolding on which all four faces will be located. The faces form an equilateral triangle which can be easily constructed with a compass and ruler.

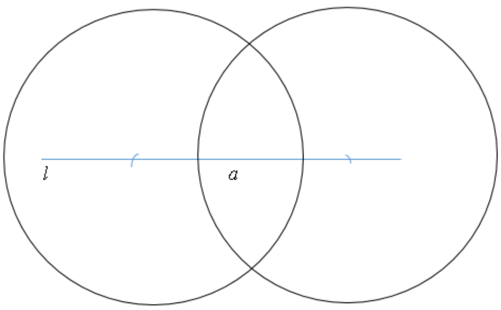
1. Before starting to build a model of a figure, he must imagine this figure, this is how abstract thinking begins to work.
2. Knowing the design possibilities drawing tools to find out whether it is possible to build a model of this figure.
3. To build a model of a tetrahedron, a student must know the properties of a spatial figure.
4. The student must know what simple figures (parts) this figure consists of, which can be built using a compass and a ruler. Those. decompose into simple geometric constructions.
5. Must know the properties of the simplest figures that make up a spatial figure.

2- stage . CONSTRUCTION. indication sequences of basic constructions enough to build a figure.

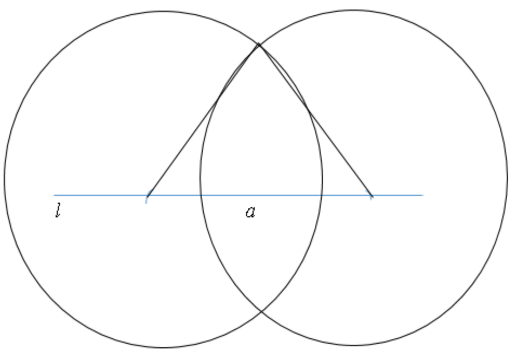
Let's take an arbitrary line. l

On a straight line l, using a compass, we set aside this segment a, which is equal to the length of the edge of the tetrahedron.

With the help of a compass, taking the segment a as the radius of a circle centered on the ends of the postponed segment a, we draw circles.



Connect the intersection point of the circles in the upper half-plane (you can also take a gentle intersection point).



Thus, we have built an equilateral triangle whose side is equal to the edge of the given tetrahedron. We will take the constructed triangle as the base of the tetrahedron.

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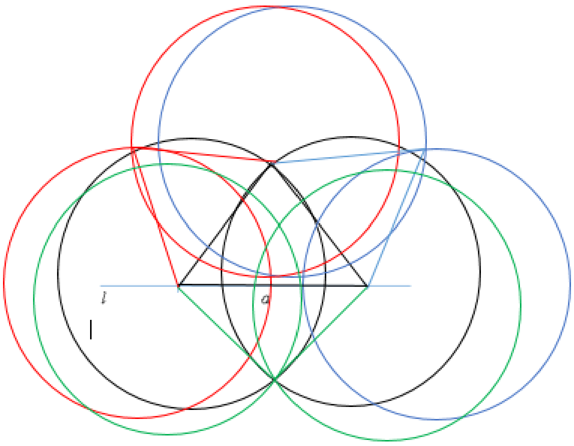
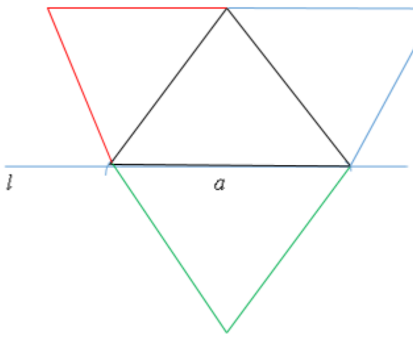
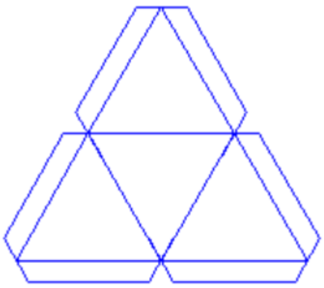
In the same way of constructing on the sides of the constructed equilateral triangle, we construct equilateral triangles whose side is equal to the edge of the tetrahedron, i.e. the length of the sides of an equilateral triangle is a.



As a result, we get the following construction



This construction is a development of a tetrahedron. To obtain a model of a tetrahedron, you need to fold and glue this unwrapping. Thus, a spatial figure will be obtained. To do this, on each side you need to leave stickers.



3-stage. EVIDENCE: establishment conformity of the constructed figure task requirements.
To prove that the constructed model of the tetrahedron actually corresponds to the length of the given segment a. Using a compass, I measured the length of the edge of the resulting model of the figure and compared the length of the edge with the original figure.
4-stage. RESEARCH: establishing a condition solvability and number of solutions for each case.
Found out that every step of the construction is doable. I established that this unfolding is not the only one , that is, there are other forms of the tetrahedron unfolding, but the difference from ours is in the arrangement of equilateral triangles.

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