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WAYS OF USING THE GEOGEBRA PROGRAM FOR CONSTRUCTING THE POLYHEDRONS SECTION

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ABSTRACT

The article discusses the use of the Geogebra program in geometry lessons on the topic of cross-sections of polyhedra. Brief information about the Geogebra program is given. The drawings in the conditions of the problem were drawn using the Geogebra program. The relevance and practical significance of the research topic is indicated.

KEYWORDS: *Polyhedra, Section, Prism, Cube, Truncated Pyramid, Geogebra Program.*

INTRODUCTION

The development of students' ability to visualize and deal with spatial figures is one of the primary challenges in the teaching of stereometry in school geometry. In stereometry, different planes are used to examine parts of figures, and in some circumstances, polyhedras. Here are some tips on where to search for polyhedra sections and how to schedule an appointment. There are three sorts of geometric problems: 1) the computation; 2) the proof; and 3) the constructing;

When studying a polyhedra's cross section, pupils first learn about the plane, which is defined as:

- Through three points;
- Through straight line and a point;
- Through two parallel straight lines;
- Through two parallel straight lines;

The ability to construct two intersecting straight lines is required.

There are three techniques for calculating age, and the trace method is one of the simplest and most widely used in school. To begin with, a convex polygon is a convex flat polygon with ends that are usually the points of intersection of the cutting plane with the polygon's edges and sides that are the intersections of the convex polyhedras. In any type of stereometry, solving problems necessitates not only math and analytical abilities, but also the capacity to describe.

Two locations are usually located and a straight line drawn through them to produce a straight line of intersection of planes. The passing straight line is used to find a point of junction of a straight line with another straight line. The sought point is then found by crossing the given straight line with the given straight line.

Geometry is one of the most difficult courses in high school. The transition from plane to spatial figures is one of the most difficult aspects of this task.

Making polyhedras and their easy sections is allocated 1 hour in the 10th grade plan, which is a relatively short time. We'll look at the illustrations on the tables in the Geogebra program to make the most of our time during the class. Let's begin with the Geogebra application. GeoGebra's first version was launched in 2002. Markus Hohenwarter, an Austrian mathematician and professor at the University of Salzburg, wrote it.

The program is developed in Java and may be downloaded for free. The platform is interactive (Windows, Linux, Mac OS, etc.) It works on a wide network, on personal computers, tablets, and even cellphones, and is available in more than 60 languages.

The word GeoGebra is made up of the first and last portions of the words Geometry and Algebra. One of GeoGebra's best qualities is its reliance on the unity of two-dimensional algebra and geometry.

Geogebra helps you to foster a creative environment in scientific classes at high schools and colleges by producing high-quality geometric drawings and picturing the outcomes in the form of dynamic models. You can get the latest version of GeoGebra from the manufacturer's website, https://www.geogebra.org [3: 7], and install it on your computer.

Let's look at some examples of how the above general concepts are put into practice. We look at the challenge of constructing the conditions given in Geogebra Problems 3.22,3.23 in the 10th grade geometry textbook.

Problem 1: Using squares, draw a plane through the opposite side of a rectangular prism's lower base. The base's side is the same as. Locate the surface of the section that was made. [2: 303] [2: 303] [2: 303] [To answer the problem, we must first do what is specified in the Geogebra program's problem condition, which is to make a section. It is difficult for kids to make a section. That is why the Geogebra program was chosen.

The reason for choosing the program Geogebra is that it is very easy and convenient to create geometric figures in this program.

Solution

Passes through sections AB and E_1D_1straight lines. $AB$and $E_1D_1$the sides are the sides of the polygon in the section. Find the side of this polygon CC_1D_1Dthat liesD_1Xon the side. D_1Xon a straight line D_1we know a point. Find the F point of intersection of the other point AB and$CD$the straight line. It CC_1D_1D lies in the plane of the collar and in the plane of the section, so that their intersection is a straight line D_1X. $D_1$and F connect the points with a straight X line to get a point. D_1X section CC_1D_1D is the side of the section on the side. Y We find a similar point. There will be a sought polygon in the section $ABXD_1E_1$Y (Figure 1).

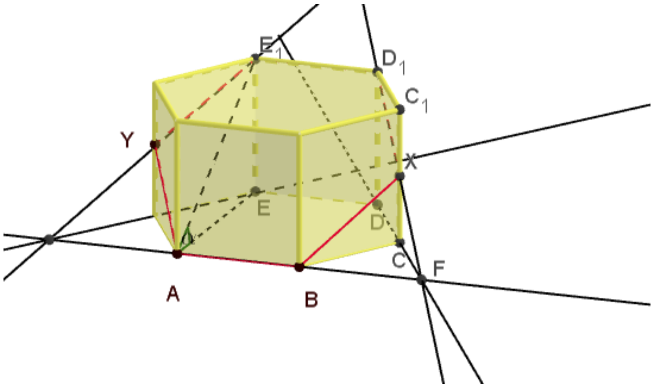

Figure 1

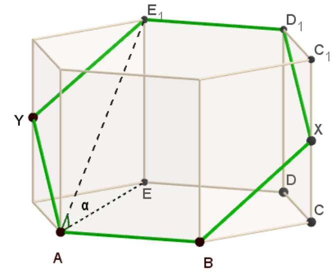

Figure 2

Now we find the surface of the section. (Figure 2). The hexagon at the base of the prism is the orthogonal projection of the hexagon in section. Hence the surface of the section $S = \frac{S_0}{COS\alpha}$, in this S_0– the surface of the base of the prism, $\alpha$and the angle formed by the section plane with the base plane. EA and AB Since it is perpendicular, E_1A and AB perpendicular. (Theorem on three perpendiculars.) Therefore $\alpha =< EAE_1$ =<EAE_1. $EE_1 = a, AE = a\sqrt{3}$ (side of a right triangle drawn inside a circle of radius), $AE = \sqrt{a^2 + (a\sqrt{3})^2} = 2a$.

So, $cos\alpha = \frac{a\sqrt{3}}{2a} = \frac{\sqrt{3}}{2}$.

The surface of the base of the prism$S_0 = 6 \cdot \frac{1}{2} a^2 sin60^0 = \frac{3a^2\sqrt{3}}{2}$.

The surface of the section $S = \frac{S_0}{cos\alpha} = 3a^2$

Next in the tables we give the figures made in geogebra.

Problem 2.ABCDA$A_1B_1C_1D_1$ofthe cubeAD*and CDits edges* M and Nare given. *The cube of* MNB$_1$ make the section that is formed by cutting with a plane [1: 139] (Figure 3)

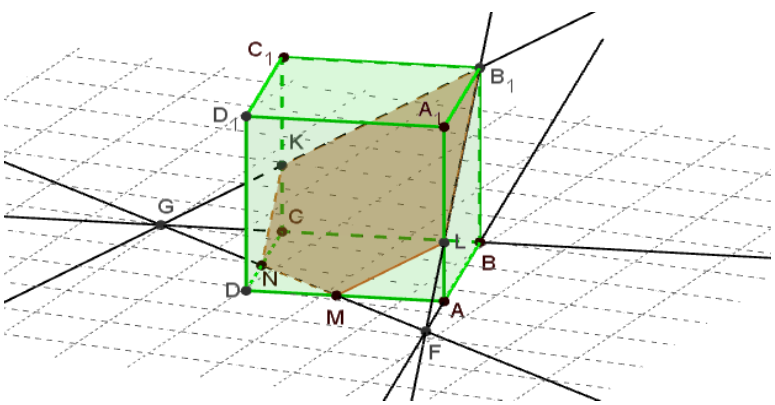

Figure 3

Problem 3.ABCDA$A_1B_1C_1D_1$ *draw the cube and* AB, BC and BB_1 which are the middle of the edges, M, N and L mark the points. Make the section that is formed when you section the MNL cube evenly [1:139].(*Figure 4*)

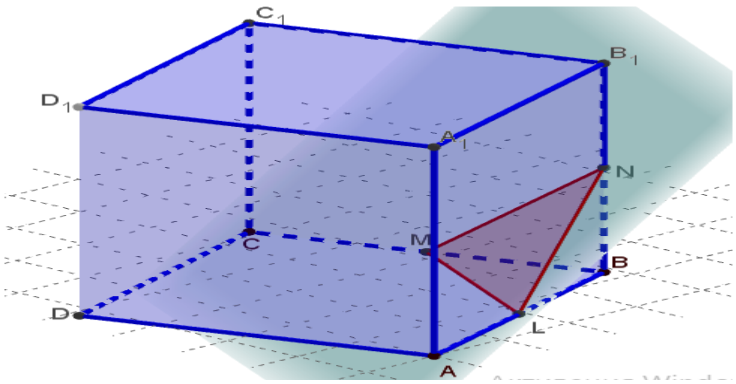

Figure 4

Problem 4. in a right triangular prism the sides of the base are 10 cm, 17 cm and 21 cm, and the height is 18 cm. Find the surface of the section through the small heights of the sides and base of the prism. [2: 303].

Solution. Given: ABC$A_1B_1C_1$ - in a triangular prism, $A_1B_1 = 17$cm, $B_1C_1 = 10$cm , $A_1C_1 =$ 28cm A$A_1 = DD_1 = 18$cm.

Need find: $S_{BDB_1D_1}$—?

How to find: To solve this problem, draw a straight line B perpendicular to AC the end of the base and mark its AC point of intersection with the side. Then a straight line is drawn from the BD end $B_1$of the prism parallel to the straight line.(Figure 5). Its AC_1 is the point of intersection$D_1$with the side. After then, from these points B, D, D_1, B_1 we make a rectangle that is we seached BDD_1B_1will be rectangle. Let's find the surface of this rectangle. For this, we first find the surface of the base using the Heron formula. So for Geron's formula, we first determine the perimeter of the rectangle:

$P_{ABC} = 17 + 10 + 21 = 48$ cm

According to Geron's formula:

$$S_{ABC} = \sqrt{24(24-10)(24-17)(24-21)} = \sqrt{24 \cdot 14 \cdot 7 \cdot 3} = 3 \cdot 7 \cdot 4 = 84$$

Now we find the height of the triangle using another formula to find the surface:

$$S_{ABCD} = \frac{1}{2} AC \cdot BD$$

From there: $BD = \frac{84 \cdot 2}{21} = 8$cm

$$S_{BDB_1D_1} = BD \cdot DD_1 = 18 \cdot 8 = 144(sm^2)$$

Hence, the surface area of the section sought is $144(sm^2)$.

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Problem 5. The height of the rectangular pyramid is 4 cm. The sides of the bases are 2 cm and 8 cm. Find the surface of the diagonal sections [4,308]

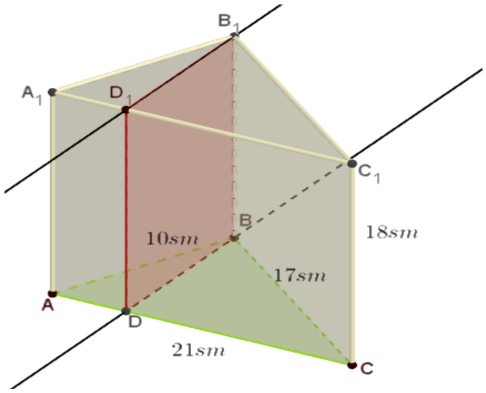

Figure 5

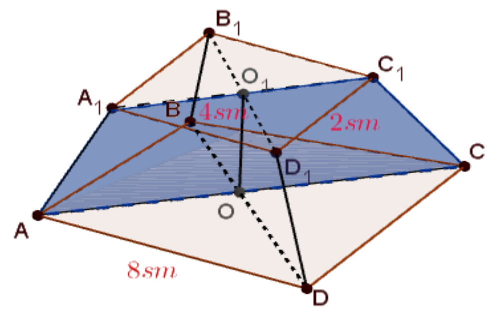

Figure 6

Solution. Given: ABCD$A_1B_1C_1D_1$- truncated pyramid $OO_1 = 4$cm,$AB = BC = CD = AD = 8sm$CD=AD=8sm$A_1B_1 = B_1C_1 = C_1D_1 = A_1D_1 = 2$cm. (Figure 6). *Need to find:*

$S_{ACC_1A_1} = \frac{AC+A_1C_1}{2} \cdot OO_1$.

ΔADCADC from $AC = \sqrt{AB^2 + BC^2} = \sqrt{2 \cdot AB^2} = 8\sqrt{2}$ cm

$\Delta A_1B_1C_1$- from$A_1C_1 = \sqrt{A_1{B_1}^2 + B_1{C_1}^2} = \sqrt{2 \cdot A_1{B_1}^2} = 2\sqrt{2}$ cm.

These are:

$$S_{ACC_1A_1} = \frac{8\sqrt{2} + 2\sqrt{2}}{2} \cdot 4 = 20\sqrt{2}sm^2$$

CONCLUSION:

It is critical to pique pupils' interest in science and to encourage in-depth study of the subject. When Geogebra is used to teach geometry, it helps to increase the quality of the lessons. The findings can be used to further research and improve multi-subject themes in a school geometry course. At the same time, higher education institutes in the field of mathematics teaching methods, teacher retraining centers, and school mathematics classes should teach how to utilize the Geogebra program.

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