

TEACHING DESCRIPTIVE GEOMETRY PROBLEMS AND EXPANDING STUDENTS' SPATIAL IMAGINATION USING THE POSSIBILITIES AND ADVANTAGES OF THE AUTOCAD GRAPHICS SOFTWARE

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***Annotation.** This article explores the basic and complex primitives in AutoCAD graphics software, as well as methods of analysis, stages of project planning, and the project development process. It also discusses creating simple contour drawings in AutoCAD graphics software, as well as object manipulation techniques such as rotating, mirroring, scaling, and stretching. Additionally, it covers object creation in AutoCAD graphics software, including trimming, extending, filleting, dimensioning, and scaling objects.*

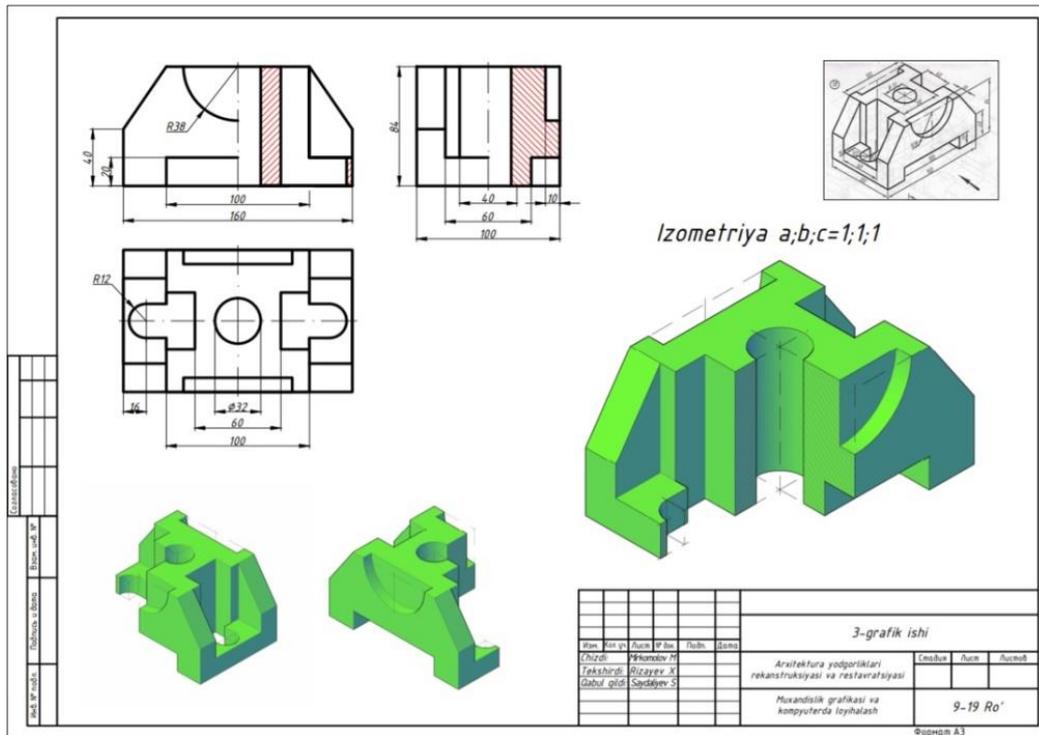
***Keywords:** AutoCAD graphics software, basic primitives, complex primitives, analysis methods, project planning stages, project development process, object manipulation, rotation, mirroring, scaling, stretching.*

Entry: In the era of current technological advancement, engineers no longer rely solely on drawing boards, rulers, pencils, and compasses to draft their designs; instead, they utilize computer hardware to model their own discovered structures.

Nowadays, the use of automatic design software has become commonplace in many developing countries around the world. Programs like AutoCAD and 3ds Max, developed by the American company **Autodesk**, are widely used and continually evolving by engineers and designers. The initial versions of the AutoCAD software were developed in the 1980s and have since gained widespread use.

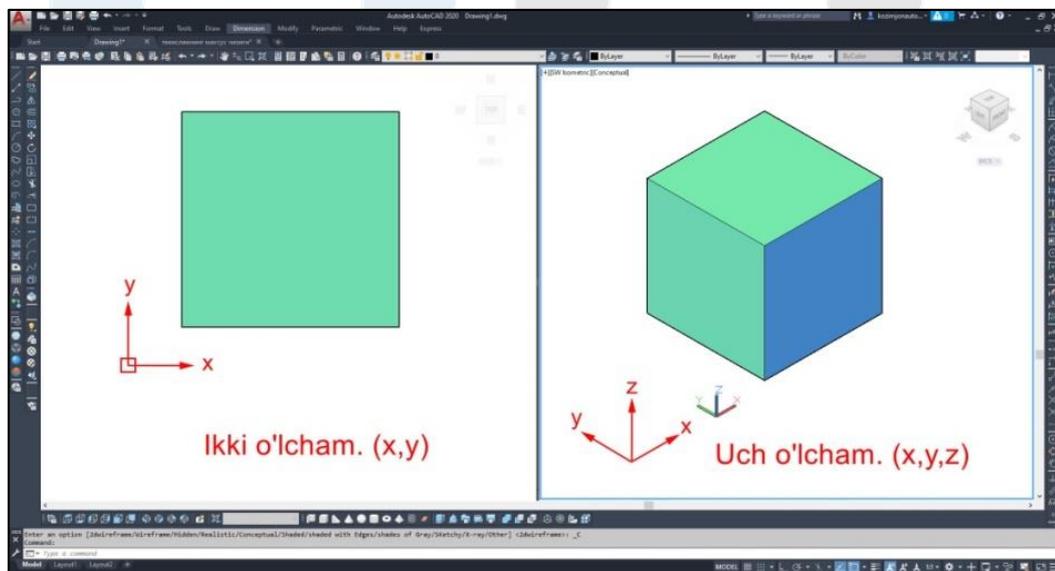
The AutoCAD graphics software version 2023-24 has been developed and released to users, reflecting the continuous evolution of the program. Users' feedback and suggestions are taken into consideration as the software continues to evolve. This software is built on the principles of Descriptive Geometry and Engineering Graphics, meaning that users can implement drawing rules and adhere to state standards in their designs.

In AutoCAD software, users can create lines and surfaces, draw details, generate geometric models from lines and surfaces, produce representations from desired angles, apply hatch patterns, depict in desired colors, manipulate and animate movements. By depicting drawings and details in three dimensions and visualizing them in space, students can further develop their spatial imagination (see shape 1). This enhances the effectiveness of teaching.



Shape 1.

In AutoCAD graphics software, it is possible to perform actions such as creating simple lines and progressing to complex surfaces. In addition to this, tasks such as creating 2D-dimensional and 3D-dimensional objects and editing them can also be carried out (see shape 2). The software provides capabilities for converting simple shapes into models, which is noteworthy. The AutoCAD graphics software allows operation on personal computers running both DOS and Windows operating systems.



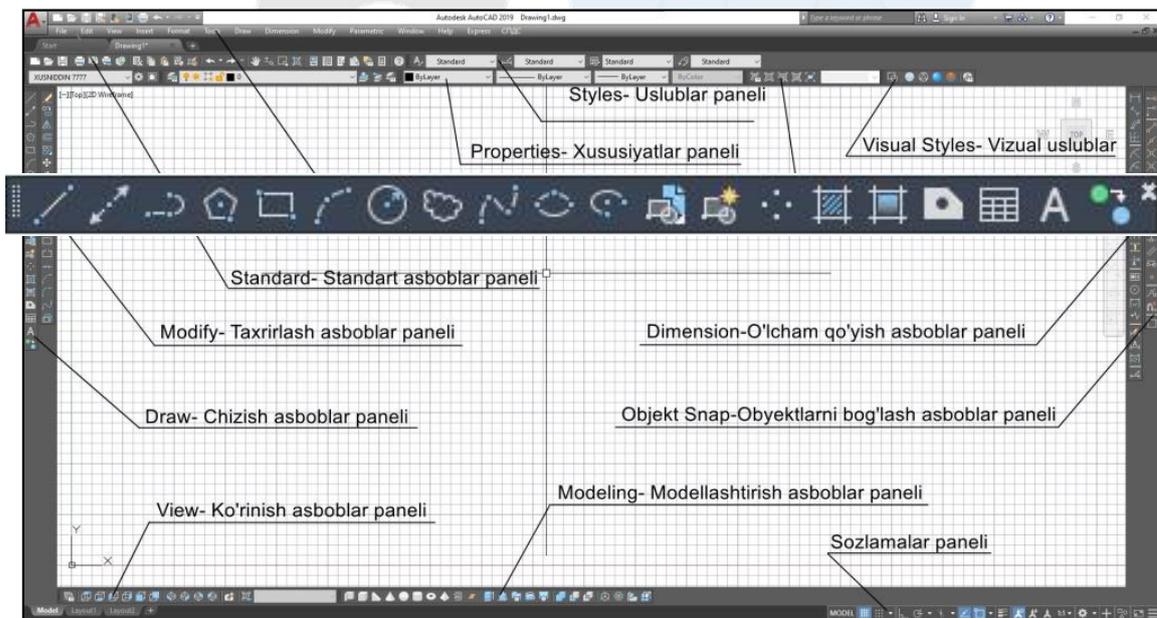
Shape 2.

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AutoCAD graphics software is one of the most sophisticated programs designed to work with high precision. Therefore, starting from simple drawings is essential. First, familiarize yourself with the AutoCAD commands. Install the AutoCAD software on your personal computer and launch it using the desktop shortcut. Upon opening, it will typically be in its default state. To customize the required tools and save the "Tools" toolbar panel to your workspace, you need to bring it up by navigating through the commands. Failing to save these settings could lead to repetitive adjustments each time you launch AutoCAD. To avoid this, it's crucial to save your customized settings right from the beginning (3-shape).

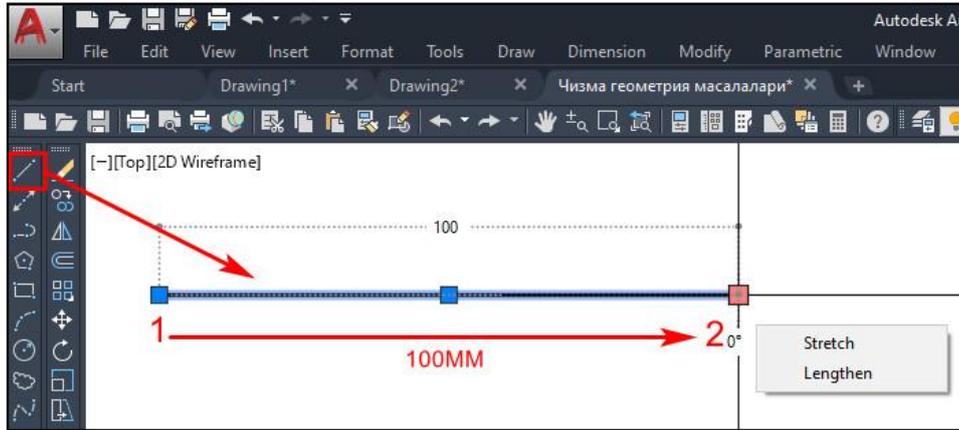
Shape 3.



Once you have configured AutoCAD, you can explore drawing tools such as lines, straight lines, circles, rectangles, polygons, and curves using the Draw panel. (4-shape)

Shape 4.

To learn how to draw a line segment, you need to enter the **Line** command using the keyboard. You can also activate this command by clicking on the Line tool in the **Draw** panel or the Draw toolbar . To start drawing the line segment, indicate the first point anywhere on the screen by



clicking or using the mouse cursor, and then press the left mouse button. After specifying the first point, AutoCAD will prompt for the next step. Move the cursor in the desired direction, input the length of the line segment (e.g., 100 mm), and press *Enter*. A line segment will appear on the screen (5-figure), connecting the two specified points. Follow similar steps to explore other drawing commands and discover the secrets of using primitives.

Shape 5.

Examples of graphics tasks drawn in AutoCAD software.

Epure

Uchburchak ABC tekislikning H va V izlari aniqlansin. 1-grafik ish

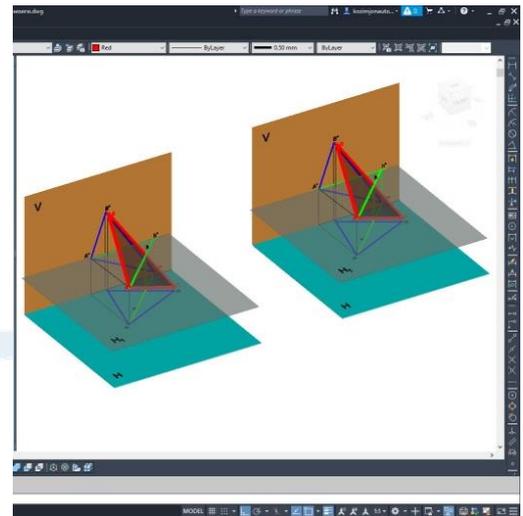
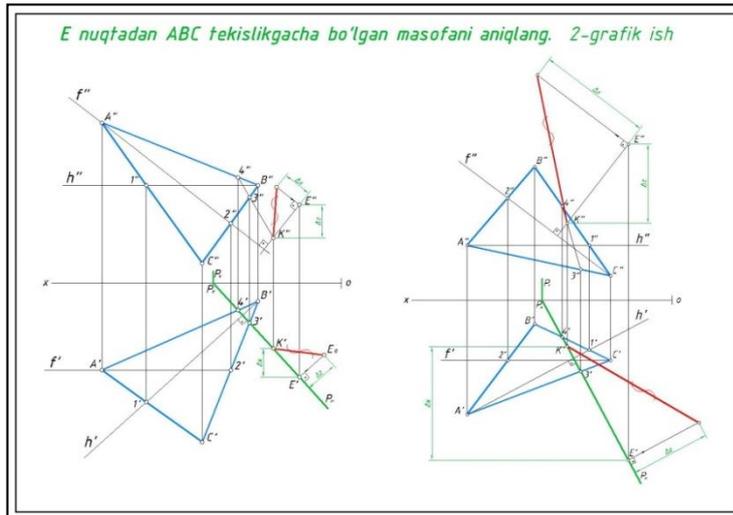
| | A | B | C |
|---|----|----|----|
| x | 40 | 70 | 15 |
| y | 65 | 10 | 40 |
| z | 10 | 35 | 55 |

a)
Tekislikning tomonlari orqali izlarini aniqlash

b)
Tekislikning mahsus chiziqlari orqali izlarini aniqlash

Epure

Clear picture



Summary. In completing the tasks related to the drawings depicted below, students are required to have a good understanding of the mathematical, technical drawing, and engineering graphics fields, along with creative activity. They need to be proficient in the following commands in the "Modify", "Draw", and "Dimension" toolbars of the AutoCAD graphics software: for performing tasks with simple complexity: "Line", "Ortho mode", "Linetype", "Lineweight", "Linear" commands; for tasks with moderate complexity: in addition to the above-mentioned commands, "Mirror", "Trim", "Move" commands are required; for tasks with high complexity: besides commands for simple and moderate complexity tasks, commands such as "Break", "Break at point", "Extend" are used to complete the task.

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