

Teaching Students to Make Geometrical Constructions

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Abstract: In this article, the theoretical rules of drawing, the main methods of geometric construction, the importance of geometric construction, such as dividing a circle into equal parts, are explained to students.

Keywords: Geometric constructions, connection, detail, model, circle, oval.

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World of Semantics: Journal of Philosophy and Linguistics (2024)
<http://wos.semanticjournals.org/index.php/JPL.org>

Expanding and strengthening students' information about the basic methods of geometric design, connecting theoretical rules to the practice of drawing, teaching the methods of making connections, and developing the skills of working with drawing tools are among the main tasks of the subject of geometric design in the drawing course. In the course of the introductory interview on the subject, students are shown the real details, and the importance of geometric constructions, such as joints, dividing a circle into equal parts, is explained. It is necessary to explain the practical application of geometric constructions in production and technology with extensive use of educational and demonstration manuals.

The teacher will show the students the smoothly shaped details made by casting or mechanical processing, and will stop on how to make a smooth transition between the surfaces, how it can be graphically represented in the drawing. Before making a drawing of details such as pads, flanges, pucks, disks, etc., on the surface of which holes and grooves are evenly located along the circle, the teacher should show students a similar detail or its model. Students are shown on the board how to divide the circle into equal parts.

At this point, the teacher should give information about dividing the circle into equal parts and its practical importance. People have been trying to divide the circle into equal parts and use it in practice since ancient times. A simple example familiar to all students: turning a disk made of a solid body into a flange connected with spokes - a bicycle wheel - made people face the problem of equal distribution of spokes on the wheel. When making such a wheel image, people tried to find accurate ways to make it using drawing tools. Making regular polygons is also directly related to dividing the circle into equal parts. Because a polygon is considered a regular polygon only when all its vertices lie on one circle and divide it into equal parts.

Regular polygons were used in the ancient patterns of all nations. People appreciated their beauty even in

those times. In addition, they saw many beautiful examples of regular polygons in nature and tried to use them in their work and artistic decoration. For example, pentagons can be observed in the shapes of minerals, flowers, fruits, and in the structure of some sea animals (starfish), and hexagons can be observed in beehives. It is not for nothing that ancient and modern scientists and practitioners were not interested in regular polygons.

The peoples living in the territory of Uzbekistan have known very precise methods of dividing the circle into equal parts since ancient times. As an example, it is possible to show the flange of the astronomical measuring instrument found in the archaeological excavations conducted under the leadership of S.P. Tolstov in the Koykiryran fortress. This disk, made about 2,000 years ago, has well-preserved traces of the lines that divide the circle into 360. In general, ancient masters and craftsmen knew very well how to make geometric designs, how to divide a circle and a square into equal parts, and how to make connections (Figures 1-2).

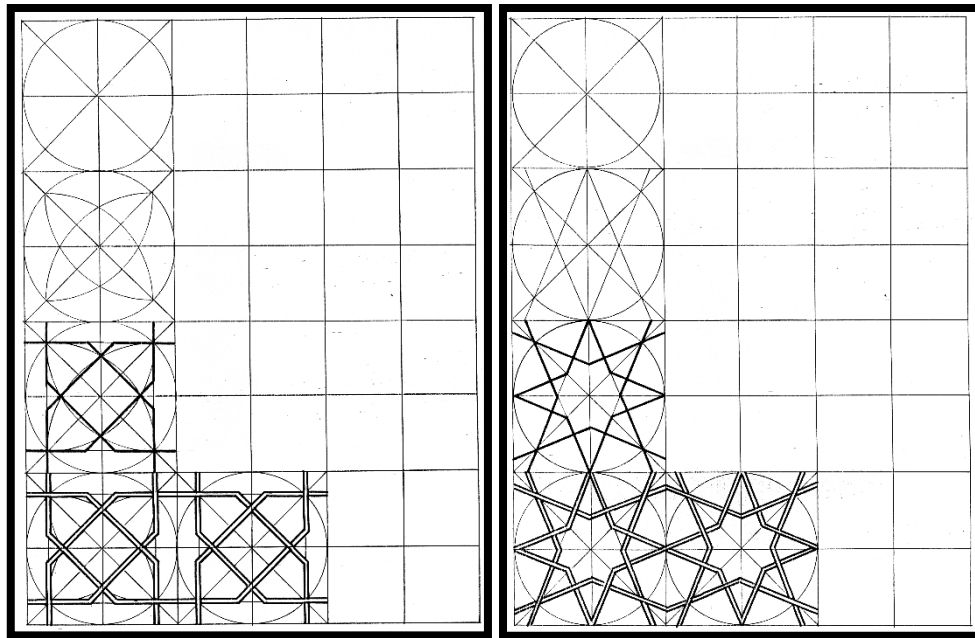


Figure 1-2. National patterns made by the method of geometric designs

There are many similar examples of dividing the circle into equal parts and using it in practice. If the teacher explains these examples with the help of various pre-prepared displays, students' interest in creating a composition of beautiful images (patterns) through simple geometric constructions will increase. This can be used to attract students to perform creative assignments on the topics of "I made a girix" similar to forms 1 and 2, or "I made an orange (rosette)" as in form 5. Students perform such tasks with great interest and enthusiasm.

But before that, the teacher should show the students how to divide the circle into equal parts on the blackboard and make sure that the students have done it in their workbooks and mastered it thoroughly.

A brief recommendation for making connections in the drawing

Using a poster depicting the main types of connections, students can be taught to independently generalize the rules for making connections.

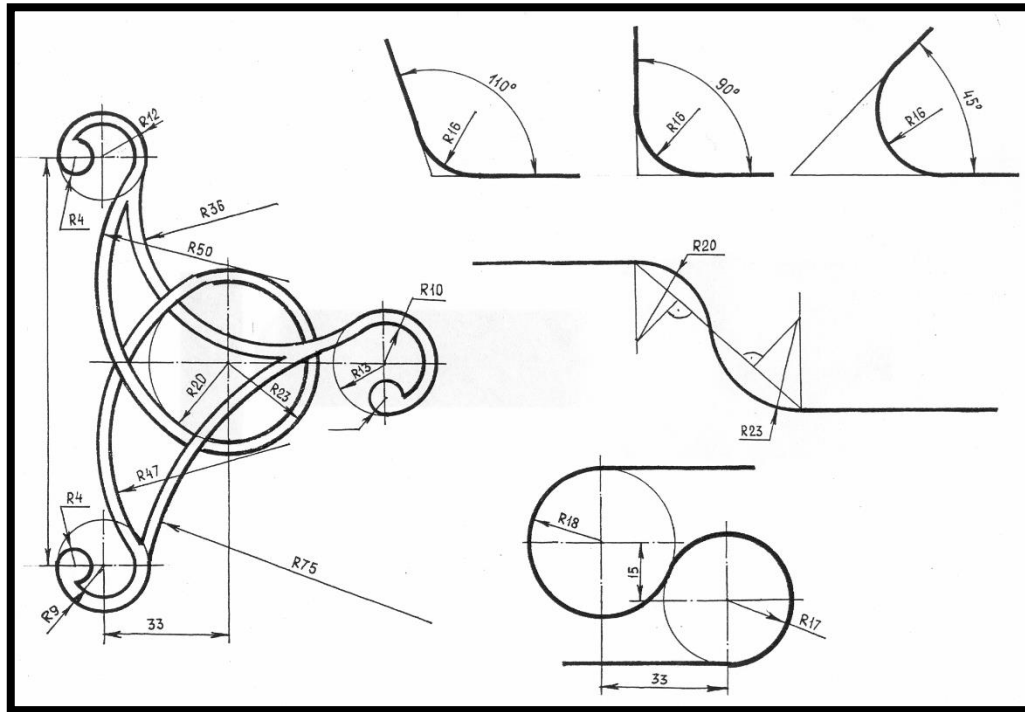


Figure 2. Connection rules.

A brief recommendation for making connections in the drawing we will pass.

1. Before proceeding with the drawing of the connection, it is necessary to analyze the detailed graphic image, that is, the types of connections used and the methods of making them are determined. It is very important to choose the right sequence of making a drawing. Therefore, before starting work, the image is mentally divided into separate elements and their execution sequence is determined.
2. The elements to be connected should be drawn first, and then connections should be made. When drawing connections, it is required to accurately perform the connection points and the centers of the connection arc.

Since making geometric designs requires high precision and clean work from students, it is necessary to explain and teach students the correct use of drawing tools. The teacher should carefully observe the work process of the students, the situation of their use during the work, the rational use of the tools, and correct the mistakes. At this stage, it is very useful to show the correct use of drawing tools, especially on the blackboard.

Teaching to make circular and lecalo curves

In the drawing course, it is not planned to allocate a separate time for teaching circular and lecalo curves according to the program. But it is necessary for students to acquire theoretical and practical knowledge of circles and arc curves in their specializations. Circle and arc lines and their practical applications are studied with great interest by students in the appropriate facultative classes in graphics, design, and design. Curves consisting of arcs are circular curves. is called Such curves include coils, ovals and ovoids. The lines of bells, eccentrics, flanges, architectural structures are made according to circular curves.

Teaching to make wraps

The coils consist of spiral-shaped circular curves drawn from several centers with different radii. Figure 4 shows two-, four-, and three-center winding diagrams. We will try to give recommendations on the methodology of organizing lessons dedicated to it without dwelling on the methods of performing

circular curves.

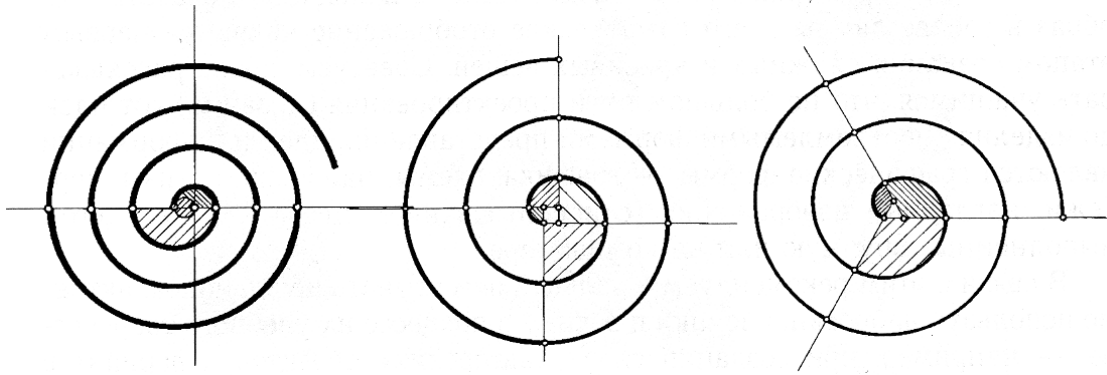


Figure 3. Two (a), four (b) and three (c) center coils made using Lekalo

Pedagogical experiences and practice show that choosing interesting object images and explaining geometric constructions to students will help them learn these topics easily and remember them well.

Below is an example of such a task with a brief description we bring: Circular curves. Brief explanation. Circular curves are formed by circular arcs connected in series. There are many types of circular curves. We will focus on open circular curves - coils, their representation in the drawing and their properties.

If you look closely at architectural structures, form-forming elements of lathes, hand tools, details of furniture, and details of musical instruments, you will see that most of their shapes are formed by circular curves.

At this point, we recommend the student to briefly dwell on the functional, constructive, technological and aesthetic significance of the circular curves in creating the product form, similar to the connections.

Examples: - The geometry of the highway track: if the driver overspeeds the turn on the highway, a disaster may occur: because the tracks of different categories are designed for a suitable speed, and the turns are adjusted to a fixed speed.

Training to perform oval

The oval is in the form of a smooth closed curve consisting of four interconnected arcs (Fig. 5). To complete its drawing, it is necessary to determine four arc centers and four connection points. According to its shape, an oval is similar to an ellipse, so often an oval is drawn instead of an ellipse because it is easier to draw an oval. There are many ways to draw different ovals. Detailed information about this is given in the literature on drawing.

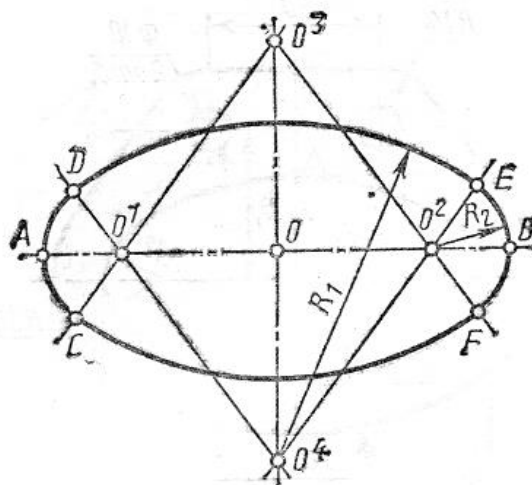


Figure 4. Making an oval drawing.

If students are given graphic assignments according to individual options, the effectiveness of the lesson will increase. The teacher should explain the options similar to homework assignments to the students on the blackboard in class. Lekalo line types can also be chosen based on students' interests. Because the main goal of teaching students the lines of the lekalo is to form the skills of making smooth curved lines using the lekalo. These skills can be useful to them later in the technical creativity circles, in labor training classes, in the design of various mechanisms and clothes.

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