
DEVELOPING STUDENTS' IMAGINATION BY TEACHING THE ELEMENTS OF THE TRIANGLE IN GALILEAN GEOMETRY

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ABSTRACT: The article provides information on the methods of using the teaching of triangle elements in Galilean geometry to develop students' imagination. The common and different aspects of Euclidean and Galilean geometry in developing imagination are shown.

KEYWORDS: Triangle, median, height, special line, bisector, distance, Euclidean geometry, non-Euclidean geometry, Galilean geometry.

INTRODUCTION

The main goal of this article is to develop students' imagination using the elements of non-Euclidean geometry and thereby increase their interest in science. For this purpose, we chose Galilean geometry, which, in our opinion, is the simplest and closest to school geometry.

As you know, in secondary schools, the triangle, its elements, and properties are taught in grade 7. Therefore, it would be useful to introduce even 7th grade students to the properties of the triangle and its elements in Galilean geometry.

When introducing students to the elements of a triangle in Galilean geometry, it is necessary to pay attention to the following two points:

1. The definition of a triangle and its elements does not differ from the definitions in school geometry lessons;
2. In Galilean geometry, only triangles whose vertices do not lie on a specific straight line are studied. In Galilean geometry, triangles whose vertices do not lie on a specific straight line are not studied.

The fact that one side of a triangle is equal to the sum of the other two sides requires students to know the projection and its properties. Determining the size of a triangle angle requires students to know the equation of the straight line passing through two given points and to calculate the difference of their slope coefficients. It is important to emphasize to students that the angle is measured in a "parabolic" way and that its value can be of arbitrary magnitude.

It is also important to draw students' attention to the fact that there is no concept of a "right angle" in Galilean geometry. This explains why a right angle, or perpendicularity, cannot be used to determine the height of a triangle.

The median of a triangle in Galilean geometry overlaps with the median in the Euclidean sense. This is because the median is related to the concept of the ratio of intercepts and the ratio of

intercepts is not dependent on the unit of measurement. Therefore, the medians of a triangle have the same properties in Euclidean and Galilean geometry.

The Main Findings and Results

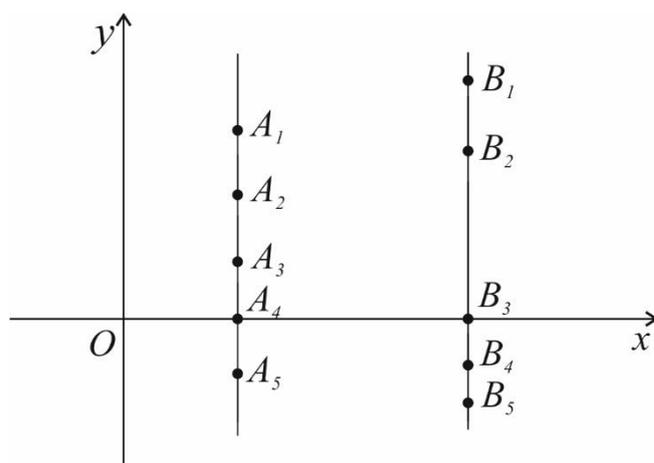
At this point, reminding students that the median divides a triangle into equilateral triangles, that all three medians intersect at a point, and that they divide in a 2:1 ratio will help them review their geometry course.

When teaching the properties of the bisector of a triangle, although this concept is defined the same in the Euclidean and Galilean planes, it is useful to show that they have two different forms by drawing different pictures. It is also necessary to separately show that one of the bisectors is determined by an exterior angle. When showing their difference from the bisectors in the Euclidean sense, it is appropriate to list the properties of the bisector in the Euclidean sense.

One of the elements of a triangle that is fundamentally different in Galilean and Euclidean geometries is the concept of “height”. Before describing the height of a triangle, it is necessary to provide information about the concept of “distance from a point to a straight line” in the Galilean plane. As is known, in the Euclidean plane, the “distance from a point to a straight line” is the length of the perpendicular segment drawn from a point to a straight line. However, in the Galilean plane, there is no concept of a perpendicular. Therefore, the shortest distance is understood as the case when the first distance is zero. In this case, a second distance appears, and it is a special straight line segment drawn from the point. The concept of distance from a point to a straight line is used to determine the height of a triangle. Of course, the fact that the heights of the triangles in the Galilean and Euclidean sense are fundamentally different from each other, that they do not intersect at a point in the Galilean plane, and that they are parallel to each other is explained to the students with the help of various illustrations.

The topic that is demonstrated by proof in the 7th grade of the geometry course in secondary schools and introduces students to the first methods of proof is the signs of triangle equality. The first and second signs of triangle equality are also valid in the Galilean plane. However, equality in this geometry is fundamentally different from its equality in Euclidean geometry. For this reason, before stating the theorem on the signs of equality, it is necessary to demonstrate the equality of triangles through various illustrations. In this, it is necessary to show that the corresponding vertices of triangles with any equal sides can be taken to lie on a special straight line. Then it is necessary to show that the altitudes drawn from the vertices in the interval are equal, and the corresponding angles of the triangles are equal.

Here, explaining to students what Galilean rotation is is one of the most difficult situations. In this case, it is necessary to be able to show that equality is determined not by their shape, but by their length. For example, two special straight lines are taken in a plane with a previously known coordinate system. Then it is required to determine five points on each of them. Let us denote these points by A_1, A_2, A_3, A_4, A_5 and B_1, B_2, B_3, B_4, B_5 (Figure 1).



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Here we pose the following question: A_1, A_2, A_3, A_4, A_5 va B_1, B_2, B_3, B_4, B_5 Which two pairs of points, joined by a line, form equal lines?

Students are mainly trying to make these sections equal in the Euclidean sense. To this end, they pay attention to which pairs of lines they connect to form parallel sections. But in Galilean geometry, any pair of lines connecting these points is equal.

These and similar drawings can be used to show the equality of a triangle and its elements.

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