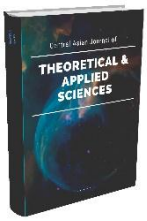

CENTRAL ASIAN JOURNAL OF THEORETICAL AND APPLIED SCIENCES

Volume: 03 Issue: 05 | May 2022 ISSN: 2660-5317

Projections With Numeral Marks. Projections of a Point and a Straight Line. Mutual Position of Straight Lines

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Received 26th Mar 2022, Accepted 15th Apr 2022, Online 27th May 2022

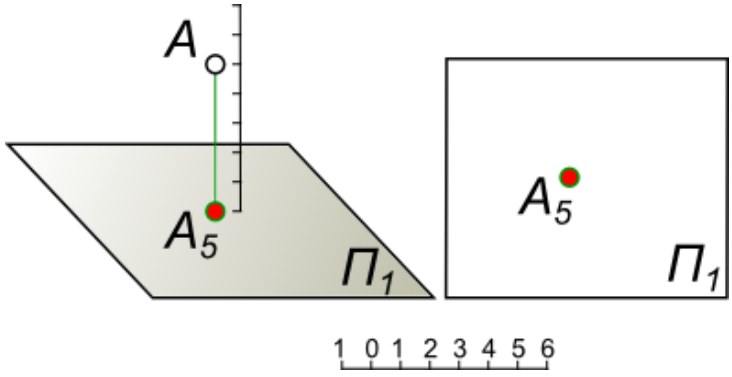
Annotation: *Projections with numerical marks. Projection of a straight line is the relative position of straight lines. In projections with numerical marks, in order to determine whether these lines intersect or not, it is necessary to grade the lines, and if the lines have the same mark at the intersection point, then the lines intersect. If their marks are different at the point of intersection of the lines, then the lines are crossed. If the lines connecting the points with the same marks on the straight lines are parallel to each other, then the straight lines intersect, otherwise they intersect.*

Keywords: *Projection, numerical mark, line, point, crossing.*

Projections with numerical marks are one of the main ways of designing earthworks. When designing roads, bridges, airfields, hydraulic structures, etc., it is necessary to depict the Earth's surface with various earth structures. Since when depicting the Earth's surface there are large distances in two dimensions and insignificant in the third dimension vertically, the method of projection on two planes becomes inconvenient. This circumstance led to the abandonment of the second projection plane and its replacement with numerical markers combined with the first projection plane.

Projections with numerical marks were used to depict depth on nautical charts at various points in water basins. In the XVI century, a method was proposed for depicting a topographic surface with curved lines that connected a number of points lying on the same level. These curved lines are called horizontals.

In this method, all points are orthogonally projected onto only one projection plane, usually horizontal. But since one projection does not determine the position of a point in space, the frontal projection is replaced by numerical marks that are placed near the projected points, for example A5.



Projections with numerical marks. The mark indicates the excess of the point above the horizontally located projection plane P1.

When projecting the earth's surface, a constant water level in the Baltic Sea is taken as an absolute zero level, sometimes a conditional level is used.

All points located above the plane taken as a conditional zero level have a mark with a + (plus) sign, which is usually not placed. All points located below the plane taken as a conditional zero level have a mark with a - (minus) sign. Projections with numerical marks. To solve some problems, projection onto a vertical plane is used, which is then combined with a horizontal plane. In this case, the vertical plane can be located anywhere relative to the point. All of the above is the basic concepts and essence of the method of projections with numerical marks.

Projection of a straight AB in projections with numerical marks. A straight line AB located in space in the drawing has a projection - a straight line that connects the projection of point A - A1 and the projection of point B - B6. Projection A1B6 corresponds to only one position of a straight line in space, provided that the scale of the drawing is set.

The angle of inclination of the straight AB to the horizontal plane is the angle between the segment of the straight AB and its projection. If the extreme points of a straight line segment have the same marks, for example A8B8, it means that the straight line is horizontal. The frontal projection of such a straight line constructed with the help of communication lines will be parallel to the axis of projections. In projections with numerical marks, in order to determine whether these lines intersect or not, it is necessary to grade the lines, and if the lines have the same mark at the intersection point, then the lines intersect. If their marks are different at the point of intersection of the lines, then the lines are crossed. If the lines connecting the points with the same marks on the straight lines are parallel to each other, then the straight lines intersect, otherwise they intersect.

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