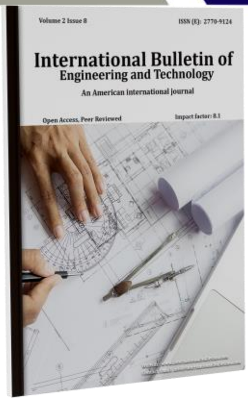

METHODOLOGY OF STUDYING GEOMETRIC QUANTITIES. CALCULATION OF SURFACES

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Abstract: In this scientific research, the methodology of studying geometric quantities and the methods of calculating surfaces are shown to students.

Key words: Parallel straight lines, square, plane, area of a figure, rectangle, area measure of a rectangle, parallelogram, area measure of a triangle, trapezoid surface measure, external polygon surface measure, perimeter, circle radius.

In the theory of measurement of surfaces, the following should be defined:

1. In the figure whose surface is being determined, it is necessary to be able to distinguish the points that belong to it and those that do not belong to it. If an arbitrary ray emanating from a given point crosses the contour of the figure an odd number of times, then the point is internal, if it crosses even times, then the point is external.

2. It is necessary to set the unit of measurement, to measure surfaces, a square surface with a side equal to a linear unit is taken.

If we divide the side of a unit square into 10 equal sections and pass straight lines parallel to the sides through the points of division, then the unit square is divided into 100 equal squares, and the surface of each square unit is 1:100 will be equal. If we perform the same division with each of the resulting squares, then squares with a surface area of 0.0001 square units will be created, and so on.

To determine the size of the surface of a figure, we put a square scale grid on this figure and count the number of grid squares belonging to the figure with all its points, and this gives an approximate value of S_1 obtained by subtracting the size of the surface.

At the same time, we find the approximate value of S_1 obtained by multiplying the surface measurement by counting the number of squares in which at least one point belongs to the figure. After that, if we divide the grid into decimal parts and carry out the previous process, we will find $S_2^{'}, S_2$ new approximate values of the surface dimension. At the end we make $\{S_n, S_n^{'}\}$ sequences. If we establish their approximation, then the number determined by them will be the surface measure of the given figure.

We find the surface area of a rectangle with sides a and v. We put a scale grid on it so that the grid lines are parallel to the sides of the rectangle.

In that case, the number of internal squares is equal to $a_0 b_0$, where a_0 and - b_0 - a and b are the approximate values obtained by subtracting them, the number of squares covering the rectangle is equal to $a_0^{'} b^{'}_0$, and the approximate values obtained by adding $a_0^{'} b^{'}_0$. After performing the decimal division, we find the approximate value of S_n obtained by the p-th minus, $S_n^{'}$, and the values obtained with the excess. But according to the rule of multiplication of real numbers, $\{a_n b_n, a_n' b_n'\}$ sequences determine ab numbers, so the surface area of a rectangle S is determined by the formula $S = ab$.

Rectilinear figures can be calculated directly using the properties of surface dimensions. Any parallelogram can be divided into two parts that form a rectangle. In this way, it can be found that the length of the base of the face of a parallelogram is determined by multiplying the length of the height: $S = ah$

By filling any triangle with a parallelogram, we find $S = \frac{ah}{2}$ formulas for the area of a triangle. Finally, dividing the polygon into triangles, its surface is found as the sum of the surfaces of the triangles it forms. In the same way, the following formulas are found:

Trapezoid face measurement:

$$S = \frac{a+b}{2} \cdot h,$$

a and b are the measurements of the lengths of the bases, h is the measurement of the length of the height.

Measurement of the surface of the external drawn polygon:

$$S = \frac{\Pr}{2}$$

where R is the perimeter, r is the length measure of the inscribed circle radius.

The following method is used to determine the size of the surface of a figure bounded by an arbitrary contour: we consider a system of polygons, each of which all points belong to the figure and whose surfaces are equal to $S_1, S_2, \ldots\ldots S_n, \ldots$. At the same time, we look at the polygons to which the given figure belongs with all its points and whose surfaces are equal to $S'_1, S'_2, \ldots\ldots S'_n, \ldots$. If the $\{S_n, S'_n\}$ sequences are converging, then the number S defined by them is the measure of the surface of the given figure.

To prove it, we put a grid of square scale on the given figure, and the squares inside a polygon with surface dimension S_n have a surface dimension of Z_m. S_n' If we take the surface dimension of the squares covering the surface-dimensional polygon to be Z'_m, the sequences converge when m, n increases at the same time $\{Z_m, Z'_m\}$:

1) $Z_m < Z'_m$

2) When m and n increase, Z_m increases and Z'_m decreases.

3) We get n so large that

$S_n - S_m < \frac{\varepsilon}{3}, S_m' - S'_n < \frac{\varepsilon}{3}$ let it be, we get m in the same way

will be appropriate.

Adding them

$Z'_m - Z_m < \varepsilon$ we get

So $\{Z_m, Z'_m\}$ determines the number of contiguous and Z sequences. According to the main theorem $Z_m < S_n, S_n < Z'_n$ from $Z_m < S_n < S'_n < Z'_n$ inequality $Z = S$.

The obtained conclusions can be applied to the face of the circle. If we make n-corners drawn on the outside and n-corners drawn on the inside of a circle at the same time, we double their sides infinitely and form $\{S_n, S'_n\}$ sequences.

Since $S_n = \frac{1}{2} P_n \cdot k_n$, we form $\left\{\frac{1}{2} P_n \cdot k_n, \frac{1}{2} P'_n \cdot k_n\right\}$ sequences. But $\{P_n, P'_n\}$ sequences determine the measure of the length of the circle, i.e. $2\pi R$, $\{R_n, R\}$, and the sequences determine the measure of the length of the radius, i.e. R. Therefore, according to the rule of multiplication of real numbers, there are $\{S_n, S'_n\}$ sequences

$$S_n = \frac{1}{2} 2\pi R \cdot R = \pi R^2$$

determines the number. Similarly, the angle of a sector is defined by the radian measure

$$S_\alpha = \frac{1}{2} P^2 \cdot \alpha$$

we find that is equal to Segment surface measurement $\frac{1}{2} R^2 \cdot \alpha$ sector surface measurement
and is found as the difference of the triangular surface measure, i.ega teng ekanligini topamiz.

$$S_{сегмент} = \frac{1}{2} R^2 \cdot (\alpha - \sin\alpha).$$

Also, figures with equal surfaces are congruent, if two polygons can be divided into pairs of equal polygons (of the same number), then they are said to be congruent.

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