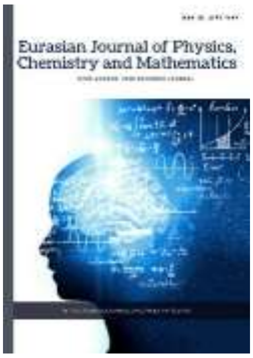

Development Of Students' Creative Skills in Solving Some Algebraic Problems Using Surface Formulas of Geometric Shapes

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ABSTRACT

This article discusses some aspects of developing students' creative activity in solving some of the problems in the Planimetry course, and provides specific examples of how each method studied can be used in teaching geometry

Keywords: Triangle median, altitude, system, surface, math sine theorem.

In this section, we show how to solve some algebraic equations and inequalities using surface formulas of geometric shapes.

Issue 1. for the numbers $\forall x, y, z \in (0;1)$ $x(1-y)+y(1-z)+z(1-x)<1$ prove the inequality.

Solution: Having made a regular triangle ABC with a side equal to 1, we place points M, K, N on its sides AB, BC, CA in such a way that AM=x, BK=z, CN=y (Fig. 1)

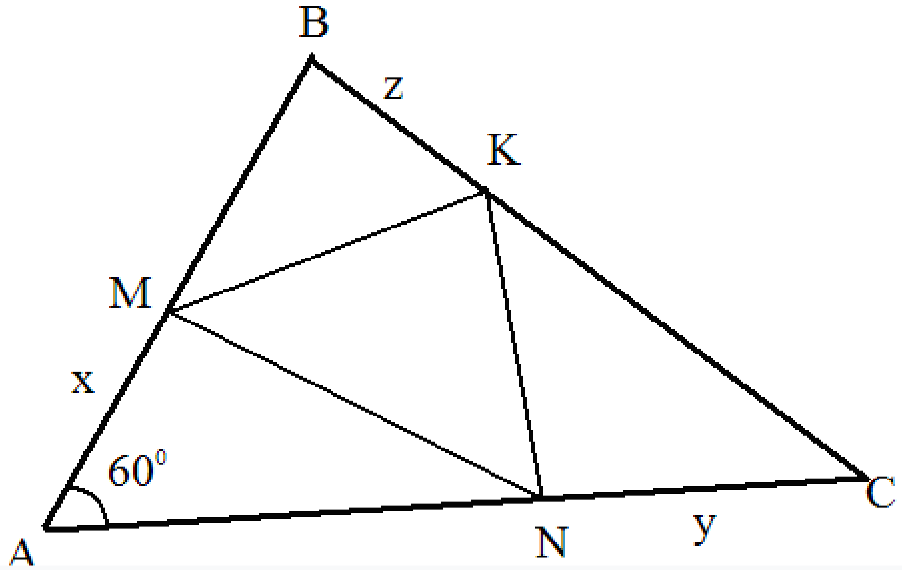

Figure 2.1. A form suitable for the condition of the matter.

If we assume that the surfaces of the resulting triangles AMN, CNK, BMK are S_1, S_2, S_3 corresponding, then

$S_1 = \frac{\sqrt{3}}{4} x(1-y)$; $S_2 = \frac{\sqrt{3}}{4} y(1-z)$;

$S_3 = \frac{\sqrt{3}}{4} z(1-x)$ will be the result.

$S_1 + S_2 + S_3 < S_{ABC}$ and $S_{ABC} = \frac{\sqrt{3}}{4}$ it is known. Based on this

$$\frac{\sqrt{3}}{4} x(1-y) + \frac{\sqrt{3}}{4} y(1-z) + \frac{\sqrt{3}}{4} z(1-x) < \frac{\sqrt{3}}{4}$$

$$\frac{\sqrt{3}}{4}(x(1-y) + y(1-z) + z(1-x)) < \frac{\sqrt{3}}{4}$$

$$x(1-y) + y(1-z) + z(1-x) < 1$$

originates. The inequality is proved

Issue 2. It is known that x+y=6 for positive numbers x and y. $\frac{1}{x}+\frac{1}{y}$ find the smallest value of the expression.

Solution: We are given the equation x+y=6. If we multiply both parts by 2, we get 2x+2y=12. We can make a rectangle with a perimeter of 12. We change the form of the required sum of $\frac{1}{x}+\frac{1}{y}$ as follows:

we change the sum as follows: $\frac{1}{x}+\frac{1}{y} = \frac{x+y}{xy} = \frac{6}{xy}$.

It is known that the square with side 3 has the largest area among rectangles with a perimeter of 12. This is because the face of the square is equal to 9 $\frac{1}{x}+\frac{1}{y} = \frac{x+y}{xy} = \frac{6}{xy} = \frac{6}{9} = \frac{2}{3}$ will be the result. So, the smallest value of the given expression $\frac{1}{x}+\frac{1}{y}$ is equal to .

Issue 3. If the following conditions are true for positive numbers x, y, z, a, b, c, find the value of the sum xy+yz+zx.

$$\begin{cases} x^2 + xy + y^2 = a^2 \\ y^2 + yz + z^2 = b^2 \\ z^2 + zx + x^2 = c^2 \end{cases}$$

Solution: In addition to surface formulas, we use the theorem of cosines to solve this problem. We place three cross-sections with lengths x, y, z in such a way that they have a common point O and make an angle of 120° with each other. By connecting the other ends of these sections, we form a triangle ABC. We take the lengths of the sides of this triangle as a, b, c, respectively (Fig. 2.2). Based on the theorem of cosines $x^2+xy+y^2=a^2$, $y^2+yz+z^2=b^2$, $z^2+zx+x^2=c^2$ equalities will be appropriate.

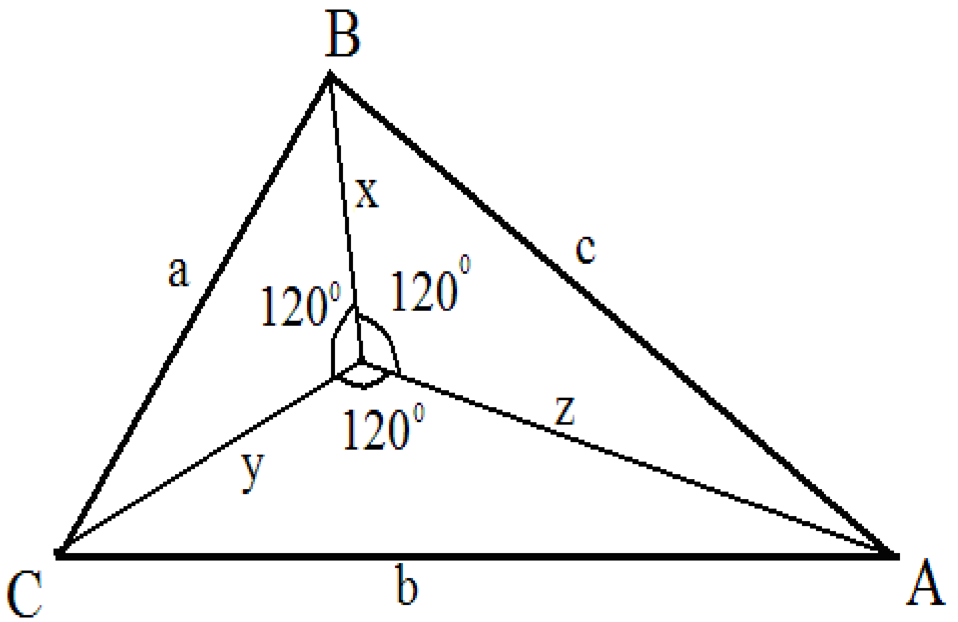

Figure 2.2. A form suitable for the condition of the matter

Now if we call the surfaces COB, AOC and AOB formed S_1, S_2, S_3, then

$S_1=\frac{\sqrt{3}}{4}xy$; $S_2=\frac{\sqrt{3}}{4}yz$; $S_3=\frac{\sqrt{3}}{4}zx$ equalities will be appropriate.

$S_1+S_2+S_3=S_{ABC}$ from the fact that originates.

$\frac{\sqrt{3}}{4}(xy+yz+zx)=S_{ABC}$ On the other hand, we find S_{ABC} - the face of a triangle using Heron's formula: $S=\sqrt{p(p-a)(p-b)(p-c)}$ formula

$$S=\sqrt{\frac{a+b+c}{2}\cdot\frac{a+b-c}{2}\cdot\frac{a+c-b}{2}\cdot\frac{b+c-a}{2}}$$

$$\frac{\sqrt{3}}{4}(xy+yz+zx)=$$
$$=\frac{1}{4}\sqrt{(a+b+c)(a+b-c)(a+c-b)(b+c-a)}$$ and from that
$$xy+yz+zx=\sqrt{\frac{(a+b+c)(a+b-c)(a+c-b)(b+c-a)}{3}}$$ equalities will be appropriate.

Issue 4. If $y>0,\quad x+y^2=7{,}25,\quad y^2-z=2$ and $y^2=\sqrt{x-1}\cdot\sqrt{2-z}$ if equalities are appropriate $y\cdot\left(\sqrt{x-1}+\sqrt{2-z}\right)$ find the value of the expression.

The solution. First, $x\neq 1, z\neq 2$. In fact, if x=1 or z=2, then y=0. Any pair of 1's and 0's $x+y^2=7{,}25$ does not satisfy the condition. It can be seen that the pair of numbers 0 and 2 does not satisfy the relation $y^2-z=2$. Secondly, for the numbers x>1 and z<2, we describe conditions $x+y^2=7{,}25$ and $y^2-z=2$ as follows: $\left(\sqrt{x-1}\right)^2+y^2=6{,}25$ and $y^2+\left(\sqrt{2-z}\right)^2=4$. now we can draw a corresponding drawing (Fig. 2.3).

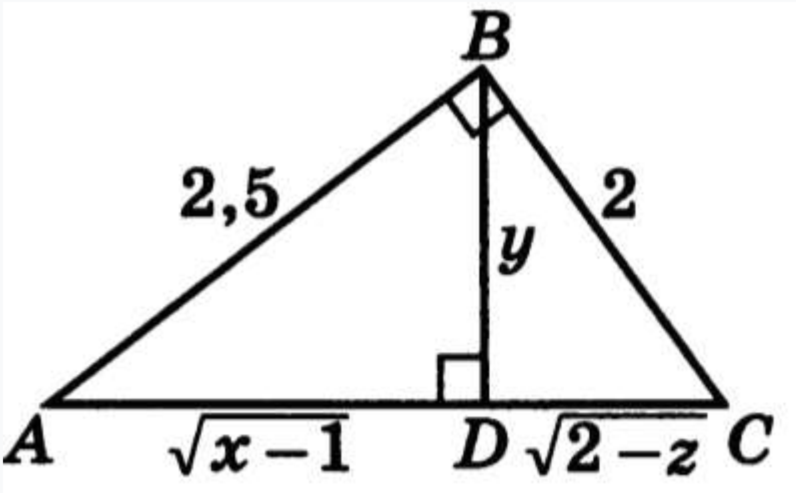

Figure 2.3. A form suitable for the condition of the matter.

Thirdly, according to the formula for finding the face of this triangle, we write the following equation:

$$S=\frac{1}{2}y\cdot\left(\sqrt{x-1}+\sqrt{2-z}\right)=\frac{1}{2}\cdot 2\cdot 2{,}5$$
$$y\cdot\left(\sqrt{x-1}+\sqrt{2-z}\right)=5$$

So, the value of the search expression is equal to 5.

Issue 5. x, y, z for positive numbers

$$\begin{cases} x^2 + xy + \dfrac{y^2}{3} = 25 \\ \dfrac{y^2}{3} + z^2 = 9 \\ z^2 + zx + x^2 = 16 \end{cases}$$

calculate the value of the sum xy+2yz+3xz without solving the system of equations.
Solution: We will draw a diagram corresponding to the condition of the problem (Fig. 2.4).

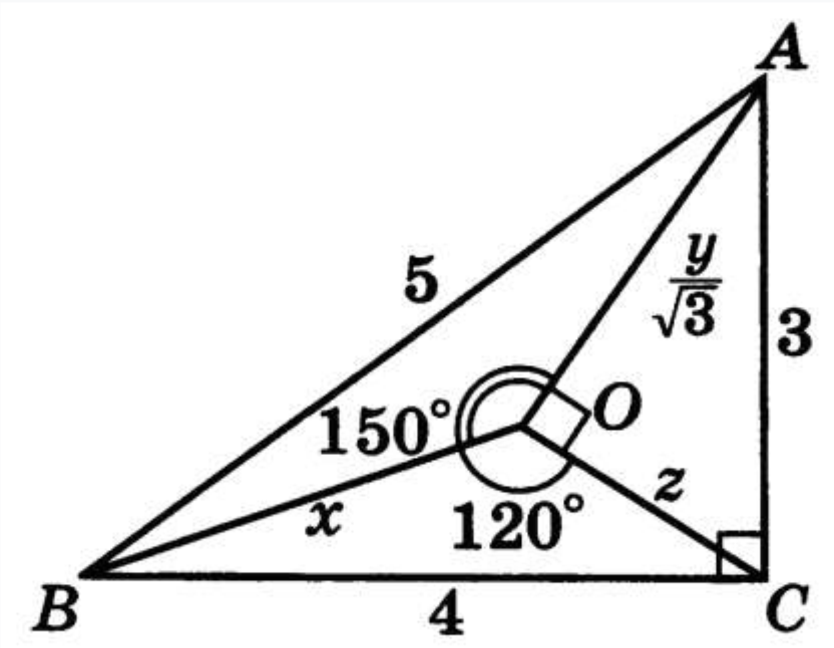

Figure 2.4. A form suitable for the condition of the matter.

As can be seen from the diagram,

$$S_{\Delta ABC} = \frac{1}{2}x\cdot\frac{y}{\sqrt{3}}\sin 150^0 + \frac{1}{2}\cdot\frac{y}{\sqrt{3}}z + \frac{1}{2}xz\sin 120^0 = \frac{1}{2}x\cdot\frac{y}{\sqrt{3}}\cdot\frac{1}{2} + \frac{1}{2}\cdot\frac{y}{\sqrt{3}}z +$$

$$+\frac{1}{2}xz\cdot\frac{\sqrt{3}}{2} = \frac{1}{4\sqrt{3}}(xy + 2yz + 3xz)$$

On the other hand, the face of a right-angled triangle ABC is equal to 6. Accordingly $\frac{1}{4\sqrt{3}}(xy + 2yz + 3xz) = 6$

from that $(xy + 2yz + 3xz) = 24\sqrt{3}$ we determine that. Answer: $(xy + 2yz + 3xz) = 24\sqrt{3}$

Issue 6. If x>0, y>0, z>0 and $xyz(x+y+z)=1$ if $(x+y)(x+z)\geq 2$ prove the inequality.

Solution: since x>0, y>0, z>0, there is a triangle ABC whose sides are AB=c=x+y, BC=a=y+z, AC=b=x+z (Figure 2.5) .

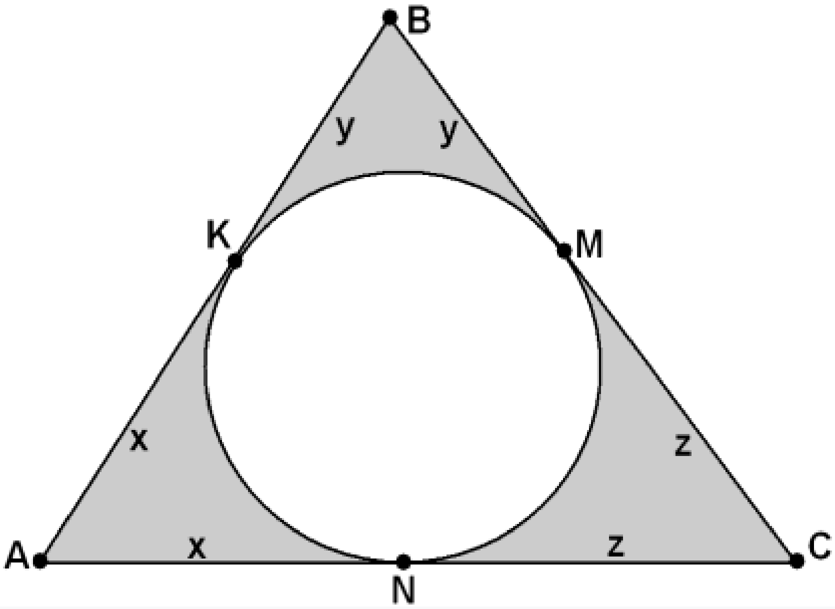

Figure 2.5. A form suitable for the condition of the matter.

The circle inscribed in this triangle corresponds to the sides AB, BC, AC try at points K, M, N. In this case, x+y+z=p, where p is the semiperimeter. In addition, AK=AN=p-a=x, BK=BM=p-b=y, CM=CN=p-c=z relations are appropriate. But as the case may be, xyz(x+y+z)=p(p-a)(p-b)(p-c)= S^2 =1 or S=1, where S is a face of triangle ABC. On the other hand, $2S=AB\cdot AC\sin BAC\leq AB\cdot AC=(x+y)(x+z)$ will be. *(x+y)(x+z)*$\geq$*2S=2* Then the Inequality is proved.

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