GEOMETRIYANI O'QITISHDA O'QUVCHILARNING IQTISODIY BILIMLARINI VA MAHORATINI RIVOJLANTIRISH YO'LLARI

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СПОСОБЫ РАЗВИТИЯ ЭКОНОМИЧЕСКИХ ЗНАНИЙ И НАВЫКОВ СТУДЕНТОВ ПРИ ОБУЧЕНИИ ГЕОМЕТРИИ

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WAYS OF DEVELOPING ECONOMIC KNOWLEDGE AND SKILLS OF STUDENTS IN TEACHING GEOMETRY

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Abstract: The problem of finding the geometric positions of points in the geometry course of academic lyceums, schools and universities is analyzed. The relevance of the article lies in the fact that the task of solving *a mathematical problem created by translating economic indicators into the language of mathematics is posed, and a method for solving it is selected. The result is a universal relationship between an economic problem and* *a mathematical problem. In economics, the budget line coincides with a straight geometric line.*

Methods. The method for solving the obtained geometric problem is the position of points, parallel movement of a straight line, rotation around a point. The vector-coordinate method was used to solve the obtained geometric problem. The resulting extremal problems were solved by geometric methods.

Results. As a result of the research, the economic problem was solved by geometric methods. It was shown that math problems are a model of some process, and for the anime we had to learn math methods.

Conclusion. The article addresses pressing and economic issues by solving geometric problems. These types of problems build economic competence in students and help improve their ability to solve geometric problems.

***Keywords**: max, min, extremum, geometric method, budget line, coordinate arrows*

Introduction. This article discusses geometric methods for calculating extreme problems, and the article provides an economic interpretation of a spherical problem. Mathematical problems are illustrated using real-life examples that arise out of necessity.

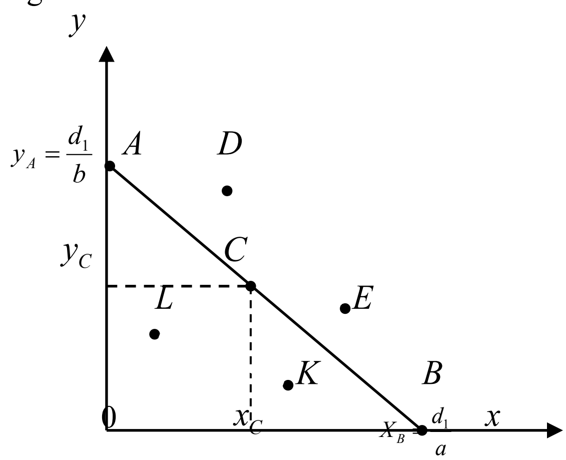
Despite the fact that geometry and its methods are abstract, many of its branches are applied and help a person to master the complex laws of nature. Using scientific abstraction, the researcher will be able to study in depth and comprehensively nature and all phenomena. The interest of a person with mathematics from his success in finding a solution to the problem, if this issue is complex, at the same time, if the interesting solution is not standard, can serve as a good factor for his further work and move forward. Since the birth of positive emotions gives an effective result in the work of the brain and allows a more powerful development of mathematical activity, the task of the teacher is an expression of the use of these drinks for the purpose of predicting, understanding and giving knowledge. We need to help students learn how to feel their beauty, how to feel their interest in the economy and the feeling of enjoyment, how to notice, appreciate and create beautiful things. In the lesson of geometry, we must choose the issue in the formation of economic knowledge of students so that this issue should be taken from life as much as possible. Topic about the solution, which expresses the importance of the result of the sentence together with the simple and original methods of its formation, we often say and hear the words "beautiful solution" or "wonderful proof". Such methods evoke pleasure in a person, help to feel the power of the mind and the beauty of thought.

In the course of geometrics of academic lyceums, issues related to finding the geometrical places of points in schools and universities are considered and checked. Let's look at the following simple matter. Suppose the buyer prefers to buy 2 different goods. Within the time given to the buyer, let the revenue. d The buyer cannot afford to spend higher than the unit of money within the given time. d Without it $ax + by = d$ (1) $(d_1 \le d)$ the condition can be purchased from a collection of satisfactory goods. $(x;\ y)$ It is convenient to use (1) equality to graphically describe the set of moles by a rectangular coordinate (in the plane of $x-$moles) (in this case, the price of the mole is the price $a-$of the mole b). (1) the line defined by the equation is referred to as the budget (Narz) line in the course of Economics.

$$y = \frac{d_1}{b} - \frac{a}{b}x$$

(2)

It is possible to write in appearance. d_1, a, b since there are immutable quantities (2) the equation represents a straight line and the $\frac{d_1}{b}$ free had, $\frac{a}{b}$ while x the coefficient in front of the variable. The budget line consists of a AB straight line on the chart. A and B the coordinates of the points are the points at the intersection of the coordinate arrows with the budget line.



Picture 1

A point ordinate $y_A = \frac{d_1}{b}$ indicates that the buyer only buys the x goods, B while the point abscissa indicates $X_b = \frac{d_1}{a}$ that the buyer only y spends his income for the goods. and the $C(X_C,\ Y_C)$ point is that the buyer is charged for his income X and Y goods. OAB Triangle is a set of opportunities for the buyer to buy goods.

Which belongs to the Triangle, K and L points indicate that it is possible to buy both the buyer x and y the goods, and in points D and E means that it is impossible to x buy y goods.

If the buyer's income d_1 increases from d_2 to and prices do not change, then the equation of the new budget line

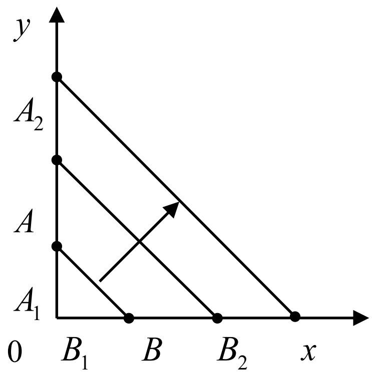
$$y = \frac{d_2}{b} - \frac{d_1}{b}x \qquad (3)$$

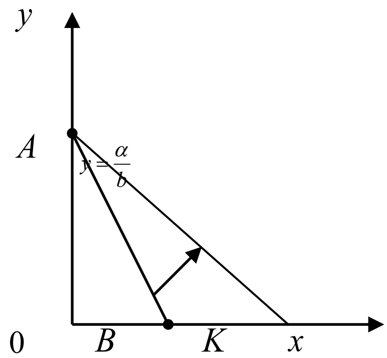
will have a look. For the fact $d_2 = d_1 + \alpha(\alpha > 0,\ \alpha \in R)$ that it was

$$y = \frac{d_2 + \alpha}{b} - \frac{d_1}{b}x = \frac{d_1}{b} - \frac{d_1}{b}x + \frac{\alpha}{b}$$

$$x = \frac{d_1 + \alpha}{a} - \frac{b}{a}y = \frac{d_1}{a} - \frac{b}{a}y + \frac{\alpha}{a}$$

formulas are formed. Since these formulas are parallel displacement formulas, the budget line indicates parallel displacement up of the budget line when income grows, and down when income decreases.





Picture 2

Picture 3

Now let's check up to just changing α the price of a single property. For clarity, x the price a of the goods has decreased, so that the y price of the goods and the buyer's income do not change. In this case, the budget line

$$y = \frac{\alpha}{b} - \frac{a}{b}x$$

it will be visible.

Thus, as the decrease x in the price of goods leads to the deviation of the budget line around the intersection point with Oy the axis of the budget line in the opposite direction to the direction of the clock stretch, the increase in the x price of goods is turned in the direction of the clock stretch, similar to the above.

Issue: if the buyer is known to buy 2 identical (2; 5) or (4; 3) sets of goods in pairs, what will the budget line look like? If the unit price is 100 000 rubles, how many rubles will the buyer's income be?

Solution. We describe this economic issue in the language of mathematics as follows. Let the equation of a straight line passing through the given two points be drawn. We are looking for the equation $ax+by=c$ of a straight line in appearance. Since the straight line passes through (2; 5) and (4; 3) points, we solve this system:

$$\begin{cases} 2a+5b=c \\ 4a+3b=c \end{cases}$$

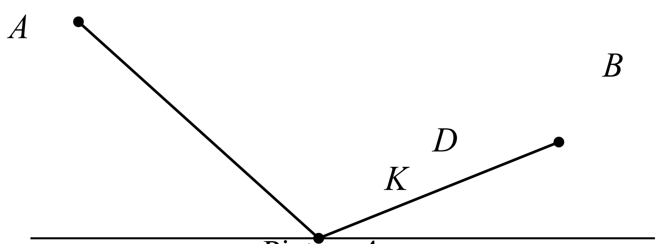
We take off the $a=b,\ c=7b$ system and find that it is. So the budget line $x+y=7$ will be in appearance.

Now we return to the economic issue. The cost of the first and second goods prices equal to the price of goods is 100 000 sum. And the buyer's income is from 700 000 rubles. This type of issue is not only economic thinking of the student, but also geometric thinking.

The main recognition in the teaching of mathematical science is that it is necessary to focus on conducting it in a way that is inextricably linked with practice. Every listener should apply in the educational process that mathematics lies especially on the basis of Economics, construction, architecture and other areas. In this place, a practical issue, let's recommend to solve it.

On one side of the channel, where the edge is in the form of a straight line, there are two living punctures, requiring the construction of a basin that provides them with clean drinking water.

Whichever place the basin is built on the channel, the cost of the pipes transferred to the living quarters will be minimal.

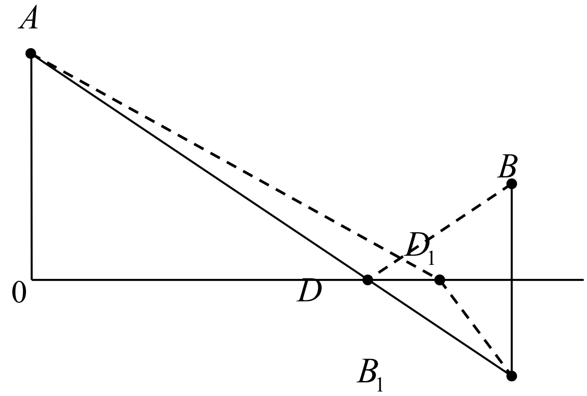


Picture 4

Let's fix the mathematical model of the issue. If we define the channel K in a straight line, the population A and B the point D at which the basin should be built, the issue will take the following view:

K find such D a point lying on a straight line that the sum of the distances from this point A and B to the points is the smallest (figure 4).

To solve this problem, we take a B point K that is symmetrical in relation to the straight line to B_1 the point AB_1 and make an incision. The point K of intersection of the same intersection D with a straight line is the point you are looking for (Figure 5).



Picture 5

Indeed, K lying on a straight line, D for an optional point D_1 different from

$$AD_1 + D_1B_1 = AD_1 + D_1B > AB_1 = AD + DB$$

it is clear that the smallest value AB_1 is the length of the cut. To find exactly this value and D point, we use the coordinate method. If K we Ox take NI as an arrow OA that includes the intersection Oy as an axis, A, B and D the coordinates of the point:

$$A(o,\ a),\ B(d,\ b),\ D(x,\ o)$$

as determined. It is $a,\ b,\ d$ known D here. the abscissa of the point is unknown. There will also B_1 be point $B_1(d;\ -b)$ coordinates, the AB_1 sought $AB_1 = \sqrt{d^2 + (a+b)^2}$ cross-section. Now, we find out x at what value this value will reach.

$\overline{AD} = (x;\ -a),\ \overline{DB_1} = (d-x;\ -b)$, as well as $\overline{AD}$ and $\overline{DB_1}$ in the same direction

$$\frac{x}{d-x} = \frac{a}{b}, \quad x = \frac{db}{a+b}$$

it is not difficult to find.

So it turned out, in which place to install the basin. This will allow some extreme issues with the same method on the second hand if they demonstrate practicality on the one hand. Let's say for sure

$$\sqrt{x^2-6x+13}+\sqrt{x^2-14x+58}$$

Whether it is required to find the smallest value of the expression, the expression given to solve the problem

$$\sqrt{(x-3)^2+4}+\sqrt{(x-7)^2+9}$$

If expressed in appearance, we can see that it is similar to the issue model seen above.

$A(x;\ o),\ \ B(3;-2),\ \ C(7;\ 3)$ as

$$AB=\sqrt{(x-3)^2+4},\quad AC=\sqrt{(x-7)^2+9}$$

wherein there will be $BC=\sqrt{41}$ a value sought, this value is achieved when it is $\overline{AB}$ and $\overline{AC}$ has the same direction.

$\overline{AB}=(3-x;\ -2),\quad \overline{AC}=(7-x;\ 3)$ from that,

$$\frac{3-x}{7-x}=-\frac{2}{3}$$ from this,. $x=4{,}6$

So, in solving the problem of analysis, the geometric method helped, in some cases, the algebra or the analysis formulas, the rules help in solving the problem of geometric.

We give examples of extreme issues that can be solved with the help of geometrical interpretation.

This

$$f(x,\ y)=ax+by \qquad (1)$$

let's look at the unit circle in which the center of the linear function is at the beginning of the coordinate. In general, it is possible to consider (1) $\overline{m}(a;\ b)$ and $\overline{\lambda}(x,\ y)$ scalar multiples of vectors. If $\overline{\lambda}(x,\ y)$ the end of the vector belongs to the circle, then its length does not change, as well as the scalar $\overline{m}(a;\ b)$ multiplication with its vector reaches its maximum value at some point when it is mutually collenear, $(x_0,\ y_0)$ and

$$(x_0,\ y_0)=\left(\frac{a}{\sqrt{a^2+b^2}};\ \frac{b}{\sqrt{a^2+b^2}}\right)$$

will be. Suitable is while scalar $(x_0,\ y_0)\cdot(a,\ b)=\sqrt{a^2+b^2}$ multiples. Hence, the minimum value of the linear function in the circle

$$\min(ax+by)=\sqrt{a^2+b^2}$$

(2)

as it would be. Now let's dwell on the specifics of an application of this texture. Practically,

$$f_1(x,\ y)=a_1x+b_1y$$
$$f_2(x,\ y)=a_2x+b_2y$$
$$f_n(x,\ y)=a_nx+b_ny$$

let it be. Without it (2) according to the result

$$\begin{aligned}&\min f_1(x,\ y)+\min f_2(x,\ y)+\ldots+\min f_n(x,\ y)\le\\&\le\min(f_1(x,\ y)+f_2(x,\ y)+\ldots+f_n(x,\ y))=\\&=\sqrt{(a_1+a_2+\ldots+a_n)^2+(b_1+b_2+\ldots+b_n)^2}\end{aligned}$$

(3)

or

$$\sqrt{a_1^2+b_1^2}+\sqrt{a_2^2+b_2^2}+\ldots+\sqrt{a_n^2+b_n^2}\le\sqrt{(a_1+a_2+..+a_n)^2+(b_1+b_2+\ldots+b_n)^2}$$

we come to inequality. With the help of this disparity, it is possible to solve some issues that are related to conditional extremum issues, but which can not be solved by classical methods.

For example this

$$\sqrt{x_1^2+y_1^2}+\sqrt{x_2^2+y_2^2}+\ldots+\sqrt{x_n^2+y_n^2}\to\max$$
$$x_1+x_2+\ldots+x_n=1$$
$$y_1+y_2+\ldots+y_n=2\sqrt{2}$$

let's look at the issue of conditional extremum. It is not difficult to see that the solution to this issue directly comes from the above (3) inequality

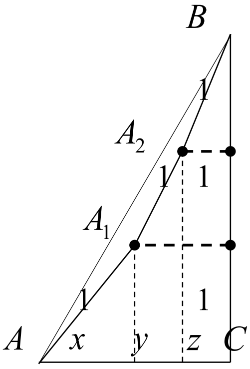
$$\begin{aligned}&\sqrt{x_1^2+y_1^2}+\sqrt{x_2^2+y_2^2}+\ldots+\sqrt{x_n^2+y_n^2}\le\\&\sqrt{(x_1+x_2+\ldots+x_n)^2+(y_1+y_2+\ldots+y_n)^2}=\sqrt{1+8}=3\end{aligned}$$

that is, the permissible maximum value of irrational expression is equal to 3. It is possible to cite such examples and issues.

We will address $x,\ y,\ z$ the issue again. when the condition for $x+y+z=1$ positive numbers is fulfilled

$$\sqrt{1+x^2}+\sqrt{1+y^2}+\sqrt{1+z^2}\to\min$$

let's solve that using a geometric method. There are other ways to solve this issue. But we chose a geometric method of solving it.



Picture 6

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6-pay attention to the picture.

AA_1A_2B for a closed broken line

$AA_1 + A_1A_2 + A_2B \geq AB$, $AC = 1,\ BC = 3$

$AA_1 = \sqrt{1+x^2},\ A_1A_2 = \sqrt{1+y^2},\ A_2B = \sqrt{1+z^2}$

$AB = \sqrt{1^2+3^2} = \sqrt{10}$ all in all,

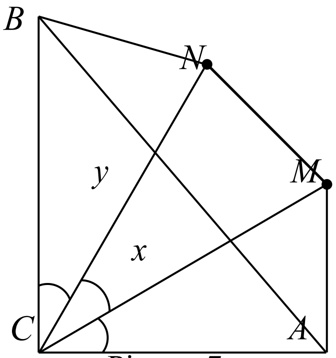
$\sqrt{1+x^2} + \sqrt{1+y^2} + \sqrt{1+z^2} \geq \sqrt{10}$

$$\min\left(\sqrt{1+x^2} + \sqrt{1+y^2} + \sqrt{1+z^2}\right) = \sqrt{10}$$

for optional x and y products

$$\sqrt{9+x^2-3\sqrt{3}x} + \sqrt{x^2+y^2-xy\sqrt{3}} + \sqrt{16+y^2-4\sqrt{3}y}$$

let it be necessary to find the smallest value of the expression.



Picture 7

Solution. ABC we look at a rectangular triangle. Its catheters $AC = 3,\ BC = 4$ (picture 7).

Divide the right angle into equal three parts ,from the formed rays $CM = x,\ CN = y$ (if x and minus, they y are put on the opposite side).

According to the cosine theorem,

$$AM = \sqrt{9+x^2-3\sqrt{3}x},\quad MN = \sqrt{x^2+y^2-xy\sqrt{3}},\quad NB = \sqrt{16+y^2-4\sqrt{3}y}$$

$$AM + MN + NB \geq AB, \qquad AB = \sqrt{3^2+4^2} = 5$$

$$\min\left(\sqrt{9+x^2-3\sqrt{3}x} + \sqrt{x^2+y^2-xy\sqrt{3}} + \sqrt{16+y^2-4\sqrt{3}y}\right) = 5$$

$X = CM,\ ACN$ because there is a triangle bisector $y = CN,\ BCM$, a bisector

$$X = \frac{3y\sqrt{3}}{3+y}, \quad y = \frac{4x\sqrt{3}}{4+x}$$

take off the last system,

$$X = \frac{24}{3+4\sqrt{3}}, \quad y = \frac{24}{4+3\sqrt{3}}$$

we form.

Conclusion. Thus, in this article we have talked about the possibility of forming the economic education of the student by solving the issues, developing his interest in science, improving the experience of solving problems from mathematics.

From these types of issues, the student's economic knowledge is attributed to the excellent study of the interdependence of Mathematical Sciences.

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