INFORMATION AND COMMUNICATION TECHNOLOGIES IN THE ORGANIZATION AND DEVELOPMENT OF INDEPENDENT CREATIVE WORK OF YOUNG PEOPLE

Odil Yusupov Qosim ugli
Tashkent state technical university named after I.Karimov
https://doi.org/10.5281/zenodo.8025249

Abstract. *The article deals with the issues of development of creative ability of academic lyceum students. The "problematic" issue of mathematics was considered, which allows to increase the creative potential of students.*
Keywords: *ability, talent, independence, thinking.*

1. Introduction

Today, in addition to technological professional training, it is necessary for a specialist to have an important factor in the development of Education – independent thinking, responsible decision-making, a creative approach to any work, constant learning, communication, the ability to cooperate, social and Professional Responsibility, etc.

The formation of personality-oriented education ensures the professional self-realization of a person and the development of his further creative maturation. Thus, the task faced in education is not only to provide comprehensive knowledge necessary for the training of a specialist, but also to develop the independence of thinking, which is necessary for a creative feeling of the surrounding world. Today it is universally recognized that science is of great importance for the development of culture and economy in the modern state. Therefore, educating and educating young people with the aforementioned qualities is the most important task.

Scientific work belongs to all areas of human activity, it can be successfully developed only by those who have creative talents. It is well known that only a small number of people with creative abilities can successfully work in the field of art, literature, music. The same applies to scientific work, only people with creative talents can successfully work here. So, for the effective development of scientific work, it is necessary to choose creatively gifted young people. In science, it is very difficult to assess a person's creative achievements, although it is made by the public, it is a small group made up of scientists qualified in the field. The selection of scientific personnel by their creative abilities is one of the most difficult organizational problems of scientific work.

The success of scientific work in any field of knowledge can only be ensured by people with creative abilities, and the number of such people is small. To form employees of the scientific sphere, it is necessary, firstly, to create conditions for attracting talented youth to scientific work, secondly, to organize the selection of these young people in accordance with the nature of creative talents, and thirdly, to create special conditions for the education of creatively gifted young people, so that natural talents develop as fully as possible. This issue is solved in the following way: after graduating from high school, such creative talented young people are sent to academic lyceums. One of the best methods of creative education of young people in academic lyceums is the organization of Olympiads for students of academic lyceums. These are competitions aimed at mathematics and physics, equipment construction, astronomical observations and the formation of students ' interest in scientific and technical creativity, which will cover as many participants as possible. These Olympiads are interested not only in discovering talented, creatively gifted youth, but also in the creative solution of scientific issues from an early age. We have such Olympiads developed widely, and they are held at a high level. Also, the creative thinking of students is well influenced by the solution of scientific creative issues in circles, seminars in various disciplines and round tables with science figures. These circles are conducted by young scientists, so students get acquainted with the creative scientific process.

It is known that effective scientific work requires not only knowledge and understanding, but, most importantly, independent analytical and creative thinking, as one of the effective means of educating, identifying and evaluating these qualities. The solution of the issue in the study of Mathematics, Mechanics, physics and other Exact Sciences is of great importance. Problem solving not only allows the student to apply his knowledge to solve practical problems, but is also one of the most effective ways for the teacher to check how deeply the student understands the subject. In addition, as mentioned above, young people can be trained in independent creative scientific thinking by solving the issue.

Mathematics is a very suitable subject for primary education in the development of creative thinking in the field of Natural Sciences. Obviously, not all tasks allow you to reveal such abilities of the student. Therefore, we will dwell specifically on the nature of such tasks. Experience shows that the issues that are usually given in sets do not always have a character that provides freedom of thought. The issues are content with the calculation of the given data using the necessary formulas. Here, the student's task is manifested only in the selection of the correct formulas necessary for calculation. The issues that motivate independent thinking and creative search, which we mentioned, form a scientific worldview in the reader.

2. In this article, we will consider the solution of the problem issue. This issue allows you to increase the creative potential of students. Here we bring a complete solution to the issue.

Issue. AB an optional point M is obtained in the cut AB, MA and MB let the cuts be drawn half circles in diameter and an inner circle that attempts each of these half circles. Find the geometric position of the center of the circle with the inner drawing, according to the choice of the point M in the cut AB. Solution: To solve the problem, we introduce the following definition: $AC = CM = R_1$, $ME = EB = R_2$, $AD = DB = R$, $OF = r$.

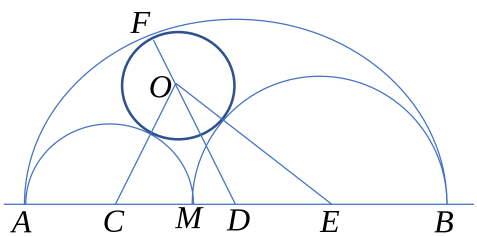


Figure 1

for ΔCOE radius of the circle drawn internally according to stuart's theorem we find OF : *2.1. Finding the radius of an inscribed circle*

$$OC^2 \cdot DE + OE^2 \cdot DC = OD^2 \cdot CE + CE \cdot CD \cdot DE \quad (1)$$

From Figure 1 $CO = R_1 + r$, $OE = R_2 + r$, $OD = R - r$, $CD = R_2$, $DE = R_1$, $CE = R_1 + R_2 = R$ placing (1),we will have

$$(R_1+r)^2\cdot R_1+(R_2+r)^2\cdot R_2=(R-r)^2\cdot R+R\cdot R_1\cdot R_2.$$

$$R_1^3+2rR_1^2+r^2R_1+R_2^3+2rR_2^2+r^2R_2=R^3-2R^2r+r^2R+R\cdot R_1\cdot R_2$$

$$R_1^3+2rR_1^2+R_2^3+2rR_2^2+r^2(R_1+R_2)=R^3-2R^2r+r^2\cdot R+R\cdot R_1\cdot R_2$$

$$2rR_1^2+2rR_2^2+2R^2r=R^3+R\cdot R_1\cdot R_2-R_1^3-R_2^3$$

$$r=\frac{R^3+R\cdot R_1\cdot R_2-R_1^3-R_2^3}{2R_1^2+2R_2^2+2R^2}. \qquad (2)$$

2.2 Finding the coordinates of an inscribed circle

Now let's describe the given drawing in the Cartesian coordinate system in order to determine the coordinates of the center of the inner drawn circle $O(x;y)$:

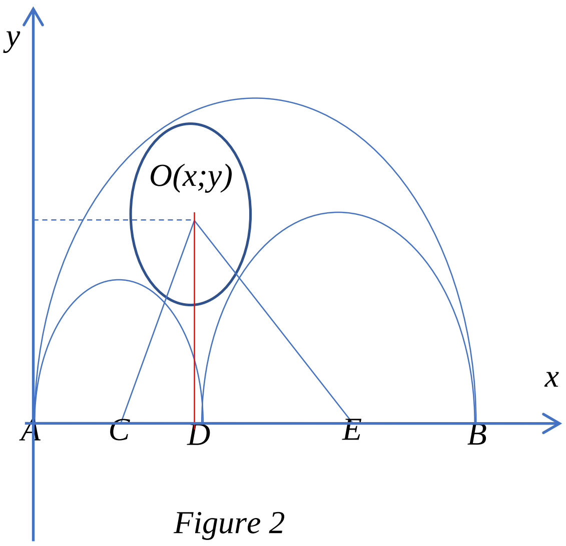


Figure 2

for ΔCOE we find the height OD (we enter the designation $CD=p$

Pythagorean theorem for $\Delta COD: CO^2=CD^2+DO^2 \Rightarrow (R_1+r)^2=OD^2+p^2$

Pythagorean theorem for ΔDOE: $OE^2=OD^2+DE^2 \Rightarrow (R_2+r)^2=OD^2+(R-p)^2$

We find and equalize the height OD from two equals:

$$(R_1+r)^2-p^2=(R_2+r)^2-(R-p)^2$$

$$R_1^2+2R_1r+r^2-p^2=R_2^2+2R_2r+r^2-R^2+2Rp-p^2$$

$$R_1^2+2R_1r=R_2^2+2R_2r-R^2+2Rp$$

$$p=\frac{R_1^2+2R_1r-R_2^2-2R_2r+R^2}{2R} \qquad CD=\frac{R_1^2+2R_1r-R_2^2-2R_2r+R^2}{2R}$$

We find height OD using the Geron formula:

$$P=R_1+R_2+r=R+r$$

$$S=\sqrt{P(P-a)(p-b)(P-c)}$$

$$S=\sqrt{(R+r)rR_1R_2}$$

$$OD=\frac{2S}{R}=\frac{2}{R}\sqrt{(R+r)rR_1R_2}$$

From this, the coordinates of the center of the circle drawn internally will be:

$$y = OD = \frac{2}{R}\sqrt{(R+r)rR_1R_2}, \quad x = AC + CD = R_1 + \frac{R_1^2 + 2R_1 r - R_2^2 - 2R_2 r + R^2}{2R}$$

2.3. Construction of parametric equation of inscribed circular coordinates

Since the coordinates of $O(x;y)$ given in the matter M depend on the choice of a point, we find the expression x and y through the coordinate of POINT M.

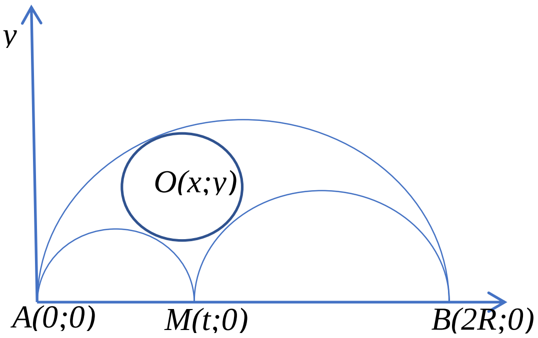


Figure 3

In this there will be $R_1 = \frac{t}{2}$, $R_2 = R - \frac{t}{2}$. The radius of the circle drawn internally in that case is expressed as:

$$r = \frac{R^3 + R\cdot\frac{t}{2}\cdot\left(R-\frac{t}{2}\right) - \frac{t^3}{8} - \left(R-\frac{t}{2}\right)^3}{2\left(R-\frac{t}{2}\right)^2 + 2\frac{t^2}{4} + 2R^2} = \frac{8R^3 + 2Rt(2R-t) - t^3 - (2r-t)^3}{4(2R-t)^2 + 8t^2 + 16R^2} =$$

$$= \frac{16R^2t - 8Rt^2}{8t^2 + 32R^2 - 16Rt} = \frac{2R^2t - Rt^2}{t^2 + 4R^2 - 2Rt}$$

We determine the coordinates of the center of the Circle $O(x;y)$ by parameter t :

$$y = \frac{2}{R}\sqrt{(R+r)rR_1R_2} = \frac{2}{R}\sqrt{\left(R + \frac{2R^2t - Rt^2}{t^2+4R^2-2Rt}\right)\frac{2R^2t - Rt^2}{t^2+4R^2-2Rt}\frac{t}{2}\left(R-\frac{t}{2}\right)} = \frac{2Rt(2R-t)}{t^2+4R^2-2Rt}$$

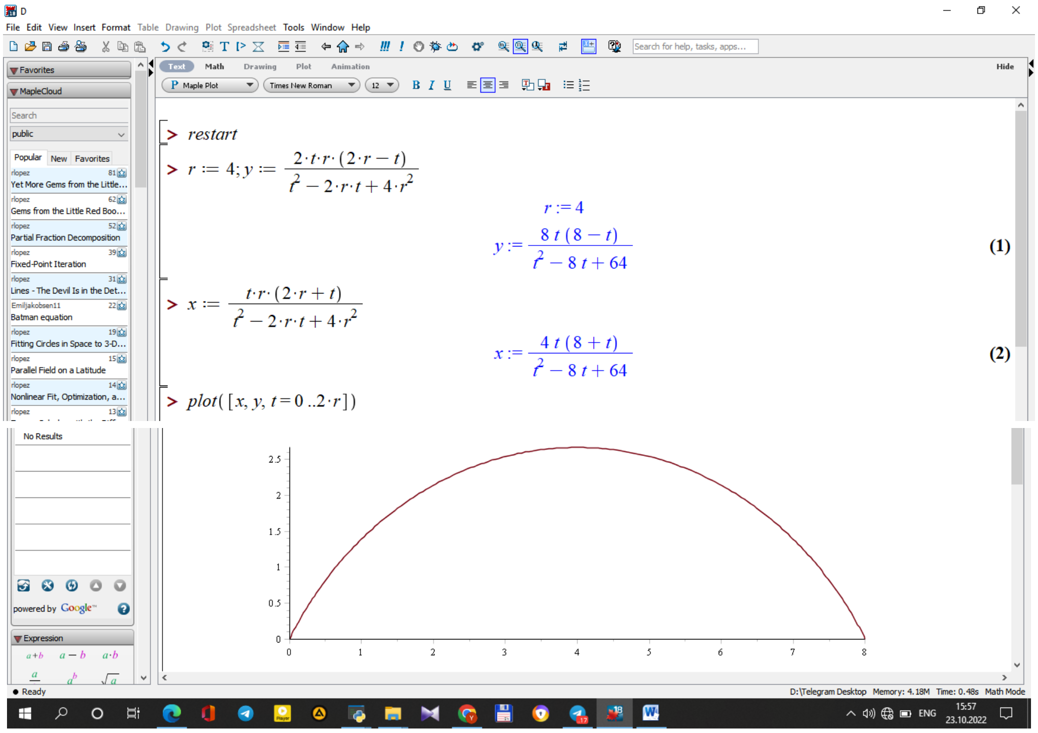
$$x = \frac{t}{2} + \frac{\frac{t^2}{4} + 2\frac{t}{2}\cdot\frac{2R^2t - Rt^2}{t^2+4R^2-2Rt} - \left(R-\frac{t}{2}\right)^2 - 2\left(R-\frac{t}{2}\right)\frac{2R^2t - Rt^2}{t^2+4R^2-2Rt} + R^2}{2R} = \frac{Rt(2R+t)}{t^2+4R^2-2Rt}$$

Hence, the parametric equation of the motion trajectory of the inner drawn circle center $O(x;y)$:

$$\begin{cases} y = \dfrac{2Rt(2R-t)}{t^2+4R^2-2Rt}, \\ x = \dfrac{Rt(2R+t)}{t^2+4R^2-2Rt}. \end{cases} \qquad (3)$$

3. The result obtained in support of information and communication technologies.

At the stage of solving this issue, we describe the schematic state of the issue. The main AB is the cut, and in this cut M the point, AM and MB are drawn by making the cuts towards the half-circles and the circle that attempts these half-circles; The center of the circle drawn internally, which attempts to semi-circles point $O(x;y)$ is the moving point, the curve formed by the set of points $O(x;y)$ will be the solution to the issue. First, you can program this process on a computer to reflect on the places of the geometric dots being searched. To do this, we use the Maple 13 software tool. We give the final result of the program written in Maple 13:



Hence, the center of the circle drawn internally is as long as the geometric role of $O(x;y)$ forms part of the Ellipse.

4.Prove in an analytical way.

$\begin{cases} y=\dfrac{2Rt(2R-t)}{t^2+4R^2-2Rt} \\ x=\dfrac{Rt(2R+t)}{t^2+4R^2-2Rt} \end{cases}$ we find parameter t from the parametric equation. To do this, we will have the corresponding sides of the Equality:

$$\frac{y}{x}=\frac{2Rt(2R-t)}{Rt(2R+t)}=\frac{4R-2t}{2R+t}$$

$$y(2R+t)=x(4R-2t)\Rightarrow 2Ry+yt=4Rx-2xt\Rightarrow (y+2x)t=4Rx-2Ry\Rightarrow t=\frac{2R(2x-y)}{y+2x}$$

we will have. By placing the found parameter t in the expression of y:

$$y=\frac{2R\dfrac{2R(2x-y)}{y+2x}\left(2R-\dfrac{2R(2x-y)}{y+2x}\right)}{\left(\dfrac{2R(2x-y)}{y+2x}\right)^2+4R^2-2R\dfrac{2R(2x-y)}{y+2x}}==\frac{4R^2(2x-y)(2Ry+4Rx-4Rx+2Ry)}{4R^2(2x-y)^2+4R^2(y+2x)^2-4R^2(2x-y)(2x+y)}=$$

$$=\frac{4Ry(2x-y)}{(2x-y)^2+(y+2x)^2-(2x-y)(2x+y)}=\frac{4Ry(2x-y)}{4x^2+3y^2}$$

After the simplifications, we come to the following equation:

$$4x^2+3y^2-8Rx+4Ry=0\Rightarrow 4\left(x^2-2Rx\right)+3\left(y^2+\frac{4}{3}Ry\right)=0\Rightarrow$$

$$4(x-R)^2+3\left(y+\frac{2}{3}R\right)^2=\frac{16}{3}R^2\Rightarrow\frac{(x-R)^2}{\frac{4}{3}R^2}+\frac{\left(y+\frac{2}{3}R\right)^2}{\frac{16}{9}R^2}=1$$

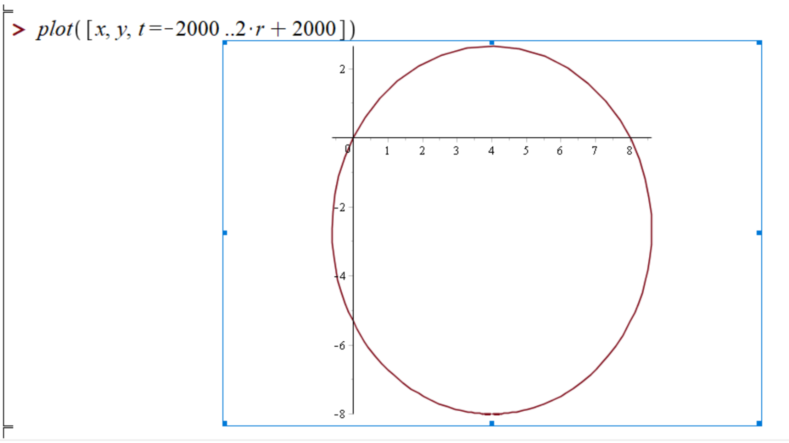
If we enter the designation $\frac{4}{3}R^2 = a^2$ and $\frac{16}{9}R^2 = b^2$ in the resulting equation

$$\frac{(x-R)^2}{a^2} + \frac{\left(y+\frac{2}{3}R\right)^2}{b^2} = 1 \qquad (4)$$

in appearance, we form the Ellipse equation.

Hence, the center of the circle drawn internally is as long as the geometric role of $O(x;y)$ forms part of the Ellipse.

The full view of the Ellipse will be as follows:



The peculiarity of such issues is that they do not have a clear solution method, that is, a problematic issue, since the reader himself - with his knowledge and abilities-can go deeper into the study of the question. The reader's solution makes it possible to assess the level and character of his scientific thinking, which is especially important when choosing the future scientific field of the student. The independent solution of this type of issue forms scientific thinking in the student and develops in him an interest in scientific problems.

5. Conclusion

In conclusion, the most important place in mathematical abilities is the ability to organize evidence and conduct careful conscious work to verify it, logically building a chain of actions that will lead to the solution of the issue. Geometry the difference between the work of a student solving problems and creative work is the difference in the level of mathematical creativity.

When solving a scientific issue, a scientist must always clearly represent in his imagination the magnitude and relative importance of physical parameters that serve to describe the phenomenon under study. This is necessary in order to select the links that are decisive in solving the issue. Therefore, it is necessary to teach young scientists to accurately express the exact quantitative values of signs in formulas that determine quantities. For physics, unlike mathematics, the parameters and variables in a mathematical equation must be exact quantities.

REFERENCES

1. L. M. Fridman Ye. N. Tureskiy. “Kak nauchitsya reshat zadachi”, Moskva «Prosveshenie», 1989.
2. O. Karimiy. Planimetriyadan hisoblashga va isbotlashga doir tanlangan masalalar. “O’qituvchi”. Toshkent-1955 y.

3. D. Xusanov, N. B. Shamsiddinov “Yoshlarning mustaqil ijodiy fikrlash faoliyatini rivojlantirishda geometric masalalarning o'rni”. “Halq ta’limimi” ilmiy-metodik jurnal.2020 yil. 5-son.
4. D. Xusanov, N. B. Shamsiddinov “Geometrik masalani turli yechish usullari yordamida o'quvchilarning ijodiy fikrlash faoliyatini rivojlantirish”. “Halq ta’limi” ilmiy-metodik jurnal.
5. 2022 yil. 3-son.
6. J. Adamar Issledovanie psixologii prosessa izobreteniya v oblasti matematiki. M., 1970.
7. V. Tixomirov - Andrey Nikolaevich Kolmogorov//Kvant.-1993.- № 3/4.-S 3-10.
8. N. V. Agapova Perspektivi razvitiya novix texnologiy obucheniya. – M.: TK Velbi, 2005. – 247 s.
9. Mario Lucentini Technological Concepts and Mathematical Models in the Evolution of Modern Engineering Systems. Germany, 2012.
10. J.Husanov, N. Shamsiddinov, B. Quvonov, Geometriya fanidan uslubiy ishlanmalar tayyorlashda axborot kommunikatsiya texnologiyalaridan foydalanish samaradorligi, Xalq ta’limi ilmiy-metodik jurnal. 2021 yil 6- son. 33-36 bet.