GEOMETRIK MASALALARNI YECHISHDA ASOSIY TUSHUNCHALARNI BIRGALIKDA QO'LLASH

Soatov Ulugbek Abdukadirovich
Jizzax politexnika instituti dotsenti, f-m.f.n.
ulugbeksoatov595@gmail.com, tel: (94) 573 17 68

Djanizoqov Ulug’bek Abdug’oniyevich
Jizzax politexnika instituti katta o’qituvchisi
udjonuzoqov@gmail.com, tel: (93) 293 59 70.

Annotasiya: Ushbu maqolada ba’zi geometrik masalalarni yechishda turli teorema va ta’riflarni birgalikda qo’llashga doir masalalar o’rganilgan bo’lib, ularni o’rganish va yechish orqali maktab bitiruvchilarida geometrik masalalarni mustaqil yechish ko’nikmalarini shakllantirish hamda qaralayotgan masalalarni yechish jarayonida qo’llaniladigan turli usullar bilan tanishtirish maqsad qilingan.

Tayanch so’zlar: teorema, formula, bissektrisa, mediana, balandlik, dioganal, urunma, perpendikulyar, burchak, qavariq.

JOINT APPLICATION OF BASIC CONCEPTS IN SOLVING GEOMETRIC PROBLEMS

Soatov Ulugbek Abdukadirovich
Jizzakh Polytechnic Institute, Associate Professor, Ph.D.
Soatov1966@mail.ru, tel: (94) 573 17 68
Dzhonizakov Ulugbek Abduganievich
Jizzakh Polytechnic Institute, senior lecturer
udjonuzoqov @ gmail.com, tel: (93) 293 59 70.

Annotation: this article examines the issues related to the joint application of various theorems and definitions in solving some geometric problems, and aims to develop the skills of independent solution of geometric problems in graduates of Secondary School by studying and solving them, as well as familiarize themselves with the various methods used in the process of solving the problems facing.

Keywords: theorem, formula, bisector, median, height, dioganal, urunma, perpendicular, angle, convex.

СОВМЕСТНОЕ ПРИМЕНЕНИЕ ОСНОВНЫХ ПОНЯТИЙ ПРИ РЕШЕНИИ ГЕОМЕТРИЧЕСКИХ ЗАДАЧ

Соатов Улугбек Абдукадирович
Джизакский политехнический институт, доцент, к.ф-м.н.
Soatov1966@mail.ru, тел: (94) 573 17 68

Джонизаков Улугбек Абдуганиевич
Джизакский политехнический институт,ст. преподаватель
udjonuzoqov @ gmail.com, тел: (93) 293 59 70.

Аннотация: В данной статье рассматриваются вопросы совместного применения различных теорем и определений при решении некоторых геометрических задач, целью изучения и решения которых является формирование у выпускников общеобразовательных школ навыков самостоятельного решения геометрических задач, а также ознакомление с различными методами, применяемыми в процессе решения рассматриваемых задач.

Ключевые слова: теорема, формула, биссектриса, медиана, высота, диагональ, произведение, перпендикуляр, угол, выпуклость.

Solving some geometric problems of varying difficulty requires the joint application of the basic theorems and formulas of geometry (planimetry). Engaging in the study and solution of this type of issue helps teachers, students and students to strengthen their knowledge, skills and abilities [1-19]. Below we will study several geometric issues of this type.

Issue 1. In triangle ABC, the medians m_a, m_b, and m_c are given. Find its sides *a, b* and *c*.

Solution: to calculate the dimension *a*, we continue the section AA_1 to the distance A $A_1F = \frac{1}{3}m_a$ and connect point F with points B and C.

Let O be the point where the medians of ΔABC intersect. OBCF is a rectangle-parallelogram (fig. 1). According to the property of parallelogram diagonals

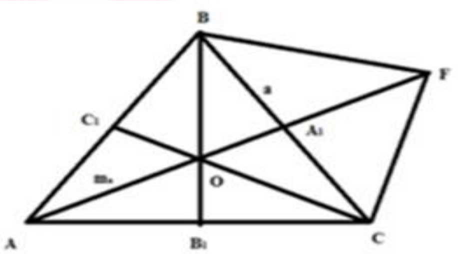

fig. 1

$$a^2 + (\frac{2}{3}m_a)^2 = 2(\frac{2}{3}m_b)^2 + 2(\frac{2}{3}m_c)^2.$$

From this $a = \frac{2}{3}\sqrt{2m_b{}^2 + 2m_c{}^2 - m_a^2}$

we find . Similar sides *b* and *c* are found.

Issue 2. The bases of the trapezium are 4 m and 16 m. If it is known that there are circles drawn inside and outside the trapezoid, find their radii (figure 2).

Solution: If a trapezoid is equilateral, it can be drawn as an outer circle:

In the trapezoid AB = CD and ABCD, if the condition AB+CD = BC + AD is fulfilled, it is possible to draw an inner circle.

Since BC = 4 m, AD = 16 m

AB = CD = 10 , AE = FD = $\frac{16-4}{2}$ = 6 m.

BE =$\sqrt{AB^2 - AE^2}$ = $\sqrt{100-36}$ = 8 m.

BD = $\sqrt{BE^2 + DE^2}$ = $\sqrt{64+100}$ =2$\sqrt{41}$ m. Also, since 2*r* = BE = 8 m, the radius of the inscribed circle is *r* = 4 m.

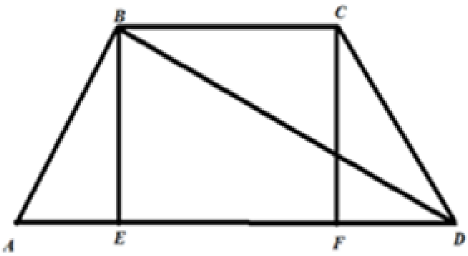

fig. 2

We find the face of Δ*ABD*: S = $\frac{1}{2}$ AD ·BE = $\frac{1}{2}$ 16· 8 = $64\,m^2$. We use the formula $R=\frac{abc}{4S}$ for the radius of the outer circle. For the ΔABD $R=\frac{16\cdot10\cdot2\cdot\sqrt{41}}{4\cdot64}=\frac{5}{4}\sqrt{41}$

The radius of the circle inscribed in Δ*ABD* is also the radius of the circle inscribed in the trapezoid.

Issue 3. $\left|MA^2-MB^2\right|=k\cdot S_{\Delta MAB}$ Prove that the set of all M points for which the equality holds consists of two straight lines (where A and B are given points, *k*>0 - constant , $S_{\Delta MAB}$– ΔMAB triangular face).

Solving. We use the method of coordinates. Let AB = a. We choose a coordinate system. (figure 3). Then *A(0;0), B(a;0), M(x;y).* that is why

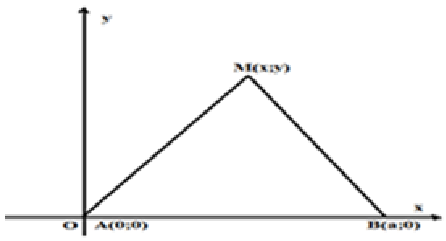

fig. 3

$MA^2=x^2+y^2$, $MB^2=(x-a)^2+y^2$ in that case

$MA^2-MB^2=x^2+y^2-(x-a)^2-y^2=2ax-a^2$

$\left|MA^2-MB^2\right|=\left|2ax-a^2\right|=a\left|2x-a\right|$

The height of the triangle MAB is modularly equal to the ordinate of the M-point, and the base of the triangle is equal to α. that is why $S_{\Delta MAB}=\frac{1}{2}a\left|y\right|$.

According to the condition $a\left|2x-a\right|<\frac{k}{2}a\left|y\right|$ or $\left|2x-a\right|=\frac{k}{2}\left|y\right|$ from this

$2x-a=\frac{k}{2}y$, $2x-a=-\frac{k}{2}y$ or $y=\frac{2}{k}(2x-a)$ and $y=-\frac{2}{k}(2x-a)$

yoki y = $\frac{2}{k}$(2*x* – a) va y= - $\frac{2}{k}$(2*x* – a) are the equations of the sought straight line.

Issue 4. The medians of a triangle are 9 cm, 12 cm, and 15 cm. Find his face.

Solution: Let the medians of triangle ABC be AA_1, BB_1, CC_1 (fig. 4). In this case, we will have six equilateral triangles: $S_{\Delta AOB_1} = S_{\Delta B_1DC}$,

$$S_{\Delta AOB_1} = \frac{1}{2}\ AO \cdot B_1O \cdot sin\alpha = \frac{1}{2}\cdot\frac{2}{3}\cdot AA_1 \cdot \frac{1}{3}BB_1 \cdot sin\alpha$$

$$S_{\Delta BOA_1} = \frac{1}{2}\ BO \cdot A_1O \cdot sin\alpha = \frac{1}{2}\cdot\frac{2}{3}\cdot BB_1 \cdot \frac{1}{3}AA_1 \cdot sin\alpha$$

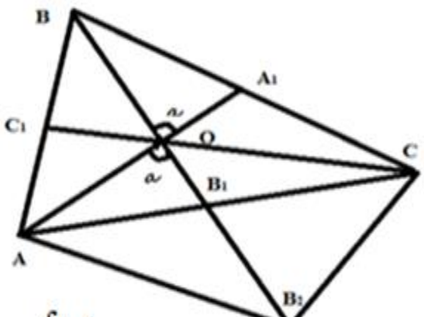

fig. 4

As a result $S_{\Delta BOA_1} = S_{\Delta BDA_1}$, etc. During the median BB_1, we put the section B_1B_2 equal to OB_1 and connect the point B_2 with the ends A and C. The diagonals of the rectangle $AOCB_2$ are divided into two equal parts at the point B_1: $AB_1=B_1C$, by condition

$OB_1= B_1B_2$. So, $AOCB_2$ is a parallelogram. That is why , $B_2C = AO = \frac{2}{3}AA_1$.

Also, each side of triangle $OB_2 = \frac{2}{3}BB_1$, $CO = \frac{2}{3}CC_1$ and ΔCOB_2 is equal to $\frac{2}{3}$ of the corresponding median of triangle ΔABC. The face of ΔCOB_2 can be found using Heron's formula, then $S_{\Delta ABC} = 3 \cdot S_{\Delta COB_2}$.

According to the condition of the problem, the sides of ΔCOB_2 are 6 cm, 8 cm, and 10 cm. In this case, the equality $6^2 + 8^2 = 10^2$ is valid, so according to the inverse theorem of the Pythagorean theorem, ΔCOB_2- is a right-angled triangle whose legs are 6 cm and 8 cm. that is why

$$S_{\Delta COB_2} = \frac{1}{2}\cdot 6 \cdot 8 = 24\ (sm^2) \text{ and } S_{\Delta ABC} = 3 \cdot 24 = 72\ (sm^2)$$

Issue 5. Prove that the face of any convex quadrilateral is equal to half the product of its diagonals and the sine of the angle between them.

Solution: diagonals AC and BD of ABCD divide it into four triangles. (fig.5).

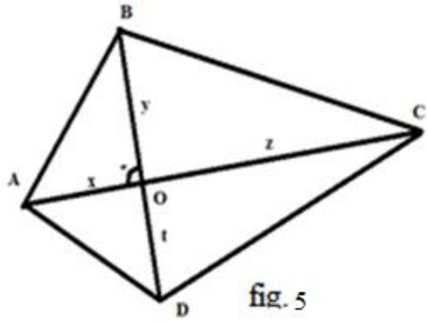

fig. 5

Suppose $AC = c$, $BD = d$, and

If we enter $AO = x$, $BO = y$, $CO = z$, $DO = t$, then $x + z = c$, $y + t = d$. For the faces of the triangles ΔAOB, ΔBOC, ΔCOD and ΔDOA, we have:

$$S_{\Delta AOB} = \frac{1}{2}xy\ sin\alpha ,$$

$$S_{\Delta BOC} = \frac{1}{2}zy\ sin(180^0 - \alpha) = \frac{1}{2}y \cdot z\, sin\alpha ,\ S_{\Delta COD} = \frac{1}{2}z\,t \cdot sin\alpha ,$$

$$S_{\Delta DOA}=\frac{1}{2}xt\ sin(180^0-\alpha)=\frac{1}{2}tx\sin\alpha\ .$$

As a result

$$S_{\Delta ABCD}=S_{\Delta AOB}+S_{\Delta BOC}+S_{\Delta COD}+S_{\Delta DOA}=\frac{1}{2}sin\alpha\left(y\left(x+z\right)+t\left(z+x\right)\right)=\frac{1}{2}\left(x+z\right)\left(y+z\right)sin\alpha$$

or $S_{\Delta ABCD}=\frac{1}{2}cd\ sin\alpha$.

In particular, the face of a trapezoid is equal to the product of its diagonals and the sine of the angle between them, and since it is the angle between the diagonals of a rhombus, the face of a rhombus is equal to half the product of its diagonals.

In conclusion, we can say that it is not difficult to understand that the study of geometric problems with a high degree of complexity, including the solution of the geometric problems presented in this article, lies in the expansion of the basic methods and substitution formulas. In this process, it is important to correctly imagine the shape of the geometric figure (shape) given in the problem and reflect it in the drawing and to be able to use its properties correctly, and by strengthening the acquired knowledge, one or the other the ability to solve problems develops. There are also many complex problems related to other topics of geometry[1-19], regularly continuing to solve them for a certain period of time helps to develop mathematical ability.

References.

1. Sh.A.Alimov, Yu.M.Kolyagin va boshqalar. Algebra va analiz asoslari. O‘rta maktab-ning 10- 11- sinf uchun darslik. -T.: O‘qituvchi, 2001.
2. В.С.Крамор. «Павторяем и систематизируем школьный курс алгебры и начал анализа», Москва, «Просвещение», 1990
3. И.Ф.Шарыгин, В.И. Голубев. Факультативный курс по математике решение задач. Москва, «Просвещение». 1991 .
4. Soatov, U. A. (2018). Djonuzoqov. UA" Problems of geometry with the help of joint application of basic theorems and formulas". *Scientific-methodical journal of" Physics, Mathematics and Informatics"*, (4), 40.
5. Soatov Ulugbek Abdukadirovich, & Dzhonuzokov Ulugbek Abduganievich (2020). ABOUT THE ISSUES OF GEOMETRICAL INEQUALITIES AND THE METHODS OF THEIR SOLUTION. European science, (7 (56)), 5-10.
6. Abdukadirovich, S. U., & Abduganievich, D. U. (2021, June). ON SOME PROBLEMS OF EXTREME PROPERTIES OF THE FUNCTION AND THE APPLICATION OF THE DERIVATIVE AND METHODS FOR THEIR SOLUTION. In *Archive of Conferences* (pp. 113-117).

7. Abdug'aniyevich, D. U. B. (2022). PARAMETRLI LOGARIFMIK TENGLAMALARNI YECHISH USULLARIGA OID BA'ZI MASALALAR. *PEDAGOGS jurnali*, *5*(1), 8-16.

8. Соатов, У. А. Сложные события и расчет их вероятностей / У. А. Соатов, У. А. Джанизоков // Экономика и социум. – 2022. – № 1-2(92). – С. 222-227.

9. Abdukadirovich, S. U., & Abduganievich, D. U. (2022). ABOUT THE METHODS OF SOLVING PARAMETRIC EQUATIONS. *Journal of Academic Research and Trends in Educational Sciences*, *1*(5), 1-7.

10. Soatov U.A. U.A. Djonuzaqov."Irratsional tenglama va tengsizliklarni yechish metodlarining tatbiqlari haqida".Scientific-methodical journal of" Physics, Mathematics and Informatics". 2019. № 4. 8-16.

11. Soatov U.A. U.A. Djonuzaqov."Tenglamalar sistemalarini tuzish va ularni yechishga oid ba'zi masalalar haqida".Scientific-methodical journal of" Physics, Mathematics and Informatics". 2019.
№ 1.13-20.

12. Гадаев, Р. Р. О семействе обобщенных моделей Фридрихса / Р. Р. Гадаев, У. А. Джонизоков // Молодой ученый. – 2016. – № 13(117). – С. 5-7.

13. Гадаев, Р. Р., Джонизоков, У. А., & Ахадова, К. С. К. (2020). ОПРЕДЕЛИТЕЛЬ ФРЕДГОЛЬМА ДВУМЕРНОЙ ОБОБЩЕННОЙ МОДЕЛИ ФРИДРИХСА. *Наука и образование сегодня*, (12 (59)).

14. Бердиеров, А. Ш. Построение периодических решений с помощью метода Простьх итераций / А. Ш. Бердиеров, У. А. Джанизоков, У. У. Арслонов // Экономика и социум. – 2021. – № 12-1(91). – С. 858-864.

15. Soatov, U. A. (2022). Logarfmik funksiya qatnashgan murakkab tenglamalarni yechish usullari haqida. *Science and Education*, *3*(9), 16-22.

16. Soatov, U. A. (2022). Tenglamalarni yechishning grafik usuli haqida. *Science and Education*, *3*(8), 7-12

17. Rahimov, B. S., Ne'matov, A. R., & Fayzullayev, S. E. (2022, February). LAGRANJ FUNKSIYASIDAN FOYDALANIB BA'ZI MASALALARNI YECHISH HAQIDA. In *Archive of Conferences* (pp. 41-43).

18. Ne'Matov, A. R., & Raximov, B. S. (2022). Aniq integralni me'morchilikda qo'llash. Aniq integralning tadbiqlariga doir misollar yechish. *Science and Education*, *3*(2), 16-21.

19. Abdukadirovich, S. U., & Abdug'oniyevich, D. U. B. (2022, November). ABOUT THE METHODS OF SOLVING GEOMETRIC PROBLEMS AT THE SCHOOL LEVEL. In *E Conference Zone* (pp. 49-56).