UCHBURCHAK VA TO‘RTBURCHAK KOMBINATSIYASI.

Madrimov Madraxim Baxtiyor o‘g‘li
madraximxon31@gmail.com
Urganch davlat universiteti fizika-matematika fakulteti 4-kurs talabasi

Annotatsiya: *ushbu maqola matematikadan olimpiada misollariga oid bo‘lganmisolni yechishga qaratilgan. Bunda uchburchakni to‘rtburchak bilan bog‘laganholda va kordinatalar sistemasi xossalaridan hamda uchburchak yuzini hisoblashformulalaridan foydalanib tahlil qilingan.*

Madrimov Madraxim Baxtiyor o‘g‘li
madraximxon31@gmail.com
4th year student of the Faculty of physics and mathematics of Urgench State University

Annotation: this article is aimed at solving an example from mathematics to the examples of the Olympiad. Here was analyzed by connecting the triangle with a rectangle and using the properties of the kordinata system as well as the formula for calculating the face of the Triangle.

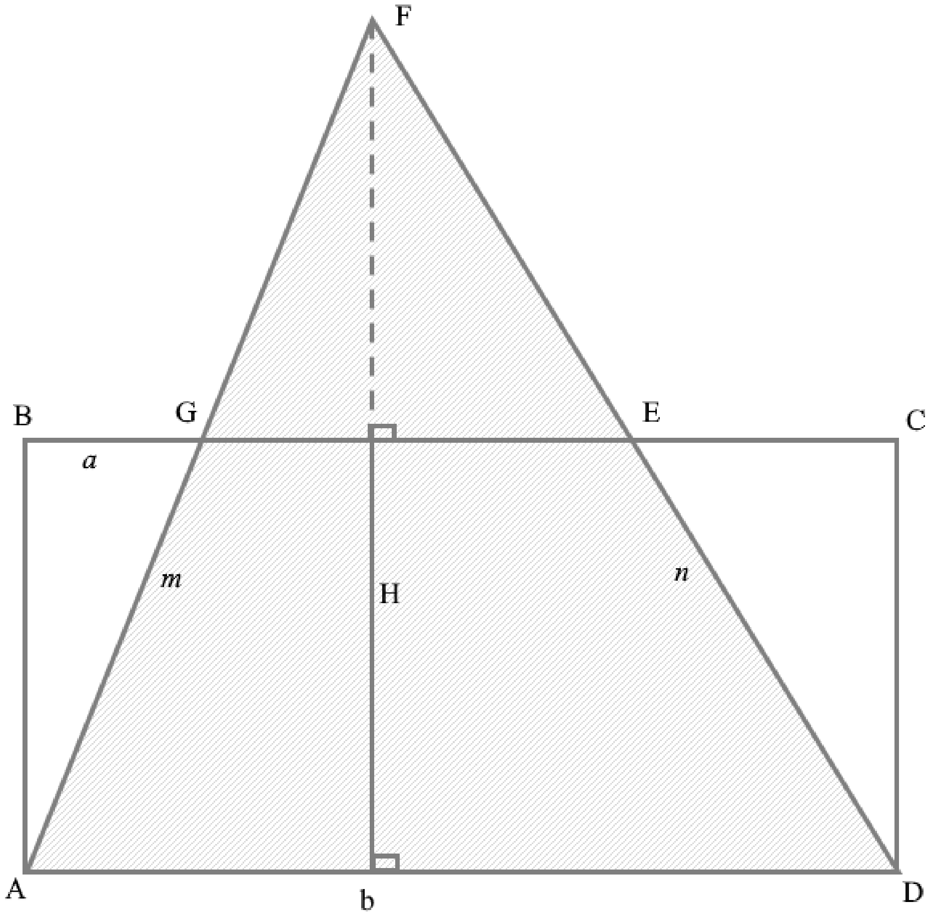
Tayanch so‘zlar: kordinatalar sistemasi, to‘g‘ri chiziq tenglamasi, chiziqli funksiya xossalari, uchburchak yuzi.

Key words: coordinates system, straight line equation, linear function properties, the face of a traingle.

Ключевые слова: система кординат, уравнение прямой, свойства линейной функции, треугольная грань.

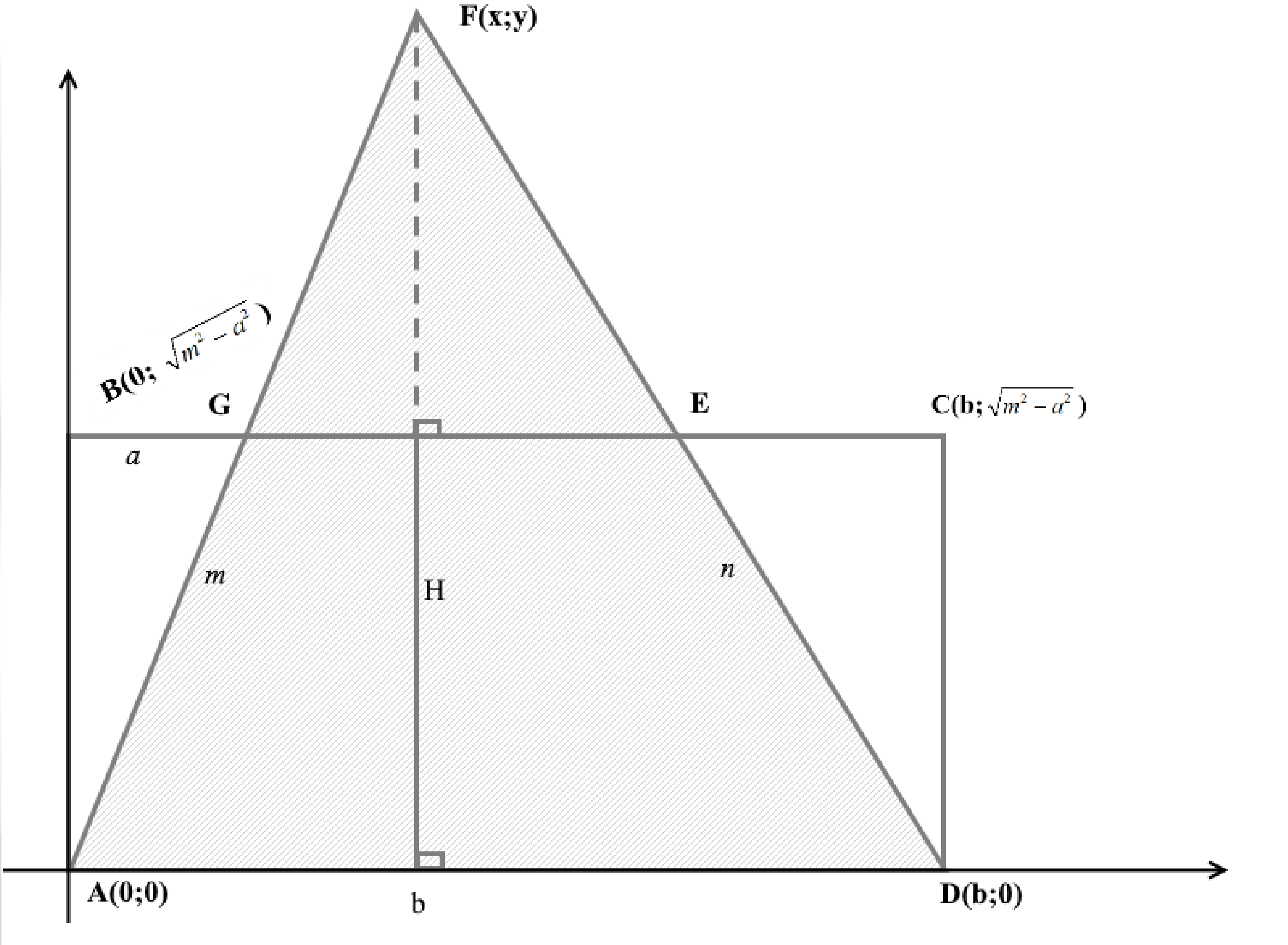
ABCD to‘g‘ri to‘trburchakning *A* va *D* uchlaridan *BC* tomonga shunday kesma o‘tirilganki, ular mos ravishda *BC* tomonni *G* va *E* nuqtalarda kesib o‘tib *F* nuqtada kesishadi. Agar $AG=m$, $DE=n$, $BG=a$ va $AD=b$ bo‘lsa, ΔADF ning yuzini toping.

Yechish: Berilgan ma’lumotlardan foydalanib, quyidagi shaklni chizamiz:



Bu misolni yechishda biz *F* nuqtadan *AD* tomonga balandlik tushiramiz va shu balandlikni berilgan ma'lumotlardan foydalanib topsak, bizdan so'ralayotgan S_{ADF}-uchburchakning yuzini hisoblashimiz mumkin. Pifogor teoremasiga ko'ra, $AB=\sqrt{m^2-a^2}$ va $AB=CD$ ekanidan $CE=\sqrt{n^2-(CD)^2}=\sqrt{n^2-\left(\sqrt{m^2-a^2}\right)^2}=\sqrt{n^2-m^2+a^2}$ hamda $BE=b-CE=\ b-\sqrt{n^2-m^2+a^2}$ bo'ladi.

ADF-uchburchakning *AD* tomoniga tushirilgan balandlikni osongina hisoblash uchun biz kordinatalar sistemasidan foydalanamiz. Bunda to'g'ri to'rtburchakning *A* uchini kordinata boshiga *(O(0;0))* joylashtiramiz va uchburchakning *AF* va *DF* tomonlari uchun to'g'ri chiziq tenglamasini tuzamiz. Ular *F(x,y)* nuqtada kesishishi ma'lum va *F(x,y)* nuqataning ordinatasini topsak, ΔADF ning *AD* tomoniga tushirilgan balandligi qiymatiga teng bo'ladi. Ma'lumki to'g'ri chiziq tenglamasini tuzish uchun bu to'g'ri chiziqqa tegishli 2 nuqtaning berilishi kifoya. Shuday qilib, *AF* tomon uchun to'g'ri chiziq tenglamasini tuzishda *A(0;0)* va $G(a,\sqrt{m^2-a^2})$ hamda *DF* tomon uchun *D(b;0)* va $E(b-\sqrt{n^2-m^2+a^2};\sqrt{m^2-a^2})$ nuqtalardan foydalanamiz.



$y=kx+b$ to‘g‘ri chiziq tenglamasidan foydalanamiz. *AF* tomon uchun to‘g‘ri chiziq tenglamasi y_1, *DF* tomon uchun y_2 deb olaylik.

y_1 va y_2 to‘g‘ri chiziqlar *F* nuqtada kesishadi. y_1 to‘g‘ri chiziq uchun *A(0;0)* va $G(a,\sqrt{m^2-a^2})$, y_2 to‘g‘ri chiziq uchun esa *D(b;0)* va $E(b-\sqrt{n^2-m^2+a^2};\sqrt{m^2-a^2})$ nuqtalardan foydalanib tenglamasini tuzamiz.

$$\begin{cases} y_1 = k_1x + b_1 \\ y_2 = k_2x + b_2 \end{cases}$$

$$0 = 0\cdot k_1 + b_1 \qquad \sqrt{m^2-a^2} = a\cdot k_1 + 0$$

$$\boxed{0 = b_1} \qquad \boxed{k_1 = \frac{\sqrt{m^2-a^2}}{a}}$$

$y_1 = \dfrac{\sqrt{m^2-a^2}}{a}x$ ekan

$$\begin{cases} 0 = k_2\cdot b + b_2 \\ \sqrt{m^2-a^2} = \left(b-\sqrt{n^2-m^2+a^2}\right)\cdot k_2 + b_2 \end{cases}$$

Sistemaga ayirish amalini qo‘llab,

$$\sqrt{m^2-a^2} = -\sqrt{n^2-m^2+a^2}\cdot k_2$$

$k_2 = \frac{-\sqrt{m^2-a^2}}{\sqrt{n^2-m^2+a^2}}$ ni topamiz va sistemaning 1-tenglamasidan b_2 - ni topamiz.

$$b_2 = -b\cdot k_2 = -b\cdot\left(-\frac{\sqrt{m^2-a^2}}{\sqrt{n^2-m^2+a^2}}\right) = \frac{b\sqrt{m^2-a^2}}{\sqrt{n^2-m^2+a^2}}$$

Demak,

$$\boxed{y_1 = \frac{\sqrt{m^2-a^2}}{a}x + \frac{b\sqrt{m^2-a^2}}{\sqrt{n^2-m^2+a^2}}}$$

bo‘ladi.

Endi ikki to‘g‘ri chiziq kesishishi uchun $y_1=y_2$ shartidan foydalanamiz.

$$\frac{\sqrt{m^2-a^2}}{a}x = -\frac{\sqrt{m^2-a^2}}{\sqrt{n^2-m^2+a^2}}x + \frac{b\sqrt{m^2-a^2}}{\sqrt{n^2-m^2+a^2}}$$

$$\cancel{\sqrt{m^2-a^2}}\cdot x\left(\frac{1}{a}+\frac{1}{\sqrt{n^2-m^2+a^2}}\right) = \frac{b\,\cancel{\sqrt{m^2-a^2}}}{\sqrt{n^2-m^2+a^2}}$$

$$x\cdot\frac{\left(\sqrt{n^2-m^2+a^2}+a\right)}{\sqrt{n^2-m^2+a^2}} = \frac{b}{\sqrt{n^2-m^2+a^2}}$$

$$\boxed{x = \frac{a\cdot b}{\sqrt{n^2-m^2+a^2}+a}}$$

$$y = \frac{\sqrt{m^2-a^2}}{a}x = \frac{\sqrt{m^2-a^2}}{a}\cdot\frac{a\cdot b}{\sqrt{n^2-m^2+a^2}+a} = \frac{b\cdot\sqrt{m^2-a^2}}{\sqrt{n^2-m^2+a^2}+a}.$$

F nuqtaning kordinatalari:

$$F\left(\frac{a\cdot b}{\sqrt{n^2-m^2+a^2}+a};\frac{b\cdot\sqrt{m^2-a^2}}{\sqrt{n^2-m^2+a^2}+a}\right)$$

Bundan esa F nuqtaning ordinatasi *ADE* uchburchak balandligi qiymatiga tengligidan foydalanib, S_{ADF} - ni topamiz:

$$S_{ADF} = \frac{1}{2}\cdot AD\cdot H = \frac{1}{2}\cdot b\cdot\frac{b\cdot\sqrt{m^2-a^2}}{\sqrt{n^2-m^2+a^2}+a} = \frac{b^2\cdot\sqrt{m^2-a^2}}{2\sqrt{n^2-m^2+a^2}+a}.$$

Javob: $S_{ADF} = \frac{b^2\cdot\sqrt{m^2-a^2}}{2\sqrt{n^2-m^2+a^2}+a}$.

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