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UCHBURCHAK YUZINI BALANDLIKLARI ORQALI HISOBLASHNING GERONCHA ISBOTI

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ANNOTATSIYA

Ushbu maqolada umumiy o'rta ta'lim maktablari, akademik litsey va professional ta'lim geometriya kursida uchraydigan uchburchak yuzini uning balandliklari orqali hisoblash formulalari keltirilgan.

Kalit so'zlar: *Balandlik, Geron formulasi, uchburchak yuzi, gipotenuza.*

АННОТАЦИЯ

В данной статье приведены формулы вычисления поверхности треугольника по его высоте, распространенные в общеобразовательных школах, академических лицеях и курсах геометрии профессионального образования.

Ключевые слова: *Высота, формула Герона, треугольное лицо, гипотенуза.*

ABSTRACT

This article contains formulas for calculating the face of a triangle by its height, which is common in general secondary schools, academic lyceums and vocational education geometry courses.

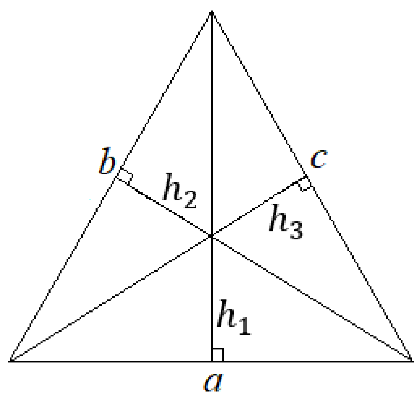
Keywords: *Height, Hierron's formula, triangular face, hypotenuse.*

KIRISH

Umumiy o'rta ta'lim maktablari, akademik litsey va *professional ta'lim geometriya* kursi uchburchak yuzini hisoblashining tomonlari orqali (Geron formulasi), tomoni va unga tushirilgan balandligi orqali, ikki tomoni va ular orasida burchagi orqali hisoblashlar berilgan, yuqoridagilardan foydalanib uchburchak yuzini balandliklari orqali hisoblash o'quvchiga murakkablik tug'diradi. Biz ushbu maqolada uchburchak yuzini balandliklari orqali hisoblashni ko'rib chiqamiz.

1-masala. Berilgan ABC uchburchakning 3 ta balandliklari berilgan holda uning yuzini hisoblang.

a tomonga tushirilgan balandlikni h_1, b tomonga tushirilgan balandlikni h_2 va c tomonga tushirilgan balandlikni h_3 orqali belgilab olamiz (1-rasm)



1-rasm.

Uchburchak yuzi asosi va balandligi ko‘paytmasining yarmiga tengligiga asosan [1].

$$\begin{cases} S=\frac{1}{2}ah_1 \\ S=\frac{1}{2}bh_2 \\ S=\frac{1}{2}ch_3 \end{cases} \text{ ushbu sistemadan } a,b,c \text{ larni aniqlaymiz. } \left.\begin{aligned} a&=\frac{2S}{h_1} \\ b&=\frac{2S}{h_2} \\ c&=\frac{2S}{h_3} \end{aligned}\right\} \quad (1)$$

(1) sistemadagi a,b,c lar orqali uchburchak yuzini Geron formulasi [2] orqali hisoblasak quydagini olamiz;

$$S=\sqrt{\left(\frac{S}{h_1}+\frac{S}{h_2}+\frac{S}{h_3}\right)\cdot\left(-\frac{S}{h_1}+\frac{S}{h_2}+\frac{S}{h_3}\right)\cdot\left(\frac{S}{h_1}-\frac{S}{h_2}+\frac{S}{h_3}\right)\cdot\left(\frac{S}{h_1}+\frac{S}{h_2}-\frac{S}{h_3}\right)}$$

bundan

$$S=S^2\sqrt{\left(\frac{1}{h_1}+\frac{1}{h_2}+\frac{1}{h_3}\right)\cdot\left(-\frac{1}{h_1}+\frac{1}{h_2}+\frac{1}{h_3}\right)\cdot\left(\frac{1}{h_1}-\frac{1}{h_2}+\frac{1}{h_3}\right)\cdot\left(\frac{1}{h_1}+\frac{1}{h_2}-\frac{1}{h_3}\right)}$$

Ushbu tenglikdan S ni aniqlasak

$$S=\frac{1}{\sqrt{\left(\frac{1}{h_1}+\frac{1}{h_2}+\frac{1}{h_3}\right)\cdot\left(-\frac{1}{h_1}+\frac{1}{h_2}+\frac{1}{h_3}\right)\cdot\left(\frac{1}{h_1}-\frac{1}{h_2}+\frac{1}{h_3}\right)\cdot\left(\frac{1}{h_1}+\frac{1}{h_2}-\frac{1}{h_3}\right)}}$$

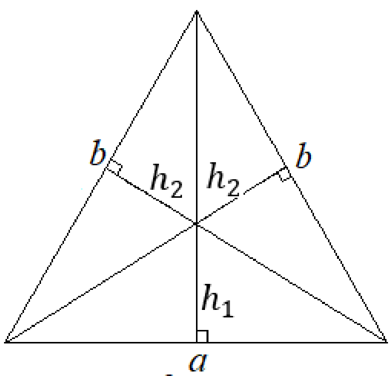
natijani olamiz. Bu formula uchburchakning uchta balandligi orqali uning yuzini topish formulasidir.

Biz $h_1h_2=H_1, h_1h_3=H_2, h_2h_3=H_3$ belgilashlar kiritsak uchburchak yuzi uchun quyidagiga ega bo‘lamiz;

$$S=\frac{H_1H_2H_3}{4\sqrt{H(H-H_1)(H-H_2)(H-H_3)}} \qquad (2)$$

bu yerda $H=\frac{H_1+H_2+H_3}{2}$.

Xususiy hollar: Agar balandliklarning qaysidir ikkitasi teng bo‘lsa, u holda uchburchak teng yonli bo‘ladi[*]. Endi (2) tenglikni teng yonli uchburchakda uchun tatbiq qilamiz. Bizga ma’lumki teng yonli uchburchakning yon tomonlariga tushirilgan balandliklari teng[3](2-rasm). Yuqoridagi



2-rasm.

belgilashlarni kiritamiz.

$$h_1h_2 = H_1, h_1h_2 = H_2 = H_1, h_2h_2 = H_3$$

va $H = \frac{2H_1 + H_3}{2}$ ekanligini aniqlaymiz. Bajarilgan almashtirishlarni (2) ga qo‘yib soddalashtirsak quydagi tenglikka ega bo‘lamiz.

$$S = \frac{H_1^2}{\sqrt{4H_1^2 - H_3^2}} \text{ yoki } S = \frac{h_1^2h_2}{\sqrt{4h_1^2 - h_2^2}} \quad (3)$$

(3) tenglik teng yonli uchburchakning yuzini balandliklari orqali hisoblash formulasidir.

2-masala. Uchburchakning balandliklari 6, 6 va 15 ga teng bo‘lsa, ushbu uchburchakning yuzini toping.

Berilganlarga asosan $h_1 = 15,\ h_2 = h_3 = 6$

(3) formuladan foydalanib hisoblaymiz.

$$S = \frac{h_1^2h_2}{\sqrt{4h_1^2 - h_2^2}} = \frac{15^2 \cdot 6}{\sqrt{4 \cdot 15^2 - 6^2}} = \frac{225}{2\sqrt{6}}$$

Agar berilgan uchburchakning h_1, h_2, h_3 balandliklari orasida $h_3 = \frac{h_1h_2}{\sqrt{h_1^2 + h_2^2}}$ (bu yerda $h_3 -$eng kichik balandlik) shart bajarilsa, u holda berilgan uchburchak to‘g‘ri burchakli uchburchak bo‘ladi[*]. Endi to‘g‘ri burchakli uchburchakda qaraylik. Geometriya kursidan ma’lumki to‘g‘ri burchakli uchuburchakning o‘tkir burchaklari uchidan tushirilgan balandliklari katetlari bilan ustma-ust tushadi. Shunga ko‘ra uchburchak yuzini quyidagicha aniqlaymiz.

$$S = \frac{1}{2}h_1h_2 \quad (4)$$

(4) formula to‘g‘ri burchakli uchburchakning yuzini balandliklari orqali hisoblash formulasidir.

4-masala. Balandliklari 9 sm, 12 sm va 7,2 sm bo‘lgan uchburchakning yuzini toping.

$$h_1 = 9,\ h_2 = 12,\ h_3 = 7{,}2$$

Uchburchakning balndliklari orasida $h_3 = \frac{h_1h_2}{\sqrt{h_1^2 + h_2^2}}$ (bu yerda $h_3 -$ eng kichik balandlik) shart bajarilmoqda.

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$$h_3 = \frac{h_1 h_2}{\sqrt{h_1^2 + h_2^2}} = \frac{9 \cdot 12}{\sqrt{9^2 + 12^2}} = \frac{108}{15} = 7,2$$

demak uchburchak to‘g‘ri burchakli. (4) formulaga asosan uchburchak yuzini hisoblaymiz.

$$S = \frac{1}{2} h_1 h_2 = \frac{1}{2} \cdot 9 \cdot 12 = 54 \ \ sm^2$$

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