FAZODA PERPENDIKULYAR TO‘G‘RI CHIZIQLAR VA TEKISLIKLAR MAVZUSINI O’QITISH METODIKASI

Sadulloyeva Dildora Ixtiyor qizi
Buxoro davlat pedagogika instituti 3-bosqich talabasi

Jurayeva Nargiza Oltinboyevna
Buxoro davlat pedagogika instituti Aniq fanlar kafedrasi dotsenti
https://orcid.org/0000-0002-3139-2217

Annotatsiya:
Ushbu maqolada umumiy o’rta ta’lim maktablari 10-sinfida “Fazoda perpendikulyar to‘g‘ri chiziqlar va tekisliklar” mavzusini hozirgi axborot resruslari hamta ta’lim texnologiyalari yordamida o’quvchilarga o’qitish metodikasi haqida asosiy tushunchalar, metodlar hamda vositalardan foydalanish bo’yicha ko’rsatmalar keltirilgan. Mavzu bo’yicha zaruriy tushunchalarni o’quvchiga yetkazish bilan birga mavzuga doir masalalar yechimlari ham keltirib o’tilgan, jumladan olimpiada masalalarini bajarish bo’yicha namunalar yechib ko’rsatilgan.

Kalit so’zlar: chiziq, perpendikulyar chiziq, parallel chiziq, tekislik, metod, masala. yechim.

МЕТОДИКА ПРЕПОДАВАНИЯ ПРЕДМЕТА ПЕРПЕНДИКУЛЯРНЫЕ ПРЯМЫЕ И ПЛОСКОСТИ В ПРОСТРАНСТВЕ

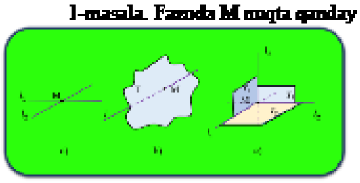
Саъдуллоева Дилдора Ихтиёр кизи
Студентка 3 курса Бухарского государственного педагогического института

Жўраева Наргиза Олтинбоевна
доцент Бухарского государственного педагогического института

Аннотация: В данной статье в 10 классе общеобразовательной школы даны инструкции по теме «Перпендикулярные прямые и плоскости в пространстве». Помимо донесения до студента необходимого понимания темы, также представлены решения вопросов, связанных с темой, в том числе примеры решения олимпиадных задач.

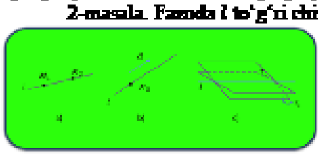
Ключевые слова: линия, перпендикуляр, параллельная линия, плоскость, метод, задача. решение.

1-masala. Fazoda M nuqta qanday hollarda bir qiymatli aniqlanadi?



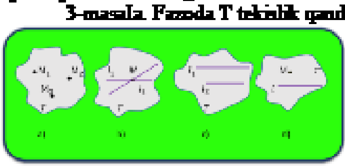
a) Ikki l_1 va l_2 to‘g‘ri chiziqning M nuqtada kesishishi sifatida;
b) l to‘g‘ri chiziq va T tekislikning M nuqtada kesishishi sifatida;
c) T_1, T_2, T_3 uch tekislikning va l_1, l_2, l_3 kesishish chizig‘ining M nuqtada o‘zaro kesishishi sifatida.

2-masala. Fazoda l to‘g‘ri chiziq qanday hollarda bir qiymatli aniqlanadi?



a) M_1 va M_2 nuqtasi bilan;
b) Bitta M_0 nuqtasi va $\vec{a}$ yo‘naltiruvchi vektori bilan;
c) T_1 va T_2 tekisliklarning kesishishi sifatida.

3-masala. Fazoda T tekislik qanday hollarda bir qiymatli aniqlanadi?



a) Bir to‘g‘ri chiziqda yotmagan uchta M_1, M_2, M_3 nuqtasi orqali;
b) M nuqtada kesishuvchi ikki l_1 va l_2 to‘g‘ri chiziq orqali;
c) Ikki l_1 va l_2 parallel to‘g‘ri chiziq orqali;
d) l to‘g‘ri chiziq va unda yotmagan M nuqta orqali.

To'g'ri chiziq va tekislik orasidagi asosiy munosabatlar

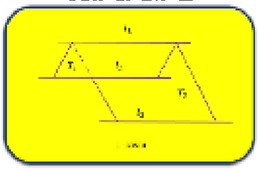
1. Ikki to'g'ri chiziqning parallelligi.

Ta'rif. Bir tekislikda yotib, kesishmaydigan to'g'ri chiziqlar parallel to'g'ri chiziqlar deyiladi.

Uch to'g'ri chiziqning o'zaro parallel bo'lishlik belgisi:

Uchinchi l_3 to'g'ri chiziqqa parallel bo'lgan ikki l_1 va l_2 to'g'ri chiziq o'zaro parallel, ya'ni (1-rasm)

$(l_2 \| l_1, l_3 \| l_1)$



2. To'g'ri chiziq va tekisliklarning parallelligi.

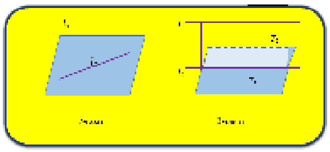
Ta'rif. Agar to'g'ri chiziq va tekislik kesishmasa, ular parallel deb aytiladi.

To'g'ri chiziq va tekislikning parallel bo'lish belgisi:

Agar T tekislikda yotmagan l_1 to'g'ri chiziq shu tekislikdagi birorta l_2 to'g'ri chiziqqa parallel bo'lsa, unda l_1, to'g'ri chiziq T tekislikka parallel bo'ladi(2-rasm).

Xossa: Berilgan T_1, tekislikka parallel bo'lgan l_1, to'g'ri chiziq orqali o'tuvchi har qanday T_2 tekislik T_1 tekislikka parallel bo'lishi yoki berilgan l_1 to'g'ri chiziqqa parallel bo'lgan l_2 to'g'ri chiziq bo'yicha kesib o'tadi(3-rasm):

$(l_1 \subset T_2 \; l_1 \| T_1) => T_2 \| T_1$ yoki $l_2 \| l_1$.



3. Tekisliklarning parallelligi.

Ta'rif. Kesishmaydigan tekisliklar parallel tekisliklar deyiladi.

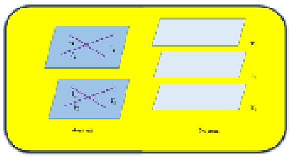
Tekisliklarning parallel bo'lishlik belgilari:

a) agar T_1 tekislikda yotuvchi kesishuvchi ikki l_1 va l_2 to'g'ri chiziq ikkinchi T_2 tekislikda yotuvchi kesishuvchi ikki l_1' va l_2' to'g'ri chiziqlariga parallel bo'lsa, unda T_1 va T_2 tekisliklar parallel bo'ladi, ya'ni(4-rasm)

$(l_1 \| l_1', \; l_2 \| l_2') \; => \; T_1 \| T_2$, bu yerda $l_1 \subset T_1, \; l_2 \subset T_1, \; l_1' \subset T_2, \; l_2' \subset T_2$;

b) agar berilgan ikki T_1 va T_2 tekislikning har biri uchinchi T_3 tekislikka parallel bo'lsa, unda berilgan ikki T_1 va T_2 tekislik o'zaro parallel bo'ladi, ya'ni(5-rasm)

$$(T_1 \| T_3, T_2 \| T_3) \; => \; T_1 \| T_2.$$



Xossalari:

a) agar ikki T_1 va T_2 parallel tekislik uchinchi tekislik bilan kesilsa, unda tekisliklarning l_1 va l_2 kesishish chiziqlari parallel bo'ladi, ya'ni(6-rasm)

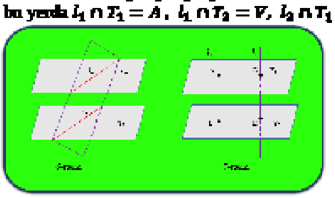
$$T_1 \| T_2 => l_1 \| l_2,$$

bu yerda $l_1 \subset T_1, \subset T_2$;

b) ikkita parallel tekislik orasidagi parallel kesmalar teng, ya'ni(7-misol)

$(T_1 \| T_2, \; l_1 \| l_2) => AV = SD,$

bu yerda $l_1 \cap T_1 = A$, $l_1 \cap T_2 = V$, $l_2 \cap T_1 = S$, $l_2 \cap T_2 = D$,



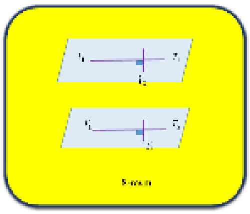
4. To'g'ri chiziqlarning perpendikulyarligi.

Ta'rif. Agar ikki to'g'ri chiziq to'g'ri burchak ostida kesishsa, ular perpendikulyar to'g'ri chiziqlar deb ataladi.

Mos ravishda ikkita l_1 va l_2 perpendikulyar chiziqlarga parallel bo'lgan kesuvchi ikki l_1' va l_2' to'g'ri chiziqlar perpendikulyar bo'ladi, ya'ni(8-rasm)

$(l_1 \| l_1', \; l_2 \| l_2', \; l_1 \perp l_2) => l_1' \perp l_2',$

bu yerda $l_1 \in T_1, \; l_2 \in T_1, \; l_1' \in T_2, l_2' \in T_2$



5. To'g'ri chiziq va tekislikning perpendikulyarligi

Ta'rif. Agar T tekislikni kesuvchi l_1 va l_2 to'g'ri chiziq shu tekislikni kesishish nuqtasi orqali o'tuvchi har qanday l_3 to'g'ri chizig'iga perpendikulyar
bo'lsa, unda l_3 to'g'ri chiziq T tekislikka perpendikulyar bo'ladi.

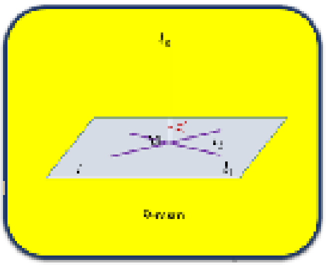
To'g'ri chiziq va tekislikning perpendikulyar bo'lishlik belgisi:
agar to'g'ri l_3 chiziq berilgan tekislikdagi kesishuvchi l_1 va l_2 to'g'ri chiziqlarga perperpendikulyar bo'lsa, unda l_3 to'g'ri chiziq T tekislikka perpendikulyar bo'ladi, ya'ni(9-rasm)
$(l_3 \perp l_1$ va $l_3 \perp l_2) => l_3 \perp T$,
bu yerda $l_1 \in T$, $l_2 \in T$.

6. Perpendikulyar va og'ma to'g'ri chiziqlar

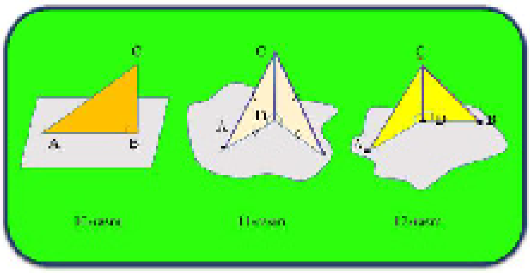
10-rasmda BC - perpendikulyar, AC - og'ma, AB - og'maning soyasi (proyeksiyasi) tasvirlangan.

11-rasmda tekislikka o'tkazilgan teng og'malar proyeksiyalarining tengligi
tasvirlangan.

12- rasmda ikkita og'madan qaysi biri katta bo'lsa, o'sha og'maning kata proyeksiyaga ega bo'lishligi



tasvirlangan.

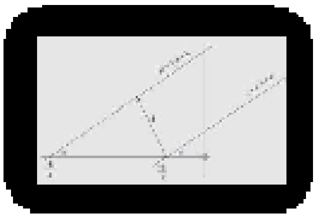


Mavzuga oid murakkab masalalar va ularni yechimlari:

1.
Ikki to'g'ri chiziq orasidagi masofani topish formulasini isbotlang.

$$tg\alpha = k,\ sin\alpha = \frac{d}{\frac{|b_2-b_1|}{k}}$$

$$cos^2\alpha = \frac{1}{tg^2\alpha+1}$$



$$1 - sin^2\alpha = \frac{1}{k^2+1}$$

$$sin\alpha = \sqrt{\frac{k^2}{k^2+1}} = \frac{d \cdot k}{|b_2-b_1|}$$

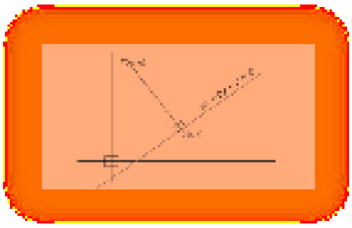
$$\frac{k}{\sqrt{k^2+1}} = \frac{d \cdot k}{|b_2-b_1|}$$

$$d = \frac{|b_2-b_1|}{\sqrt{k^2+1}}$$

1. To'g'ri chiziqlar orasidagi burchak tangensi formulasini isbotlang.

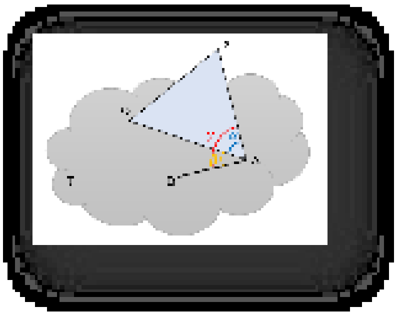
$$180^\circ - \varphi = \beta - \alpha$$
$$tg(180^\circ - \varphi) = tg(\beta - \alpha)$$
$$-tg\varphi = \frac{tg\beta - tg\alpha}{1 + tg\alpha \cdot tg\beta}$$
$$tg\varphi = \frac{tg\alpha - tg\beta}{1 + tg\alpha \cdot tg\beta} = \frac{k_1 - k_2}{1 + k_1 \cdot k_2}$$
$$tg\varphi = \frac{k_1 - k_2}{1 + k_1 \cdot k_2}$$

2. **Nuqtadan to'g'ri chiziqgacha eng qisqa masofani aniqlash formulasini keltirib chiqaring.**

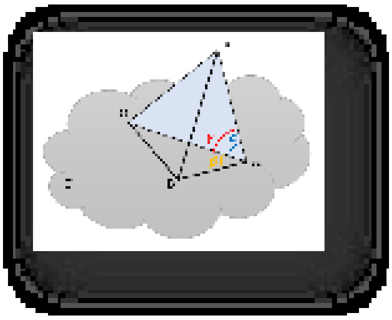


$$\begin{cases} y = -\frac{a}{b}x - \frac{c}{b} \\ y_1 = \frac{b}{a}x + A = \frac{b}{a}x + \left(y_0 - \frac{b}{a}x_0\right) \end{cases}$$
$$-\frac{a}{b}x - \frac{c}{b} = \frac{b}{a}x + \left(y_0 - \frac{b}{a}x_0\right)$$
$$x = \frac{b^2x_0 - aby_0 - ac}{a^2 + b^2}$$
$$y = -\frac{a}{b}x - \frac{c}{b} = \frac{a^2y_0 - abx_0 - bc}{a^2 + b^2}$$
$$L = |PQ| = \sqrt{(x - x_0)^2 + (y - y_0)^2} =$$
$$\sqrt{\left(\frac{b^2x_0 - aby_0 - ac}{a^2 + b^2} - x_0\right)^2 + \left(\frac{a^2y_0 - abx_0 - bc}{a^2 + b^2} - y_0\right)^2} =$$
$$\sqrt{\left(\frac{-a(ax_0 + by_0 + c)}{a^2 + b^2}\right)^2 + \left(\frac{-b(ax_0 + by_0 + c)}{a^2 + b^2}\right)^2} = \frac{|ax_0 + by_0 + c|}{\sqrt{a^2 + b^2}}$$

3. **Og'ma tekislik α burchak tashkil etadi. Shu burchak uchidan tekislikda og'ma bilan γ burchak tashkil etuvchi va og'maning tekislikdagi proyeksiyasi bilan β burchak tashkil etuvchi to'g'ri chiziq o'tkazilgan. $Cos\gamma = cos\alpha \cdot cos\beta$ ekanligini isbotlang.**



Yechilishi: SA kesma T tekislikka o'tkazilgan og'ma bo'lsin, AB esa T tekislikda berilgan to'g'ri chiziq. Tekislik bilan SA og'ma orasidagi α burchakni yasash uchun S nuqtadan T tekislikka perpendikulyar tushiramiz. SA ning T tekislikdagi proyeksiyasi AO ni yasaymiz. $\angle SAO = \alpha$ bo'lsin. Shartga ko'ra, $\angle BAS = \gamma$ va $\angle BAO = \beta$. Aytaylik, $OA \perp AB$ bo'lsin, unda $SA \perp AB$.



ΔSAB dan $\cos\gamma = \frac{AB}{SA}$, ΔSAO dan $\cos\alpha = \frac{OA}{SA}$, ΔOAB dan $\cos\beta = \frac{AB}{OA}$.

Unda $\cos\alpha \cdot \cos\beta = \frac{OA}{SA} = \frac{AB}{OA} = \frac{AB}{SA} \cos\gamma$.

$SA = x$ bo'lsin.

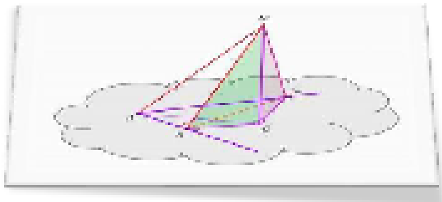
ΔSBA dan $AB = SA\cos\gamma = x\cos\gamma$ (1)

ΔSAO dan $OA = SA\cos\alpha = x\cos\alpha$

ΔOAB dan $AB = OA\cos\beta = x\cos\alpha \cdot \cos\beta$ (2)

(1) va (2) => $x\cos\gamma = x\cos\alpha\cos\beta$ x kesma uzunligi bo'lgani uchun har ikkala tomonini x ga bo'lib yuboramiz va $\cos\gamma = \cos\alpha \cdot \cos\beta$ ni hosil qilamiz.

4. Tekislikda olingan CAB burchak 60° ga teng. Fazodagi M nuqtadan burchak uchigacha bo'lgan masofa 25 ga. burchak tomonlarigacha bo'lgan masofalar 20 va 7 ga teng bo'lsa, M nuqtadan tekislikkacha bo'lgan masofani toping.
Yechilishi:
Masala shartiga mos chizma chizib olamiz:



$AM = 25,\ MC = 7,\ MB = 20$ va $\angle CAB = 60°$; $MO = h = ?$

$$\Delta AMC: AC^2 = AM^2 - MC^2 \rightarrow AC^2 = 25^2 - 7^2 \rightarrow AC = 24$$
$$\Delta AMB: AB^2 = AM^2 - MB^2 \rightarrow AB^2 = 25^2 - 20^2 \rightarrow AB = 15$$
$$\Delta ABC: BC^2 = AC^2 + AB^2 - 2 \cdot AC \cdot AB \cdot \cos(\angle CAB) \rightarrow BC^2 = 441$$
$$\Delta MOC: OC^2 = MC^2 - MO^2 \rightarrow OC^2 = 7^2 - h^2 \rightarrow OC = \sqrt{49 - h^2}$$
$$\Delta MOB: OB^2 = MB^2 - MO^2 \rightarrow OB^2 = 20^2 - h^2 \rightarrow OB = \sqrt{400 - h^2}$$

$\boxdot\ ABOC: \angle CAB = 60°, \angle ABO = 90°, \angle ACO = 90° \rightarrow \angle COB = 120°$

$$\Delta BOC: BC^2 = OC^2 + OB^2 - 2 \cdot OC \cdot OB \cdot \cos(\angle COB)$$
$$BC^2 = 49 - h^2 + 400 - h^2 - 2 \cdot \sqrt{49 - h^2} \cdot \sqrt{400 - h^2} \cdot \left(-\frac{1}{2}\right)$$
$$449 - 2h^2 + \sqrt{19600 - 449h^2 + h^4} = 441$$
$$\sqrt{19600 - 449h^2 + h^4} = 2h^2 - 8$$
$$h = \sqrt{37}$$

Javob: $\sqrt{37}$

Foydalanilgan adabiyotlar ro'yxati:

1. GEOMETRIYADAN masalalar to'plami. E. E. Jumayev. Toshkent. "ALOQACHI" – 2005
2. Погорелов А.В."Геометрия 10–11", учебник. –М., Просвешение, 2009.
3. Jo'rayeva N. O., Barakayeva D.Z. Algebraik kasrlar ustida birgalikda bajariladigan amallar. Образование и наука в XXI веке». Выпуск №26 (том 6) (май, 2022). -812-822 стр
4. Jo'rayeva N. O., Baxshulloyeva D. Masalalarni tenglamalar yordamida yechish metodikasi. Образование и наука в XXI веке». Выпуск №26 (том 6) (май, 2022). -561-571 стр
5. С.Ходжиев, Н.О.Жўраева. Некоторые указания и решением текстовые задачи связанные с работой. Pedagogik akmeologiya (maxsus son), 2022. -114-122