



## Masalalarni yechishda zanjirli kasrlarning qo'llanilishi

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**Annotatsiya:** Ushbu ilmiy maqolada akademik litseylar algebra va analiz asoslari darslarida masalalarni yechishda zanjirli kasrlarning qo'llanilishi haqida nazariy bilim va bu bilimni mustahkamlashda yangi pedagogik texnologiyaning "Moslik o'rnatish" usulidan foydalanib "O'zingizni sinab ko'ring" ruknida topshiriqlar berilgan.

**Kalit so'zlar:** Zanjirli kasr, "Moslik o'rnatish" usuli.

Davlat rahbari hurmatli prezidentimiz Sh. Mirziyoyev tomonidan jadal rivojlanish uchun "to'rtinchi sanoat inqilobi" kasblarining ahamiyati qayd etildi. Shu munosabat bilan, yoshlarni matematika (STEM) bilan bog'liq kasblarga qiziqishini o'stirish zarur. O'quvchilarning intellektual qobiliyatlarini jadal o'stirishda, ularning chuqur, tabaqalashtirilgan va kasb-hunarga yo'naltirilgan bilim olishlarini ta'minlash nuqtai nazaridan kelib chiqib ushbu maqolani yozishga "bel bog'ladik".

Ushbu maqola yoshlar uchun sifatli ta'limni ta'minlashda, iqtidorli yoshlar qobiliyatini rivojlantirishda, shuningdek, umumta'lim maktablari, akademik litseylarda faoliyat yuritayotgan aniq fanlar metod birlashmalarida o'rganib chiqilib, darslarda foydalanilsa, albatta, ta'lim sifati oshishida yordam beradi degan umiddamiz.

### Masalalarni yechishda zanjirli kasrlarning qo'llanilishi

Matematika masalalarini yechishda ayrim qiziqarli tenglamalarga kelib qolamiz. Shunday tenglamalardan biri Diofant tenglamalaridir. Diofant tenglamalarini yechishning bir qancha usullari bor. Bu ishda Diofant tenglamalarni zanjirli kasrlar yordamida yechishni keltiramiz.

$$a + \frac{b_1}{a_1 + \frac{b_2}{a_2 + \dots + \frac{b_n}{a_n}}} a + \frac{b_1}{a_1 + \frac{b_2}{a_2 + \dots + \frac{b_n}{a_n}}} \quad (1)$$

Ushbu

$a_i (i = \overline{0, n}), a_i (i = \overline{0, n}), b_j (j = \overline{1, n}) b_j (j = \overline{1, n})$  butun sonlar ko'rinishidagi ifoda uzluksiz zanjir deyiladi. Agar (1) da  $b_1 = b_2 = b_3 = \dots = b_n = 1$ ,  $b_1 = b_2 = b_3 = \dots = b_n = 1$ ,  $a_0 a_0$  butun son  $a_1, a_2, a_3, \dots a_n a_1, a_2, a_3, \dots a_n$



lar natural sonlar bo'lib,  $a_n > 1, a_n > 1$  bo'lsa, u holda ushbu

$$a + \frac{b_1}{a_1 + \frac{b_2}{a_2 + \dots + \frac{b_n}{a_n}}} a + \frac{b_1}{a_1 + \frac{b_2}{a_2 + \dots + \frac{b_n}{a_n}}}$$

ifoda **chekli zanjir kasr** deyiladi.

$$+ \frac{1}{1 + \frac{1}{2 + \frac{1}{4 + \frac{1}{2}}}} + \frac{1}{1 + \frac{1}{2 + \frac{1}{4 + \frac{1}{2}}}}$$

Masalan: 3 ifoda chekli zanjir kasrga misol bo'ladi. Bu zanjirli kasr

$$+ \frac{1}{1 + \frac{1}{2 + \frac{1}{4 + \frac{1}{2}}}} = 3 + \frac{1}{1 + \frac{1}{2 + \frac{2}{9}}} = 3 + \frac{1}{1 + \frac{9}{20}} = 3 + \frac{20}{29} = \frac{107}{29}$$

3

$$+ \frac{1}{1 + \frac{1}{2 + \frac{1}{4 + \frac{1}{2}}}} = 3 + \frac{1}{1 + \frac{1}{2 + \frac{2}{9}}} = 3 + \frac{1}{1 + \frac{9}{20}} = 3 + \frac{20}{29} = \frac{107}{29}$$

noto'g'ri kasrning bir ko'rinishi

$$\frac{107107}{2929}$$

bo'lib, uni  $[3; 1, 2, 4, 3]$  belgi orqali ham berish mumkin. Bu belgi  $\frac{107107}{2929}$  noto'g'ri kasrning zanjirli kasrga o'tish belgisidir.

**1-misol.**  $\frac{a}{b} = [-1; 1, 2, 4, 5] \frac{a}{b} = [-1; 1, 2, 4, 5]$  zanjirli kasrga mos kasrni toping.

$$\frac{a}{b} = -1 + \frac{1}{1 + \frac{1}{2 + \frac{1}{4 + \frac{1}{5}}}} = -1 + \frac{1}{1 + \frac{1}{2 + \frac{5}{21}}} = -1 + \frac{1}{1 + \frac{21}{47}} = -1 + \frac{47}{68} = -\frac{21}{68}$$

Yechish:

$$\frac{a}{b} = -1 + \frac{1}{1 + \frac{1}{2 + \frac{1}{4 + \frac{1}{5}}}} = -1 + \frac{1}{1 + \frac{1}{2 + \frac{5}{21}}} = -1 + \frac{1}{1 + \frac{21}{47}} = -1 + \frac{47}{68} = -\frac{21}{68}$$

$$\text{Javob: } \frac{a}{b} = -\frac{21a}{68b} = -\frac{21}{68}$$

**2-misol.**  $\frac{1972}{1508} = [1; 3, 4] \frac{1972}{1508} = [1; 3, 4]$  kasrni zanjirli kasrga yoyish yordamida qisqartiring.

$$\frac{1972}{1508} = 1 + \frac{1}{3 + \frac{1}{4}} = 1 + \frac{4}{13} = \frac{17}{13}$$

**Yechish.** Kasrni zanjirli kasrga yoyamiz:

$$\frac{1972}{1508} = 1 + \frac{1}{3 + \frac{1}{4}} = 1 + \frac{4}{13} = \frac{17}{13}$$

$$\text{Javob: } \frac{1972}{1508} = \frac{17}{13} \frac{1972}{1508} = \frac{17}{13}$$

**3-misol.** Berilgan  $\sqrt{15}\sqrt{15}$  sonini zanjir kasr ko'rinishida ifodalang.



$$\sqrt{15} = 3 + \frac{1}{a_1} \sqrt{15} = 3 + \frac{1}{a_1};$$

**Yechish.**

$$a_1 = \frac{1}{\sqrt{15}-3} = \frac{\sqrt{15}+3}{6} = 1 + \frac{1}{a_2} a_1 = \frac{1}{\sqrt{15}-3} = \frac{\sqrt{15}+3}{6} = 1 + \frac{1}{a_2};$$

$$a_2 = \frac{1}{\frac{\sqrt{15}+3}{6}-1} = \frac{6}{\sqrt{15}-3} = \frac{6 \cdot (\sqrt{15}+3)}{6} = \sqrt{15} + 3 = 6 + \frac{1}{a_3}$$

$$a_2 = \frac{1}{\frac{\sqrt{15}+3}{6}-1} = \frac{6}{\sqrt{15}-3} = \frac{6 \cdot (\sqrt{15}+3)}{6} = \sqrt{15} + 3 = 6 + \frac{1}{a_3};$$

$$a_3 = \frac{1}{\sqrt{15}+3-6} = \frac{1}{\sqrt{15}-3} = \frac{\sqrt{15}+3}{6} = 1 + \frac{1}{a_4}$$

$$a_3 = \frac{1}{\sqrt{15}+3-6} = \frac{1}{\sqrt{15}-3} = \frac{\sqrt{15}+3}{6} = 1 + \frac{1}{a_4};$$

$$a_4 = \frac{1}{\frac{\sqrt{15}+3}{6}-1} = \frac{6}{\sqrt{15}-3} = \frac{6 \cdot (\sqrt{15}+3)}{6} = \sqrt{15} + 3 = 6 + \frac{1}{a_5}$$

$$a_4 = \frac{1}{\frac{\sqrt{15}+3}{6}-1} = \frac{6}{\sqrt{15}-3} = \frac{6 \cdot (\sqrt{15}+3)}{6} = \sqrt{15} + 3 = 6 + \frac{1}{a_5};$$

$a_4 = a_1$   $a_4 = a_1$  bo'lganligi uchun, yana yuqoridagi jarayon hosil bo'ladi.

Demak,  $\sqrt{15} = [3; (1,6)] \sqrt{15} = [3; (1,6)]$  cheksiz zanjirli kasrni hosil qilib, uning taqribiy qiymatini topamiz.

$$\sqrt{15} = 3 + \frac{1}{1+\frac{1}{6+\dots}} \sqrt{15} = 3 + \frac{1}{1+\frac{1}{6+\dots}}$$

**Javob:**

**4-misol.**  $[2; 1, 1, 6, 8]$  zanjirli kasrga ko'ra sonning o'zini toping

$$2 + \frac{1}{1+\frac{1}{1+\frac{1}{6+\frac{1}{8}}}} = 2 + \frac{1}{1+\frac{1}{1+\frac{8}{1+8}}} = 2 + \frac{1}{1+\frac{49}{57}} = 2 + \frac{57}{106} = \frac{163}{106}$$

**Yechish.**  $[2; 1, 1, 6, 8] =$

$$2 + \frac{1}{1+\frac{1}{1+\frac{1}{6+\frac{1}{8}}}} = 2 + \frac{1}{1+\frac{1}{1+\frac{8}{1+8}}} = 2 + \frac{1}{1+\frac{49}{57}} = 2 + \frac{57}{106} = \frac{163}{106}$$

**Javob:**  $\frac{163}{106}$   $\frac{163}{106}$ .

**5-misol.**  $\frac{1515}{2222}$  kasr  $[2; 1, 3, 4, 1, 2]$ ,  $[0; 3, 1, 2, 7]$ ,  $[0; 1, 1, 6, 8]$ ,  $[-3; 1, 1, 2]$  zanjirli kasrlarning qaysi biriga mos?

**Yechish.** Avvalo masala shartini o'qib, tahlil qilamiz. Berilgan kasr to'g'ri kasr bo'lganligi uchun uning butun qismi 0 ga teng. Demak, biz yechimni  $[0; 3, 1, 2, 7]$  va



[0;1,1,6,8] zanjirli kasrlar ichidan izlaymiz. Ularni zanjirli kasr ko`rinishida yoyib, shakl almashtirishlar bajarganimizdan so`ng natijaga erishamiz.

**Javob:** [0;3,1,2,7]

Aziz o`quvchi, keling pedagogik texnologiyani "Moslik o`rnating" usuli orqali yuqorida olgan bilimlarimizni mustahkamlab olaylik. Zero, takrorlash -bu bilimning onasidir.

### O`zingizni sinab ko`ring

| Topshiriq:                                                                                                               | Moslik o`rnating: | Javoblar:       |
|--------------------------------------------------------------------------------------------------------------------------|-------------------|-----------------|
| $\frac{a}{b} = [2; 1,1,3,1,2]$ $\frac{a}{b} = [2; 1,1,3,1,2]$<br>zanjirli kasrga mos kasrni toping.                      |                   | $\frac{58}{21}$ |
| $\frac{2494}{903} = [2; 1,3,5]$ $\frac{2494}{903} = [2; 1,3,5]$<br>kasrni zanjirli kasrga yoyish yordamida qisqartiring. |                   | [3;(1,2,1,6)]   |
| Berilgan $\sqrt{14} \sqrt{14}$ sonini zanjirli kasr ko`rinishida ifodalang.                                              |                   | $\frac{64}{25}$ |
| [3;1,1,2] zanjirli kasrga ko`ra sonning o`zini toping                                                                    |                   | [0;1,4,3,2]     |
| $\frac{3030}{3737}$ kasr qaysi zanjirli kasrga mos?                                                                      |                   | $\frac{18}{5}$  |

### Foydalanilgan adabiyotlar.

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