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## MATEMATIKADA UCHINCHI SHAXS YUMORI

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### ANNOTATSIYA

Maqolada o'quvchilarga matematika fanini qiziqarli va tushunarli qilib o'qitish uchun o'quvchilar tomonidan yo'l qo'yiladigan xatoliklarga nisbatan matematik yumorlardan kasrlarni qisqartirish, kasrlarni qo'shish, logarifmlar, burchaklar yig'indisi sinusi tushunchalari misolida qanday qilib foydalanish haqida ma'lumotlar keltirilgan.

**Kalit so'zlar:** Matematik yumor, tub sonlar, proporsiya, kasrning maxraji va surati, kasrni qisqartirish, kasrlarni qo'shish, EKUB, EKUK, logarifm, burchak sinusi, burchaklar yig'indisi sinusi, kosinuslar ayirmasi.

## THE THIRD-PERSON HUMOR IN MATHEMATICS

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### ABSTRACT

The article provides data on the use of mathematical humor about student's mistakes on the example of the concepts of reduction of fractions, the addition of fractions, the logarithms, the sine of the sum of angles for teaching mathematics, understandable and entertaining

**Keywords:** Mathematical humor, prime numbers, proportion, fraction's denominator and numerator, the reduction of fraction, the addition of fractions, LCD, GCM, logarithm, the sine of the angle, the sine of the sum of angles, the difference of the cosine

### KIRISH

Barchamizga ma'lumki, prezidentimiz Shavkat Mirziyoyev 2020-yilni "Ilm-ma'rifat va raqamli iqtisodiyotning rivojlantirish yili" deb nomladi. Prezidentimiz Shavkat Mirziyoyevning "Matematika hamma aniq fanlarga asos, bu fanni yaxshi bilgan bola aqlli, keng tafakkurli bo'lib o'sadi, istalgan sohada muvaffaqiyatli ishlab ketadi" degan so'zlarini keltirib o'tamiz. O'quvchilarni matematik bilimlarini kengaytirish uchun biz ham ta'lim tizimiga yangicha yondashuv bilan qarashimiz kerak. Bunga qanday erishishimiz mumkin?

O'rta ta'limda o'quvchilarni mantiqiy fikrlashni shakllantirish bugungi kunda juda dolzarb masalalardan biri hisoblanadi. Chunki dunyo hamjamiyatida o'z o'rniga ega bo'lib borayotgan yurtimizning yosh avlodlari jahon bolalari bilan teng fikrlay olishi, turli jabhalarda o'zini ko'rsata olishi zarur.

Lekin, hozirgi kunda hamma ham matematikaga birdek qiziqadimi? So'nggi yillardagi tendensiya shuni ko'rsatmoqdaki, o'quvchilar tomonidan matematika fani eng murakkab va hayotda tatbig'i eng kam bo'lgan fan sifatida ko'riladi.

### ADABIYOTLAR TAHLILI VA METODOLOGIYA

Matematika faniga qiziqish uyg'otish, mantiqiy fikrlashni yanada oshirish uchun o'qituvchilar ba'zan nostandart masalalardan foydalanishadi. Nostandart masalalar, albatta, o'quvchidan alohida yondashishni, o'rganilgan qoidani yoki formulani yanada chuqurroq bilishni talab etadi. Nostandart masalalar tarkibiga matematik yumorlar ham kiradi. Matematika va yumorlar orasida chuqur bog'liqlik borligi haqida ko'p matematiklar aytishgan[1,3,4,5]. Matematik yumorlarni shartli ravishda uch sinfga bo'lish mumkin: birinchi shaxs hazili; uchinchi shaxs hazili va aniqlanmagan semantik hazillar[5]. Uchinchi shaxs yumori biz noto'g'ri deb bilgan, kamchiliklarga asoslangan

bir ishni uchinchi shaxsning qilishidir. Uchinchi shaxs yumoriga quyidagi matematik hisob-kitoblar misol bo'la oladi:

$$\frac{95}{19} = \frac{\cancel{9}5}{\cancel{1}9} = \frac{5}{1} = 5$$

$$\frac{d}{dx} x = \frac{\cancel{d}}{\cancel{d}x} x = \frac{x}{x} = 1$$

Bu hisob-kitoblarda kimdir be'mani usullar bajarganligini ko'ramiz. Biroq buning natijasi xato emas. Lekin bu usulda qat'iy matematik formulani buzishga olib keladigan xatolikka yo'l qo'yilgan! Bunga quyidagi misol yordamida ishonch hosil qilish mumkin:

$$3 = \frac{42}{14} = \frac{\cancel{4}2}{\cancel{1}4} = \frac{2}{1} = 2$$

## NATIJA

**1-masala.** Maxraji va surati 100 dan oshmagan nechta kasrni  $\frac{95}{19} = \frac{\cancel{9}5}{\cancel{1}9} = \frac{5}{1} = 5$

qoidaga asosan qisqartira olamiz?

**Yechish.** Aytaylik,  $a, b, c \in \{1, 2, \dots, 9\}$  raqamlar bo'lsin. Endi

$$\frac{\overline{bc}}{\overline{ab}} = \frac{\overline{b\overline{c}}}{\overline{a\overline{b}}} = \frac{c}{a}$$

tenglikni tekshirib ko'ramiz (bu yerda  $\overline{ab}$  ikki xonali son). Har qanday ikki xonali sonni quyidagicha yoza olamiz:  $\overline{ab} = 10a + b$ . Bundan foydalanib,  $\frac{10b+c}{10a+b} = \frac{c}{a}$  nisbatni hosil qilamiz. Proporsiya qoidasidan foydalanib, uni soddalashtiramiz:  $(10b+c)a = (10a+b)c$  yoki  $10ab + ac = 10ac + bc$ .

Bundan  $b = \frac{9ac}{10a-c}$  munosabatni topamiz.

Bu yerda quyidagicha holatlar bo'lishi mumkin:

1)  $a=1$  bo'lsin. U holda  $b = \frac{9c}{10-c}$  ni hosil qilamiz.  $b \in \overline{1,9}$  bo'lganligi uchun  $c=1$

da  $b=1$ ,  $c=4$  da  $b=6$  va  $c=5$  da  $b=9$  bo'ladi. Demak,  $\frac{11}{11}$ ,  $\frac{64}{16}$ ,  $\frac{95}{19}$  kasrlarni yuqoridagi qoidaga ko'ra qisqartira olamiz.

2)  $a=2$  bo'lsin. U holda  $b = \frac{9ac}{10a-c} = \frac{18c}{20-c}$  ni hosil qilamiz. Bu tenglik  $c=2$  da

$b=2$  va  $c=5$  da  $b=6$  bo'lganda bajariladi. Demak,  $\frac{22}{22}$  va  $\frac{65}{26}$  kasrlarni yuqoridagi qoidaga ko'ra qisqartira olamiz.

3)  $a=3$  bo'lsin. U holda,  $b = \frac{9ac}{10a-c} = \frac{27c}{30-c}$  tenglik faqatgina  $c=3$  va  $b=3$

bo'lganda bajariladi. Demak,  $\frac{33}{33}$  kasrni yuqoridagi qoidaga ko'ra qisqartira olamiz.

4)  $a=4$  bo'lsin. U holda  $b = \frac{9ac}{10a-c} = \frac{36c}{40-c}$  tenglik hosil bo'ladi. Bu tenglikni

$c=4$  da  $b=4$  va  $c=8$  da  $b=9$  qanoatlantiradi. Demak,  $\frac{44}{44}$  va  $\frac{98}{49}$  kasrlarni yuqoridagi qoidaga ko'ra qisqartira olamiz.

5)  $5 \leq a \leq 9$  holatlar uchun faqat  $a=b=c$  shart bajarilganda yuqoridagi qoida bo'yicha qisqartirish mumkin bo'ladi.

Demak,  $\frac{11}{11}, \frac{64}{16}, \frac{95}{19}, \frac{22}{22}, \frac{65}{26}, \frac{33}{33}, \frac{44}{44}, \frac{98}{49}, \frac{55}{55}, \frac{66}{66}, \frac{77}{77}, \frac{88}{88}, \frac{99}{99}$  kasrlarni masala shartidagi qoida bo'yicha qisqartira olar ekanmiz.

**2-masala.**  $\frac{9-25}{6+10} = \frac{9}{6} - \frac{25}{10}$  tenglik bajariladi. Yana qanday butun sonlarda bu tenglik bajariladi?

**Yechish.**  $\frac{a-b}{c+d} = \frac{a}{c} - \frac{b}{d}$  (bu yerda  $c \neq 0, d \neq 0$ ) tenglik bajariladigan  $a, b, c, d \in \mathbb{Z}$

sonlarni topaylik.  $\frac{a-b}{c+d} = \frac{ad-bc}{cd}$  tenglikdan

$(a-b)cd = (ad-bc)(c+d)$  ekanligi kelib chiqadi. Uni soddalashtirsak,  $ad^2 - bc^2 = 0$  munosabat hosil bo'ladi. Demak,

$$ad^2 - bc^2 = 0$$

shartni qanoatlantiruvchi butun sonlarni yuqoridagi kabi yoza olamiz.

**3-masala.** Ko'pchilik tomonidan kasrlarni qo'shishda quyidagicha xatoga yo'l qo'yiladi:  $\frac{1}{3} + \frac{2}{5} = \frac{1+2}{3+5}$ . Bu qo'shish, albatta, to'g'ri emas. Endi quyidagicha savol

tug'iladi:  $\frac{a}{c} + \frac{b}{d} = \frac{a+b}{c+d}$  nisbatni qanoatlantiruvchi natural sonlar mavjudmi?

**Yechish.** 2-masaladan olingan natijadagi  $(-b)$  ning o'rniga  $b$  olinsa,  $ad^2 + bc^2 = 0$  munosabat hosil bo'ladi. Afsuski, bu shartni qanoatlantiruvchi natural sonlar mavjud emas.

**4-masala.** Har qanday  $a, b, c \neq 0, d \neq 0$  sonlar uchun quyidagi tenglik o'rinli:  $\frac{a}{c} + \frac{b}{d} = \frac{ad+bc}{cd}$ . Lekin, kasrlarni qo'shishda bu qoida har doim ham qo'llanmaydi.

Qanday hollarda kasrlarni qo'shish uchun  $\frac{a}{c} + \frac{b}{d} = \frac{ad+bc}{cd}$  tenglikdan foydalansak bo'ladi?

**Yechish.** Bizga ma'lumki, kasrlarni qo'shishda maxrajdagi sonlarning EKUKi olinadi. Bundan esa,  $EKUK(c,d) = cd$  tenglik hosil bo'ladi. Har qanday ikkita  $m,n$  natural sonlar uchun  $mn = EKUB(m,n)EKUK(m,n)$  bo'ladi. Bu tasdiqni  $c,d$  sonlar uchun qo'llasak,  $EKUB(c,d)EKUK(c,d) = cd$  tenglik o'rinli bo'ladi. Bundan esa,  $EKUB(c,d) = 1$  hosil bo'ladi. Ya'ni,  $c,d$  sonlar o'zaro tub bo'lsa, yuqoridagi shart bajariladi.

**5-Masala.** Quyidagi tengliklar bajarilishini tekshirish oson:

$$\ln\left(16 + \frac{16}{15}\right) = \ln 16 + \ln \frac{16}{15} \quad \text{va} \quad \ln\left(\frac{64}{7} - 8\right) = \ln \frac{64}{7} - \ln 8.$$

Qanday shartlar bajarilganda qavslarni shu qoida bo'yicha ocha olamiz?

**Yechish.** Birinchi tenglik uchun

$$\ln(a+b) = \ln a + \ln b$$

shart qanday musbat  $a,b$ larda bajarilishini tekshiramiz. Logarifmlash qoidasidan  $\ln(a+b) = \ln(ab)$  ni hosil qilamiz. Ikkala tomondan logarifmlarni tashlab yuborsak,  $a+b = ab$  yoki  $\frac{1}{a} + \frac{1}{b} = 1$  tenglik kelib chiqadi.

Ikkinchi tenglik uchun  $\ln(c-d) = \ln c - \ln d$  shart qanday  $c,d$  musbat sonlarda bajarilishini tekshiramiz. Logarifmlash qoidasidan foydalansak,  $\ln(c-d) = \ln \frac{c}{d}$  hosil bo'ladi. Ikkala tomondan logarifmlarni tashlab yuborsak,  $c-d = \frac{c}{d}$  tenglik o'rinli bo'ladi. Bundan,  $c = \frac{d^2}{d-1}$  tenglik hosil bo'ladi.

**6-masala.**  $a$  va  $b$  larning qanday qiymatlarida  $\sin(a+b) = \sin a + \sin b$  tenglik o'rinli bo'ladi.

**Yechish.** Sinuslar yig'indisi uchun quyidagi tenglik o'rinli:

$$\sin a + \sin b = 2 \sin \frac{a+b}{2} \cos \frac{a-b}{2}.$$

Bu tenglikdan masala shartidagi tenglikni

$$\sin(a+b) = 2 \sin \frac{a+b}{2} \cos \frac{a-b}{2}$$

kabi yoza olamiz. Ikkilangan sinus formulasidan esa

$$2 \sin \frac{a+b}{2} \cos \frac{a+b}{2} = 2 \sin \frac{a+b}{2} \cos \frac{a-b}{2}$$

tenglikni hosil qilamiz. Chapdagi ifodani, o'ng

tomonga o'tkazib, umumiy ko'paytmani qavsdan tashqariga chiqarsak,

$$2 \sin \frac{a+b}{2} \left( \cos \frac{a+b}{2} - \cos \frac{a-b}{2} \right) = 0$$

ni hosil qilamiz. Kosinuslar ayirmasi formulasidan esa,

$$\sin \frac{a+b}{2} \sin \frac{a}{2} \sin \frac{b}{2} = 0$$

ga ega bo'lamiz. Ko'paytma nolga teng bo'lishi uchun, ularning

kamida bittasi nolga teng bo'lishi kerak. Demak,  $\sin \frac{a+b}{2} = 0$ ,  $\sin \frac{a}{2} = 0$  yoki  $\sin \frac{b}{2} = 0$



tengliklar o'rinli. Bundan esa,  $a+b=2\pi k$ ,  $a=2\pi l$  va  $b=2\pi t$ ,  $k,l,t \in Z$  yechimlarini olamiz.

### MUHOKAMA

Yuqoridagi masalalardan ko'rinadiki, agar qoida yoki formularning ishlash mexanizmini ozroq o'zgartirsak, (ya'ni xatolikka yo'l qo'ysak) ularning ishlashi ba'zi shartlarga bog'liq bo'lib qolar ekan. Bundan esa, o'quvchilar ko'p yo'l qo'yadigan xatolarni chetlab o'tishga zamin yaratib, formula yoki qoidani chuqurroq his qilishga undaydi.

### XULOSA

O'rta ta'lim maktablarida matematika fanini og'ir va zerikarli fan deb ta'kidlashadi. Matematika fanini qiziqarli va o'quvchilar darsda zerikishlarini oldini olish uchun yumorlardan foydalanib o'tish maqsadga muvofiq bo'ladi. Yuqorida keltirilgan misollarda o'quvchilarni kasrlar ustida amallarda qanday xatolarga yo'l qo'yishi mumkinligi keltirilgan. Shu xatolaridan foydalanib, kasrlarni hisoblashni tushuntirish, ya'ni xatodan to'g'ri hisoblashlarga o'tish o'quvchilarga kasrlar ustida amallarni o'rganishi uchun ancha samarali bo'ladi.

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