METHODS OF EASY SOLUTION OF MODULAR EQUATIONS IN ACADEMIC LYCEUMS BASED ON NEW PEDAGOGICAL TECHNOLOGIES

Ochilova Azizabonu Yorqin kizi
Student of Bukhara State Pedagogical Institute

Annotation: This article discusses effective and easy methods of solving modular equations in academic lyceums based on new pedagogical technologies. In particular, the issues of developing students' logical thinking through interactive methods, problem-based learning, cluster, brainstorming, work in small groups, "Blitz-survey" and the use of ICT tools are analyzed. Innovative approaches to solving modular equations in the traditional way are compared and their advantages are substantiated. The results of the study show that the lesson process organized on the basis of modern pedagogical technologies significantly increases students' independent thinking, analysis and generalization skills.

Keywords: Modular equation, new pedagogical technologies, interactive methods, problem-based learning, innovative approach, academic lyceum, logical thinking, ICT, work in small groups, efficiency.

AKADEMIK LITSEYLARDA MODULLI TENGLAMALARNI YANGI PEDAGOGIK TEXNOLOGIYALAR ASOSIDA OSON YECHISH USULLARI.

Ochilova Azizabonu Yorqin qizi
Buxoro davlat pedagogika instituti talabasi

Annotatsiya:Mazkur maqolada akademik litseylarda modulli tenglamalarni o‘qitishda yangi pedagogik texnologiyalar asosida samarali va oson yechish usullari yoritilgan. Jumladan, interfaol metodlar, muammoli ta’lim, klaster, aqliy hujum, kichik guruhlarda ishlash, “Blits-so‘rov” va AKT vositalaridan foydalanish orqali o‘quvchilarning mantiqiy tafakkurini rivojlantirish masalalari tahlil qilingan. Modulli tenglamalarni an’anaviy usulda yechish bilan innovatsion yondashuvlar taqqoslanib, ularning afzalliklari asoslab berilgan. Tadqiqot natijalari shuni ko‘rsatadiki, zamonaviy pedagogik texnologiyalar asosida tashkil etilgan dars jarayoni o‘quvchilarning mustaqil fikrlash, tahlil qilish va umumlashtirish ko‘nikmalarini sezilarli darajada oshiradi.

Kalit so‘zlar:Modulli tenglama, yangi pedagogik texnologiyalar, interfaol metodlar, muammoli ta’lim, innovatsion yondashuv, akademik litsey, mantiqiy tafakkur, AKT, kichik guruhlarda ishlash, samaradorlik.

Bugungi kunda ta’lim tizimini modernizatsiya qilish, o‘quv jarayoniga innovatsion yondashuvlarni joriy etish va o‘quvchilarning mustaqil fikrlash ko‘nikmalarini rivojlantirish dolzarb masalalardan biri hisoblanadi. Xususan, akademik litseylarda matematika fanini o‘qitishda murakkab mavzularni, jumladan modulli tenglamalarni samarali o‘zlashtirishni ta’minlash muhim pedagogik vazifa sanaladi [4].

Modulli tenglamalar mavzusi o‘quvchilardan yuqori darajadagi mantiqiy tafakkur, tahlil qilish va umumlashtirish ko‘nikmalarini talab qiladi. An’anaviy o‘qitish usullarida bu mavzu ko‘pincha qiyinchilik tug‘diradi, natijada o‘quvchilarda mavzuga nisbatan qiziqish pasayadi. Shu bois zamonaviy pedagogik texnologiyalar asosida darslarni tashkil etish zarurati yuzaga kelmoqda.Ta’lim jarayoniga interfaol metodlarni joriy etish g‘oyalari Viktor Shatalov, Mikhail Klarin, John Dewey kabi pedagog olimlarning ilmiy qarashlarida o‘z aksini topgan [1][2][3]. Ularning fikricha, o‘quvchi ta’lim jarayonining faol subyekti bo‘lishi, bilimni mustaqil ravishda izlab topishi va amaliyotda qo‘llay olishi lozim.

Mazkur maqolaning maqsadi – akademik litseylarda modulli tenglamalarni yangi pedagogik texnologiyalar asosida oson va samarali o‘qitish usullarini ishlab chiqish hamda ularning amaliy ahamiyatini asoslab berishdan iborat. Tadqiqot davomida interfaol metodlar, muammoli ta’lim, differensial yondashuv hamda axborot-kommunikatsiya texnologiyalaridan foydalanishning samaradorligi tahlil qilinadi [6].

Modul ichida noma'lum son qatnashgan tenglamalar modulli tenglamalar deyiladi.

Masalan:

$a)\ |x| = 7 \quad b)\ |x-3| = |x+5| \quad c)\ |x^2-2x| + |x| = 3 \quad d)\ |2x-1| = 3x+1 \quad e)\ 5x^2 - 3|x| + 2 = 0$

I. $|f(x)| = c$, (c=berilgan son) ko'rinishdagi tenglamalar.

1. Agar c>0 bo'lsa, $|f(x)| = c$ tenglama 2 ta tenglamaga ajratib yechiladi. f(x)=c va f(x)=-c

1-misol: $|3x-1| = 17$

1) $3x - 1 = 17$, $3x = 18$, $x = 6$

2) $3x - 1 = -17$, $3x = -16$, $x = -5\frac{1}{3}$

$javob:\ 6;\ -5\frac{1}{3}$

1. Agar c=0 bo'lsa, $|f(x)| = 0$ tenglama faqat 1 ta f(x)=0 tenglamaga almashtirib yechamiz.

2-misol:

$|7x-15| = 0 \quad 7x - 15 = 0 \quad 7x = 15 \quad x = \frac{15}{7} \quad x = 2\frac{1}{7} \quad javob: 2\frac{1}{7}$

2. Agar c<0 bo'lsa, $|f(x)| = c$ tenglama yechimga ega bo'lmaydi.Chunki hech qanday sonning moduli manfiy emas.

3-misol: $a)\ |3x-1| = -2 \quad b)\ |x^2 - 4x + 5| = -3$ tenglamalar yechimga ega emas.

II. $|f(x)| = |g(x)|$ ko'rinishishdagi tenglamalar.

Bunday tenglamalarni 2 xil usulda yechish mumkin.

1-usul: $|a| = |b|$ tenglik $a = \pm b$ bo'lganda to'g'ri bo'lishini hisobga olsak $|f(x)| = |g(x)|$ tenglamani quyidagicha 2 tenglamaga ajratib yechish mumkin.

$f(x) = g(x) \ \ va\ \ f(x) = -g(x)$

$1-misol: \; |x-3| = |x+1| \quad tenglamani \; yeching.$

$x-3 = x+1 \qquad\qquad x-3 = -x-1$

$0 = 4 \qquad\qquad 2x = 2 \qquad\qquad Javob: x = 1$

$\varnothing \qquad\qquad x = 1$

2-usul: $|a|^2 = a^2 \;\; va \; |a \pm b|^2 = (a \pm b)^2$ tenglamalardan foydalanib, $|f(x)| = |g(x)|$ tenglamani $f^2(x) = g^2(x)$ tenglamaga almashtirib yechiladi.

$2-misol: \; |x-3| = |x+1| \quad tenglamani \; yeching.$

$(x-3)^2 = (x+1)^2$

$x^2 - 6x + 9 = x^2 + 2x + 1 \qquad\qquad Javob: x = 1$

$-8x = -8 \qquad x = 1$

1-eslatma: $|x-a| = |x-b| \quad tenglamaning \; ildizi \; x = \dfrac{a+b}{2} \; bo'ladi.$

$a) \; |x-5| = |x-3| \qquad\qquad b) \; |x+7| = |x-1|$

$x = \dfrac{5+3}{2} \qquad\qquad x = \dfrac{-7+1}{2}$

$x = 4 \qquad\qquad x = -3$

III. $f(|x|) = 0 \; ko'rinishdagi \;\; tenglamalarni \;\; yechish.$

Bunday tenglamalarga misollar: $a) \; |x| - 3x = 1 \qquad b) \; x^2 - 5|x| + 4 = 0$

1) $x \geq 0$ debs hart bo’lib modulni tashlab, hosil bo’lgan tenglamani yechib topilgan ildiz shartni qanoatlantirsa javobga olinadi, shartni qanoatlantirmasa chet ildiz sifatida tashlab yuboriladi.

2) x<0 deb shart qo’yib modulni ochib hosil bo’lgan tenglama yechiladi va topilgan ildiz shartni qanoatlantiradimi yokii yo’qmi aniqlanadi.

$1-misol: \ |x|-3x=1 \ \ tenglamani \ \ yeching.$

1) $x\geq 0$ $bo'lsin,\ x-3x=1$ $\quad -2x=1 \quad x=-0{,}5$

2) $x<0$ $bo'lsin,\ -x-3x=1$ $\quad -4x=1 \quad x=-0{,}25 \quad javob:-0{,}5;-0{,}25$

$2-misol: \ x^2-5|x|+4=0 \ \ tenglamani \ \ yeching.$

1) $x\geq 0$ $bo'lsin,\ x^2-5x+4=0 \quad x_1=1,\ \ x_2=4$

2) $x<0$ $bo'lsin,\ x^2+5x+4=0 \quad x_1=-1,\ \ x_2=-4 \quad javob:\pm 1;\ \pm 4$

$3-misol: x^2-2|x|-3=0 \ \ tenglamani \ \ yeching.$

1) $x\geq 0$ $bo'lsin,\ x^2-2x-3=0 \quad x_1=-1,\ \ x_2=3 \quad x=-1\ chet\ ildiz$

2) $x<0$ $bo'lsin,\ x^2+2x-3=0 \quad x_1=1,\ \ x_2=-3 \quad x=1\ chet\ ildiz \quad javob:\pm 3$

IV. $|f(x)|=g(x)$ tenglamani yechish.

Bunday tenglamalar ham shartlar qo'yib, 2 ta tenglamaga ajratib yechiladi.

1) $f(x)\geq 0\ bo'lsa,\ \ f(x)=g(x) \quad$ 1) $g(x)\geq 0\ bo'lsa,\ \ f(x)=g(x)$

1) $f(x)<0\ bo'lsa,\ \ f(x)=-g(x) \quad$ 1) $g(x)\geq 0\ bo'lsa,\ \ f(x)=-g(x)$

$1-misol: \ |x-3|=3x-13$

1) $x-3\geq 0 \quad x\geq 3$ $\qquad$ 2) $x-3<0 \quad x<3$

$x-3=3x-13$ $\qquad -x+3=3x-13$ $\qquad Javob: x=5$

$-2x=-10 \quad x=5$ $\qquad -4x=-16 \quad x=4 \quad chet\ ildiz$

V. $|f(x)|=f(x)$ tenglamani yechish.

Misollar: $a)\ |x+5|=x+5$ $\qquad b)\ |x^2+3x|=x^2+3x$

$|f(x)|=f(x)$ tenglamani yechish uchun $f(x)\geq 0$ tengsizlikni yechish etarli.

$1-misol: \ |x+5|=x+5$ $\qquad 2-misol: |x^2+3x|=x^2+3x$

$x+5\geq 0$ $\qquad x^2+3x\geq 0$

$x\geq -5$ $\qquad x(x+3)\geq 0$

$javob: [-5;\infty)$ $\qquad javob: (-\infty;-3]\cup[0;\infty)$

VI. $|f(x)|=-f(x)$ tenglamani yechish.

Bunday tenglamalarga Misollar: $a)\ |x-2|=2-x$ $\qquad b)\ |x^2-5x|=-x^2+5x$

$|f(x)| = -f(x)$ tenglamani yechish uchun $f(x) \le 0$ tengsizlikni yechish etarli.

$1-misol:\ |x-2| = 2-x$
$x-2 \le 0$
$x \le 2$
$javob: (-\infty;2]$

$2-misol:\ |x^2-5x| = -x^2+5x$
$x^2-5x \le 0$
$x(x-5) \le 0$
$javob: [0;5]$

VII. $|x-a|+|x-b|+|x-c| = d$ ko'rinishdagi tenglamalarni yechish.

Bunday tenglamalarni yechish uchun a, b va c nuqtalar yordamida sonlar o'qini oraliqlarga ajratamiz.Aytaylik a<b<c bo'lsin, bunda 4 ta oraliq hosil bo'ladi: 1) $(-\infty;a)$ 2) $[a;b)$ 3) $[b;c)$ 4) $[c;\infty)$ berilgan tenglama har bir oraliqda alohida-alohida yechiladi.

Tenglamani biror oraliqda yechish degani o'sha oraliqdan biror son tanlov x ning o'rniga o'sha sonni qo'yganda har bir modul ichidagi qiymat musbat yoki manfiyligini aniqlab,modulni ochib hosil bo'lgan tenglama yechiladi va topilgan ildiz qaralayotgan oraliqda tegishli bo'lsa, javobga kiritiladi. Aks holda chet ildiz sifatida tashlab yuboriladi. Barcha oraliqlar uchun shu ish takrorlanadi.

1-eslatma: Mabodo tenglamani biror oraliqda yechayotganimizda x lar yo'qolib to'g'ri sonli tenglik hosil bo'lsa, o'sha qaralayotgan oraliqdagi barcha sonlar yechim bo'ladi.

$1-misol:\ |x+3|+|x-7|-|x-3| = 9$ *tenglamani yeching.*

1) $x<3$ bo'lsin
$-x-3-x+7+x-3=9$
$-x=8 \qquad x=-8$

2) $-3 \le x < 3$ bo'lsin
$x+3-x+7+x-3=9$
$x=2$

3) $3 \le x < 7$
$x+3-x+7-x+3=9$
$-x=-4 \qquad x=4$

4) $x \ge 7$
$x+3+x-7-x+3=9$
$x=10$

$javob: -8;\ 2;\ 4;\ 10$

O'quvchilar mavzuni qay darajada tushunganini bilish uchun "Soyasini top" metodidan foydalanamiz.

"Soyasini top" metodi uchun savollar:

$a)\ |x-2|=0;$ $b)\ |3-4x|=0;$ $c)\ |4x+3|=2;$

$d)\ \left|\frac{3}{4}x-\frac{1}{2}\right|=\frac{1}{4};$ $e)\ |x|=2{,}1;$ $f)\ |3-x|=8;$

$g)\ |3-4x|=3;$ $h)\ \left|\frac{2}{3}x+\frac{1}{6}\right|=\frac{1}{3};$ $i)\ |3x-5|=5.$

$j)\ |x-1|=3{,}4;$ $k)\ |1-x|=2{,}4;$ $l)\ |1-2x|=5;$

$m)\ |x-1|=|x-2|;$ $n)\ |x-5|=|x-8|;$ $o)\ |x+1|=|x-2|;$

$p)\ |x+3|=|x-5|;$ $q)\ |x+3|=|x+7|;$ $r)\ |x+6|=|x+10|.$

1-rasm. "Soyasini top" metodini namunaviy ko'rinishi

Xulosa. Akademik litseylarda modulli tenglamalarni o'qitishda yangi pedagogik texnologiyalarni qo'llash ta'lim samaradorligini oshirishning muhim omillaridan biri hisoblanadi. Interfaol metodlar va zamonaviy axborot-kommunikatsiya vositalari yordamida tashkil etilgan darslar o'quvchilarning mavzuni chuqurroq anglashiga, mustaqil yechim topish ko'nikmalarining shakllanishiga hamda matematik tafakkurning rivojlanishiga xizmat qiladi. Shuningdek, modulli tenglamalarni bosqichma-bosqich tahlil qilish, grafik usul, test texnologiyalari va differensial yondashuvdan foydalanish o‘quvchilarning bilim darajasini hisobga olgan holda individual rivojlanishni ta’minlaydi. Natijada, o‘quvchilar nafaqat tenglamalarni mexanik yechish, balki ularning mantiqiy mohiyatini anglash darajasiga erishadilar. Demak, modulli tenglamalarni o‘qitishda innovatsion pedagogik texnologiyalarni keng joriy etish ta’lim sifatini oshirish va raqobatbardosh bilimli yoshlarni tarbiyalashda muhim ahamiyat kasb etadi [1][2][3][6].

Foydalanilgan adabiyotlar

1. John Dewey. Democracy and Education. — New York: Macmillan, 1916.
2. Mikhail Klarin. Pedagogicheskaya texnologiya v uchebnom protsesse. — Moskva, 1989.
3. Viktor Shatalov. Pedagogik tajriba va ilg‘or metodlar. — Kiev, 1980.
4. O‘zbekiston Respublikasi “Ta’lim to‘g‘risida”gi Qonuni. — Toshkent, 2020.
5. Matematika fanidan akademik litseylar uchun o‘quv dasturi. — Toshkent, 2022.
6. Zamonaviy pedagogik texnologiyalar asoslari. — Toshkent: O‘qituvchi nashriyoti, 2019.