GALAXY INTERNATIONAL INTERDISCIPLINARY RESEARCH JOURNAL (GIIRJ)
ISSN (E): 2347-6915
Vol. 11, Issue 04, April (2023)

ELEMENTARY MATHEMATICS IN THE COURSE " MODULAR INEQUALITIES SOLUTION " TOPIC OF TEACHING GOALS

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ABSTRACT

Inequalities department of mathematics main meaningful from directions is one Inequalities function concept with directly depends has been issues both in learning and other many It is also used in concepts .

Main common of education state education standard " Mathematics " subject learning results the following reflection to continue need states :

- study mathematician the text with performance (analysis to do , necessary information get), math terminology and from symbols used without own thoughts sure and qualified expression reach ability develop , implement increase , classify , logical justification ;

-from a natural number real to the thighs until numbers and digital systems about ideas work output ; oral , written , instrumental calculation skills assimilation ;

- of algebra symbolic language mastery of expressions one different to change done increase methods , equations solving , equations systems , inequalities and inequalities systems , in algebra real situations modeling , algebra apparatus using built models learning , the result interpretation to do ability ;

- functional concepts system mastering skills development ;

- solve for functional-graphic from images use.

School students main and deep in degrees education successful continue carry on opportunity when provided the following learning opportunity have will be :

- concepts with work : inequality , inequality solving inequalities identification areas , inequalities systems ;

- whole and fraction rational inequalities intervals method using solve;

- parameterized linear inequalities solve;

- textual issues solve for linear inequalities system make up and solve;

- received of results reliability assessment done increase , other study sciences issues in solving linear inequalities systems solve;

- given real situation or practical of the matter mathematician model make up for belongs to inequalities or their systems make up;

- inequality or their system in solving received the result given real situation or in the context of a practical problem interpretation do it get.

Students in schools education deep level successful continue if they make different in topics issues solution to do they learn as well as daily situations use opportunity have will be :

- concepts with free work : inequality , equal strong inequalities ;

- various different inequalities and their systems solve;

- inequalities and their system of solving different methods mastering , solving method choose and the selection justification ;
- fraction rational and irrational expressions own into received inequalities solve for intervals method use;
- parameterized algebraic inequalities and their systems algebraic and graph method solve;
- inequalities to prove different methods study;
- inequalities or inequalities system with given collections in the plain describe;

General education mathematics in 2017 of schools in the textbook to the students module that's all by the modulus of the number explained . In the textbook modular the equation to solve numbers axis describe the way explained in the 6th grade textbook 3 hours on the subject of the module of the number separated .

General education of schools SH.A.Alimov, O.R.Kholmuhamedov, M.A.Mirzaahmedov in the 8th grade algebra textbook modular equations and inequalities topic for 3 hours separated. In the textbook about the modulus of the number concepts , count module numbers axis describing taught. Modular equation and of inequalities simple in appearance examples given .

Inequalities how solution to do to teach according to instructions common medium 8th grade algebra textbook of the school for methodical in recommendations teacher the following to the rules action to do need :

- new concept learning for motivation to give
- from students to understand demand to do , words memorize it's not definitions ;
- him solution to do and design the most simple and reasonable method search;
- to students independent respectively discover to do opportunity give , but one of time in itself this the process organize reach and control to do
- student on the board something task when you take off , har one to the movement comment ask;
- under study minimum level of knowledge check for tests transfer.

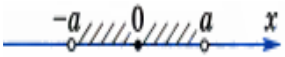
Modular inequality solve algorithm modular equations solve to the algorithm than much complicated because of the solution last stage unknown hint account get need _ From this except from Eq different as , the inequality to individual solutions have not solutions to the collection have. On the thigh axis of inequality solutions of the collection geometric image students for usual not , but very necessary and especially useful _ inequalities system in solving The equation solution , solution to Eq take go to put the way with checked , of the inequality the solution while this way checking it won't be . " Inequality " is the topic of the algebra course all topics with closely depend. That's it with together , module with inequality graph way solve and two of the function graphics as seeing exit possible and this on the ground of algebra another many components already connected . " Modular "Inequalities " topic from learning main the goal is this inequalities solve methods is mastery .

"Module symbol under the unknown own into received inequalities ” section inequalities of solving one how much methods analysis done. Material from the explanation before $y=|x|, y=|x-a|, y=|x-a|$ function graph draw , of the modulus of the number definition repetition to the goal is appropriate .

Of the module geometric to the interpretation based on method students for the most of the difficult ones is one Theoretical the material schedule offer it is done while in students skill

harvest to be until this method according to module using inequalities in solving hint will be Students to their notebooks helper table they write and from him the material in strengthening they use.

New the material learning level helper table .

Inequality	Geometric meaning	Numbers in line interpretation to do	Answer
$\lvert x\rvert < 0$ $(a > 0)$	x coordinate point from scratch smaller to the distance take thrown a units		$-a < x < a,$ $x \in (-a;a)$
$\lvert x\rvert > 0$ $(a < 0)$	x coordinate point from scratch bigger to the distance take thrown a compounds		$x > a$ or $x < -a$ $x \in (-\infty;-a) \cup (a;+\infty)$

It is important to draw students' attention to the fact that in problems where two modules are compared along with a solution using module expansion by definition, it is useful to square both parts of the inequality (this transformation will lead to an equivalent inequality, since both parts of the original inequality are obviously non-negative). It is worth drawing the attention of students to the fact that timely observation of the received expressions can simplify the solution of the problem.

An example for , if in the inequality unknown x has been one how many inequalities there is if , then we x of all values mean we hold their each one this of conditions each one satisfies .. For example , if in the collection unknown x has been one how many inequalities there is if , then we x of all values we understand, theirs each one this from the conditions at least one satisfies .

Inequalities in solving module each always need , first in line and the left of the inequality right in parts which functions that there is analysis will be done because sometimes module to the definition based on right linear solution instead of , sometimes inequality equal to to the degree raise can _

Example 1 . $1+\sin x > \lvert\cos x\rvert$ inequality take off

Solving . R of the set each one at the point both function $f(x) = 1+\sin x$ and $g(x) = \lvert\cos x\rvert$ Minus no , that's it for $1+\sin x > \lvert\cos x\rvert$ inequality $(1+\sin x)^2 > \cos^2 x$ to inequality equivalent. From this of the sum of two numbers square formula we use :

$$1+2\sin x+\sin^2 x > \cos^2 x .$$

From this then , main trigonometric from the facts using inequality right on the side expression to the left take let's go the following expression harvest will be :

$$2\sin x(1+\sin x)>0.$$

$t(t+1)>0$ inequality $t>-1$ and $t>0$ to solutions have that it was because of $1+\sin x>|\cos x|$ of inequality solutions $\sin x<-1$ and $\sin x>0$ of inequalities all solutions in the union consists of will be These inequalities the first one to the solution have not the second of inequality the solution $(2\pi;\pi+2\pi k), k\in Z$.

So ,$1+\sin x>|\cos x|$ of inequality the solution $(2\pi;\pi+2\pi k), k\in Z$ will be

Answer : $(2\pi;\pi+2\pi k), k\in Z$ _

You also need to be careful when solving a fractional-rational inequality with a modulus. Our recommendations focus on inequalities in which you can get rid of the denominator by multiplying by a function that is positive and is defined in the same place as the original functions.

Example 2 . $\frac{\sqrt{x^2+1}-|\cos x|}{\sqrt{2x}+|\cos x|}>\frac{\sqrt{2x}-|\cos x|}{\sqrt{x^2+1}+|\cos x|}$

Solving . $\frac{\sqrt{x^2+1}-|\cos x|}{\sqrt{2x}+|\cos x|}>\frac{\sqrt{2x}-|\cos x|}{\sqrt{x^2+1}+|\cos x|}$ of inequality identification field $x\geq 0$. Inequality the denominator $q(x)=(2x+|\cos x|)\left(\sqrt{x^2+1}+|\cos x|\right)$ let's define and it is positive , therefore for $\frac{\sqrt{x^2+1}-|\cos x|}{\sqrt{2x}+|\cos x|}>\frac{\sqrt{2x}-|\cos x|}{\sqrt{x^2+1}+|\cos x|}$ inequality each two side $q(x)$ to the function if we multiply , $\frac{\sqrt{x^2+1}-|\cos x|}{\sqrt{2x}+|\cos x|}>\frac{\sqrt{2x}-|\cos x|}{\sqrt{x^2+1}+|\cos x|}$ inequality $\left(\sqrt{x^2+1}\right)^2-(|\cos x|)^2>\left(\sqrt{2x}\right)^2-(|\cos x|)^2$ to inequality equivalent that known will be

Harvest has been inequality to the square increasing inequality right on the side expressions to the left take transfer as a result $x^2-2x+1>0$ inequality harvest will be Inequality solutions collection $x\in(-\infty;1)\cup(1;+\infty)$. Above said identification to the field attention if we give , of inequality the solution $x\in[0;1)\cup(1;+\infty)$ will be

Answer : $x\in[0;1)\cup(1;+\infty)$ _

Also, the author of this manual gives an interesting solution for the inequality with special types of modules: $|f(x)|+|g(x)|\leq f(x)+g(x)\Leftrightarrow\begin{cases}f(x)\geq 0\\ g(x)\geq 0.\end{cases}$

Example 3. Inequality take off $|x^2-4x+3|+|x-4|-x^2+5x-7\leq 0$

Solving . Inequality as follows again is written :

$$|x^2-4x+3|+|4-x|\leq(x^2-4x+3)+(4-x)$$

To the above according to $|x^2-4x+3|+|4-x|\le(x^2-4x+3)+(4-x)$ inequality $\begin{cases}x^2-4x+3\ge 0;\\4-x\ge 0\end{cases}$ to the system is equivalent . $\begin{cases}x^2-4x+3\ge 0;\\4-x\ge 0\end{cases}$ inequalities system if we solve , the first of the system solutions $x\in(-\infty;1]\cup[3;\infty)$ will be Second of inequality the solution $x\in(-\infty;4]$ will be Inequalities of the system all solutions two the interval organize does : $(-\infty;1]$ and $[3;4]$. So , tensions to the system equivalent of inequality solutions collection too $(-\infty;1]\bigcup[3;4]$ will be

Answer : $x\in(-\infty;1]\bigcup[3;4]$_

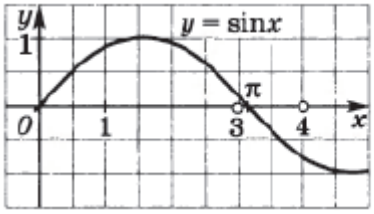
We note that "in those cases when, when the inequality is freed from the sign of the modulus, the coordinate axis is divided into an infinite number of intervals, it can be useful to go over to a set of systems equivalent to the original inequality . Let's illustrate this with an example.

Example 4. $|\sin x|+\sin x\left(x^2-7x+11\right)>0$ inequality take off

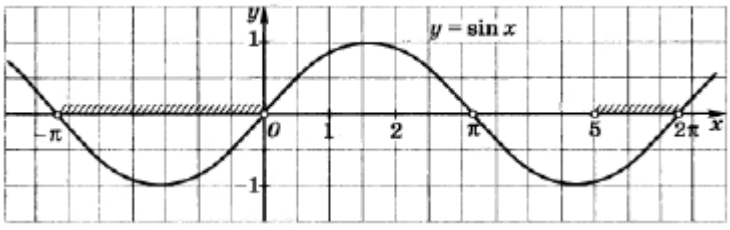
Solving . $\sin x=0$ equality right has been x of the thighs never one of inequality the solution not, So and inequality two of the system to the combination is equal .

$$\begin{cases}\sin x>0\\1+x^2-7x+11<0\end{cases}\text{ and }\begin{cases}\sin x<0\\-1+x^2-7x+11>0\end{cases}$$

First of the system second inequality solutions set (3 ;4). Of them this of the system the first inequality only x from is satisfied $(3;\pi)$. Second of the system second inequality many to solutions have $(-\infty;2)\bigcup(5;+\infty)$ and this of the system the first inequality one series are spaces $(\pi+2\pi n;2\pi+2\pi n),n\in Z$



So , second Don't want to solutions collection $(5;2\pi)$ and $(\pi+2\pi n;2\pi+2\pi n),n\in Z,n\neq 0$.



So , inequality solutions collection $(3;\pi)va(5;2\pi)$ from intervals and one series from intervals $(\pi+2\pi n;2\pi+2\pi n),n\in Z,n\neq 0$.

Answer . $(3;\pi)va(5;2\pi)$ and $(\pi+2\pi n;2\pi+2\pi n),n\in Z,n\neq 0$

If, when considering an inequality, it turns out that both its parts are defined on a set consisting of one or more numbers, then there is no need to carry out any transformations of

the inequality equation, it is enough to check whether each of these numbers is a solution to this inequality or not.

Before sorting out the seemingly cumbersome tasks from the textbook, you can invite students to solve the following example:

Example 5. $\left(\sqrt{x^2-81}+2\right)\log_3|x|+\frac{9}{x}\left(\sqrt{81-x^2}+1\right)>4$ inequality take off

Solving . Inequality both part three provided is determined ; $x^2-81\geq 0, 81-x^2\geq 0$ and $x\neq 0$. These conditions only two number satisfies : $x_1=9, x_2=-9$. Check that's it shows that the number 9 $\left(\sqrt{x^2-81}+2\right)\log_3|x|+\frac{9}{x}\left(\sqrt{81-x^2}+1\right)>4$ of inequality solution , but number -9 not. That's it for of inequality the solution $x=9$ will be

Answer : $x=9$

Thus, in order to improve the quality of mathematical education of schoolchildren when teaching them to solve inequalities with a module in the lessons in an in-depth course of mathematics in a general education school, a teacher needs to: consider various types of inequalities with a module and methods for solving them; identify effective methods of explaining the material; to motivate students to study methods for solving inequalities with a module, focusing on the practical application of the acquired knowledge and skills; demonstrate the competent design of solutions to these inequalities; use tasks for independent work and be able to organize it.

To successfully solve any inequality with a module, a graduate of a general education school must: know various types of inequalities from a school mathematics course and be able to solve them; know the main types of inequalities with a modulus and the main methods for solving them; systematically solve a sufficient amount of problem material to consolidate the ability to apply a certain method for solving an inequality with a module for a specific type of inequality with a module.

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