International Journal of Trend in Scientific Research and Development (IJTSRD)
Volume 5 Issue 6, September-October 2021 Available Online: www.ijtsrd.com e-ISSN: 2456 – 6470

The Use of Logic Science Elements in the Preparation of Students with Creative Abilities

K. B. Mamadaliyev, B. K. Mamadaliyev
Andijan State University, Andijan, Uzbekistan

ABSTRACT
This article explains the importance of using the algebraic formulas of predicates in teaching students proof of theorems and solution of inequalities. From the examples and theorems presented in the article, it is possible to use them not only in teaching the exercises of the algebraic of predicates, but also in working with students with creative abilities, and also in organizing classes on the subject of mathematics in circles.

How to cite this paper: K. B. Mamadaliyev | B. K. Mamadaliyev "The Use of Logic Science Elements in the Preparation of Students with Creative Abilities" Published in International Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456-6470, Volume-5 | Issue-6, October 2021, pp.1601-1604, URL: www.ijtsrd.com/papers/ijtsrd47691.pdf

IJTSRD47691

The science of mathematics is studied and developed on the basis of the laws of mathematical logic. In this case, the science of mathematical logic is not taught as a separate science in secondary schools. Although elements of mathematical logic are partially included in the textbooks of Mathematics, its applications are not sufficiently covered. As a result, students are faced with many difficulties in an in-depth study of the theoretical foundations of mathematical science, solving equations and inequalities, especially in proving theorems. Taking this into account, in this article we will consider the applications of the algebra of predicates to solve the system of inequalities and inequalities, as well as to prove theorems

In the study of the application of algebraic predicates, it is important to know its equivalent formulas. Let's mention the main equivalent formulas of algebraic predicates:

$$P(x)\wedge(S(x)\vee Q(x)) \equiv P(x)\wedge S(x)\vee P(x)\wedge Q(x) \quad (1)$$

$$P(x)\vee S(x)\wedge Q(x) \equiv (P(x)\vee S(x))\wedge(P(x)\vee Q(x)) \quad (2)$$

$$\overline{P(x)\wedge S(x)} \equiv \bar{P}(x)\vee\bar{S}(x) \quad (3)$$

$$\overline{P(x)\vee S(x)} \equiv \bar{P}(x)\wedge\bar{S}(x) \quad (4)$$

$$P(x) \Longrightarrow S(x) \equiv \bar{P}(x)\vee S(x) \quad (5)$$

$$P(x) \Longrightarrow S(x) \equiv \bar{S}(x) \Longrightarrow \bar{P}(x) \quad (6)$$

$$P(x) \Leftrightarrow S(x) \equiv P(x)\wedge S(x)\vee\bar{P}(x)\wedge\bar{S}(x) \quad (7)$$

$$P(x) \Leftrightarrow S(x) \equiv \left(\bar{P}(x)\vee S(x)\right)\wedge\left(\bar{S}(x)\vee P(x)\right) \quad (8)$$

Since inequalities consist of predicates, the question of solving inequalities comes to the question of finding the sphere of truth of the predicate. Let P(x) and S(x) be the predicates defined in an M set. We denote the areas of truth of these predicates with E_p and E_s respectively, the denominator of the predicate P(x) and the collection $M\backslash E_p$with $\overline{E_p}$.We use the following formulas when finding the areas of the predicate $\bar{P}(x)$, $P(x)\vee S(x)$, $P(x)\wedge Q(x)$, $P(x) \Longrightarrow S(x)$ and $P(x) \Leftrightarrow S(x)$ in the predicate.

$$E_{\bar{p}} = \bar{E}_p. \quad (9)$$

$$E_{p\vee s} = E_p \cup E_s. \quad (10)$$

$$E_{p\wedge s} = E_p \cap E_s. \quad (11)$$

$$E_{p\Rightarrow s}=\overline{E_p}\cup E_s \qquad (12)$$

$$E_{p\Leftrightarrow s}=(E_p\cap E_s)\cap(\bar{E}_p\cap\bar{E}_s) \qquad (13)$$

$$E_{p\Leftrightarrow s}=(\bar{E}_p\cup E_s)\cap(\bar{E}_s\cup E_p). \qquad (14)$$

Proof of these formulas comes from the definitions of actions on predicates and the above-mentioned equivalent formulas of algebraic predicates [4].

R-let it be a set of real numbers.

1-example. x^2-$4x$-$5<0$ predicate in R set is given. Find the area of its truthfulness.

Solution. We mark the given predicate with P(x), the sphere of its truthfulness with E_p. Thus,$P(x)\equiv(x^2-4x-5<0)\equiv((x+1)(x-5)<0)\equiv$

$\equiv(x+1<0)\wedge(x-5>0)\vee(x+1>0)\wedge(x-5<0)\equiv$

$\equiv(x<-1)\wedge(x>5)\vee(x>-1)\wedge(x<5)$, From this and (10), (11) we find,

$E_p=(-\infty;-1)\cap(5;\infty)\cup(-1;\infty)\cap(-\infty;5)=\emptyset\cup(-1;5)=(-1;5)$.

Answer:$E_p=(-1;5)$.

2-example. $P(x)$=(x^2-x-20>0) predicate in R set is given. Find the area of its truthfulness.

Solution.$P(x)\equiv(x^2-x-20>0)\equiv((x+4)\cdot(x-5)>0)\equiv$

$\equiv(x+4<0)\wedge(x-5<0)\vee(x+4>0)\wedge(x-5>0)\equiv$

$\equiv(x<-4)\wedge(x<5)\vee(x>-4)\wedge(x>5)$, From this and (10), (11) we find,

$E_p=\{x\in R|x<-4\}\cap\{x\in R|x<5\}\cup$

$\cup\{x\in R|x>-4\}\cap\{x\in R|x>5\}=(-\infty;-4)\cap(-\infty;5)\cup$

$\cup(-4;\infty)\cap(5;\infty)=(-\infty;-4)\cup(5;\infty)$.

Answer:$E_p=(-\infty;-4)\cup(5;\infty)$.

3-example.$P(x)=\left(\frac{2x+6}{5x-10}\leq 0\right)$predicate in R set is given. Find the area of its truthfulness.

Solution.$(x)=\left(\frac{2x+6}{5x-10}\leq 0\right)\equiv(2x+6\leq 0)\wedge(5x-10>0)\vee$

$\vee(2x+6\geq 0)\wedge(5x-10<0)\equiv(x\leq -3)\wedge(x>2)\vee(x\geq -3)\wedge(x<2)$.

From this and (10), (11) we find,$E_p=\{x\in R|x\leq -3\}\cap\{x\in R|x>2\}\cup\cup\{x\in R|x\geq -3\}\cap\{x\in R|x<2\}=(-\infty;-3]\cap(2;\infty)\cup[-3;\infty)\cap$ $\cap(-\infty;2)=\emptyset\cup[-3;2)=[-3;2)$. Answer:$E_p=[-3;2)$.

4-example.$P(x)$=(|x-2|<3) predicate in R set is given. Find the area of its truthfulness.

Solution.$P(x)=(|x-2|<3)\equiv(x-2<3)\wedge(x-2>-3)\equiv$

$\equiv(x<5)\wedge(x>-1)$. From this and (11),

$E_p=\{x\in R|(x<5)\wedge(x>-1)\}=\{x\in R|x<5\}\cap\{x\in R|x>-1\}=$

$=(-\infty;5)\cap(-1;\infty)=(-1;5)$. Answer:$E_p=(1;5)$.

5-example. $P(x)=(|2x+6|\geq 4)$predicate in R set is given. Find the area of its truthfulness.

Solution.$P(x)=(|2x+6|\geq 4)\equiv(2x+6\geq 4)\vee(2x+6\leq -4)\equiv$

$\equiv(2x\geq -2)\vee(2x\leq -10)\equiv(x\geq -1)\vee(x\leq -5)$. From this and (11),

$E_p=\{x\in R|(x\geq -1)\vee(x\leq -5)\}=\{x\in R|x\geq -1\}\cup\{x\in R|x\leq -5\}=$

$=[-1;\infty)\cup(-\infty;-5]=(-\infty;-5]\cup[-1;\infty)$,

Answer:$E_p=(-\infty;-5]\cup[-1;\infty)$.

6-example. R is given the predicates $(x)=(x^2-x\leq 0)$and $(x)=(x\leq\sqrt{x})$, which are determined in the set. $E_p=?$, $E_s=?$, $E_{p\wedge s}=?$, $E_{p\vee s}=?$, $E_{p\Rightarrow s}=?$, $E_{s\Rightarrow p}=?$, $E_{p\Leftrightarrow s}=?$ Find.

Solution. (9) - (14) we use formulas.

$E_p=\{x\in R|x^2-x\leq 0\}=\{x\in R|x(x-1)\leq 0\}=\{x\in R|(x\leq 0)\wedge$

$\wedge(x-1)\geq 0\}\vee(x-1\leq 0)\wedge(x\geq 0)\}=\{x\in R|x\leq 0\}\cap\{x\in R|x\geq 1\}\cup$

$\cup\{x\in R|x\leq 1\}\cap\{x\in R|x\geq 0\}=(-\infty;0]\cap[1;\infty)\cup(-\infty;1]\cap[0;\infty)=$

$=\emptyset\cup[0;1]=[0;1]$; $E_p=[0;1]$.

$E_s=\{x\in R|x\leq\sqrt{x}\}=\{x\in R|(x\geq 0)\wedge(x^2\leq x)\}=\{x\in R|x\geq 0\}\cap$

$\cap\{x\in R|x(x-1)\leq 0\}=[0;\infty)\cap[0;1]=[0;1]$. $E_s=[0;1]$.

$E_{p\wedge s}=E_p\cap E_s=[0;1]\cap[0;1]=[0;1]$

$E_{p\vee s}=E_p\cup E_s=[0;1]\cup[0;1]=[0;1]$

$E_{p\Rightarrow s} = \bar{E}_p \cup E_s = (-\infty;0) \cup (1;\infty) \cup [0;1] = (-\infty;\infty)$.

$E_{s\Rightarrow p} = (-\infty;\infty)$. $E_{p\Leftrightarrow s} = E_{p\Rightarrow s} \cap E_{s\Rightarrow p} = (-\infty;\infty)$.

The following theorems can be used in teaching students how to solve proof-of-concept issues using equivalent formulas of predicate algebra.

1. theorem. $(\forall x \in R)(x^2 \leq x \Rightarrow x \leq \sqrt{x})$.
2. theorem. $(\forall x \in R)(x \leq \sqrt{x} \Rightarrow x^2 \leq x)$.
3. theorem. $(\forall x \in R)(x \leq \sqrt{x} \Leftrightarrow x^2 \leq x)$.
4. theorem. $(\forall x \in \mathcal{M})(P(x) \Rightarrow S(x)) \Rightarrow (E_p \subset E_s)$.
5. theorem. $E_p \subset E_s \Rightarrow (\forall x \in \mathcal{M})(P(x) \Rightarrow S(x))$.
6. theorem. $(\forall x \in \mathcal{M})(P(x) \Leftrightarrow S(x)) \Rightarrow (E_p = E_s)$.
7. theorem. $(E_p = E_s) \Rightarrow (\forall x \in \mathcal{M})(P(x) \Leftrightarrow S(x))$.

This is easily proved by the method of hypothesis of the opposite of theorems. We are limited to bringing proof of the 7-theorem.

Proof. We use the method of hypothesis from the opposite.

$$\overline{(\forall x \in \mathcal{M})\big(P(x) \Leftrightarrow S(x)\big)} \equiv (\exists x \in \mathcal{M})\overline{(P(x) \Leftrightarrow S(x))} \equiv$$

$$\equiv (\exists x \in \mathcal{M})\overline{(P(x) \wedge S(x) \vee \bar{P}(x) \wedge \bar{S}(x))} \equiv$$

$$\equiv (\exists x \in \mathcal{M})\big(\big(\bar{P}(x) \vee \bar{S}(x)\big) \wedge \big(P(x) \vee S(x)\big)\big) \equiv$$

$$\equiv (\exists x \in \mathcal{M})(\bar{P}(x) \wedge S(x) \vee \bar{S}(x) \wedge P(x)),$$

$$(\exists x \in \mathcal{M})((\bar{P}(x) \wedge S(x) = 1) \vee (\bar{S}(x) \wedge P(x) = 1)) \equiv$$

$$(\exists x \in \mathcal{M})((\bar{P}(x) = 1) \wedge (S(x) = 1) \vee (\bar{S}(x) = 1) \wedge (P(x) = 1)) \equiv$$

$$(\exists x \in \mathcal{M})((P(x) = 0) \wedge (S(x) = 1) \vee (S(x) = 0) \wedge (P(x) = 1)) \equiv$$

$$(\exists x \in \mathcal{M})\big(\big(\overline{x \in E_p}\big) \wedge (x \in E_s) \vee \big(\overline{x \in E_s}\big) \wedge \big(x \in E_p\big)\big) \Rightarrow$$

$\Rightarrow \overline{E_p = E_s} \Rightarrow E_p \neq E_s$. The theorem was proof.

8- theorem. $E_{p\Leftrightarrow s} = (E_p \cap E_s) \cap (\bar{E}_p \cap \bar{E}_s)$

Proof. x element $E_{p\Leftrightarrow s}$ balllamga get the appropriate optional element.

$$\Rightarrow P(x) \wedge S(x) \vee \bar{P}(x) \wedge \bar{S}(x) = 1 \Rightarrow$$

$$\Rightarrow (P(x) \wedge S(x) = 1) \vee (\bar{P}(x) \wedge \bar{S}(x) = 1) \Rightarrow$$

$$\Rightarrow (P(x) = 1) \wedge (S(x) = 1) \vee (\bar{P}(x) = 1) \wedge (\bar{S}(x) = 1) \Rightarrow$$

$$\Rightarrow (x \in E_p) \wedge (x \in E_s) \vee (x \in E_{\bar{p}}) \wedge (x \in E_{\bar{s}}) \Rightarrow$$

$$\Rightarrow (x \in E_p \cap E_s) \vee (x \in \bar{E}_p) \wedge (x \in \bar{E}_s) \Rightarrow$$

$$\Rightarrow (x \in E_p \cap E_s) \vee (x \in \bar{E}_p \cap \bar{E}_s).$$

$x \in E_p \cap E_s \cup \bar{E}_p \cap \bar{E}_s$.

$$(x \in E_p \cap E_s) \vee (x \in \bar{E}_p \cap \bar{E}_s) \Rightarrow$$

$$\Rightarrow (x \in E_p) \wedge (x \in E_s) \vee (x \in \bar{E}_p) \wedge (x \in \bar{E}_s) \Rightarrow$$

$$\Rightarrow (P(x) = 1) \wedge (S(x) = 1) \vee (x \in E_{\bar{p}}) \wedge (x \in E_{\bar{s}}) \Rightarrow$$

$$\Rightarrow (P(x) = 1) \wedge (S(x) = 1) \vee (\bar{P}(x) = 1) \wedge (\bar{S}(x) = 1) \Rightarrow$$

$$\Rightarrow (P(x) \wedge S(x) = 1) \vee (\bar{P}(x) \wedge \bar{S}(x) = 1) \Rightarrow$$

$$\Rightarrow P(x) \wedge S(x) \vee \bar{P}(x) \wedge \bar{S}(x) = 1.$$

$P(x) \Leftrightarrow S(x) = 1 \Rightarrow x \in E_{p\Leftrightarrow s}$. The theorem was proof.

9-theorem. $E_{p\Leftrightarrow s} = (\bar{E}_p \cup E_s) \cap (\bar{E}_s \cup E_p)$.

Proof. $\big(\bar{P}(x) \vee S(x)\big) \wedge \big(\bar{S}(x) \vee P(x)\big) = 1 \Rightarrow$

$$\Rightarrow (\bar{P}(x) \vee S(x) = 1) \wedge (\bar{S}(x) \vee P(x) = 1) \Rightarrow$$

$$\Rightarrow ((\bar{P}(x) = 1) \vee (S(x) = 1)) \wedge ((\bar{S}(x) = 1) \vee (P(x) = 1)) \Rightarrow$$

$$\Rightarrow \big(\big(x \in E_{\bar{p}}\big) \vee (x \in E_s)\big) \wedge \big((x \in E_{\bar{s}}) \vee \big(x \in E_p\big)\big) \Rightarrow$$

$$\Rightarrow \big(\big(x \in \bar{E}_p\big) \vee (x \in E_s)\big) \wedge \big((x \in \bar{E}_s) \vee \big(x \in E_p\big)\big) \Rightarrow$$

$$\Rightarrow (x \in \bar{E}_p \cup E_s) \wedge (x \in \bar{E}_s \cup E_p) \Rightarrow x \in (\bar{E}_p \cup E_s) \cap (\bar{E}_s \cup E_p).$$

$x \in (\bar{E}_p \cup E_s) \cap (\bar{E}_s \cup E_p)$,

$$x \in (\bar{E}_p \cup E_s) \cap (\bar{E}_s \cup E_p) \Rightarrow (x \in \bar{E}_p \cup E_s) \wedge (x \in \bar{E}_s \cup E_p) \Rightarrow$$

$$\Rightarrow \big(\big(x \in \bar{E}_p\big) \vee (x \in E_s)\big) \wedge \big((x \in \bar{E}_s) \vee \big(x \in E_p\big)\big) \Rightarrow$$

$$\Rightarrow \big(\big(x \in E_{\bar{p}}\big) \vee (x \in E_s)\big) \wedge \big((x \in E_{\bar{s}}) \vee \big(x \in E_p\big)\big) \Rightarrow$$

$$\Rightarrow ((\bar{P}(x) = 1) \vee (S(x) = 1)) \wedge ((\bar{S}(x) = 1) \vee (P(x) = 1)) \Rightarrow$$

$$\Rightarrow (\bar{P}(x) \vee S(x) = 1) \wedge (\bar{S}(x) \vee P(x) = 1) \Rightarrow$$

$$\Rightarrow \big(\bar{P}(x) \vee S(x)\big) \wedge \big(\bar{S}(x) \vee P(x)\big) = 1.$$

$(P(x) \Leftrightarrow S(x) = 1) \Rightarrow x \in E_{p\Leftrightarrow s}$.The theorem was proof.

Of the examples and issues discussed above, it is possible to use them in teaching students the application of predicate algebra. The students are taught the laws of the science of mathematical logic, the rules of derivation, equivalent formulas and their applications in depth and in detail, their ability to solve problematic situations quickly and without errors develops.

Used literature

[1] K. B. Mamadaliyev, B. K. Mamadaliyev. Use of Elements of Predicate Algebra in Solving Proof Problems. Central asian journal of theoretical and applied sciences. Volume: 02 Issue: 08 | Aug 2021 ISSN: 2660-5317. https://cajotas.centralasianstudies.org/index.php/CAJOTAS/article/view/219.

[2] K. B. Mamadaliyev, B. K. Mamadaliyev. Solving problems of applications of collection theory. academicia globe: Inderscience Research. **issn:** 2776-1010 Volume 2, Issue 5, May, 2021. https://agir.academiascience.org/index.php/agir/article/view/126/115