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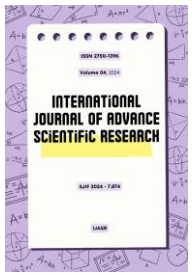

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Research Article

TEACHING TO SOLVE ALGEBRAIC PROBLEMS IN PRIMARY SCHOOL MATHEMATICS LESSONS

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Abstract

This article discusses the process of working with algebraic expressions and preparing students for understanding equations during primary school mathematics lessons. It highlights the teaching methods for introducing students to variable expressions and solving problems involving variables.

Keywords

Algebraic expressions, variable, expressions with variables, equality, equation, root of an equation.

Introduction

In Uzbekistan, significant reforms have been implemented in recent years as part of the Action Strategy and its logical continuation, the Development Strategy. These reforms aim to continuously improve the system of lifelong education, provide quality education, and train qualified personnel, aligning with the practices of developed countries.

As part of the 2022–2026 Development Strategy of New Uzbekistan, mechanisms have been developed to expand access to quality education for children with special needs. Inclusive education has been introduced as a social norm in educational institutions, ensuring equal opportunities for all children.

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In the primary mathematics curriculum, the gradual preparation of students to understand the concept of variables is envisaged (although the term itself is not used in primary grades). This process begins in Grade 1, where students solve "box problems" (e.g., 5+□=75 + □ = 7 or □+□=4□ + □ = 4). In Grade 3, students are introduced to simple equations where letters represent unknown numbers. Additionally, students encounter letters in expressions where they act as variables capable of taking on different numerical values.

By the end of primary school, students should:

1. Understand the meaning of basic algebraic expressions.

2. Calculate the value of expressions by substituting specific values for variables.

3. Solve inequalities, such as determining for which values of aa the inequality 3+a>73 + a > 7 holds true.

Introducing elements of symbolic notation helps students grasp the concept of variables and prepares them to use algebraic methods for problem-solving. In Grades 3–4, special attention is given to solving problems with letters, constructing and comparing algebraic expressions, and solving equations step-by-step.

Teaching Equations:

The process of solving equations involves revisiting earlier material to demonstrate the relationship between components and results in addition and subtraction. Visual aids are often used to reinforce these relationships. For example:

- Students solve equations like x+48=90x + 48 = 90 and x−27=33x - 27 = 33.
- They learn to represent unknown numbers using letters (e.g., aa, bb, cc, etc.).

Teaching Multiplication and Division:

In topics like "Multiplication and Division," students first explore the relationship between components and results in multiplication, followed by division.

Example:

- Place 2 circles on a desk 4 times.
- "How many circles are there in total?" (Answer: 8).
- "What do the numbers in this example represent?" (Multiplier, multiplicand, product).
- Students then formulate division examples based on the arrangement: 8÷2=48 \div 2 = 4 and 8÷4=28 \div 4 = 2. They compare these to the multiplication example and generalize the rule: "If we divide the product by one factor, the other factor is obtained."

This approach helps students gradually understand the relationships between operations and use these relationships to solve equations effectively. For example, when solving certain equations, students analyze the relationships between unknown numbers.

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By introducing these methods in primary school, students build a strong foundation for understanding algebraic concepts, which will be further developed in higher grades.

1	X+280=530 X=530-280 X=250	The addend is unknown. To find the unknown addend, subtract the known addend from the sum.
2	y - 340 = 260 y = 340 + 260 X= 600	The minuend is unknown. To find the unknown minuend, add the subtrahend to the difference.
3	350 - Z - 190 Z = 350 - 190 Z = **160**	The subtrahend is unknown. To find the unknown subtrahend, subtract the difference from the minuend.
4	70*a = 560 a = 560:70 a = 8	The multiplier is unknown. To find the unknown multiplier, divide the product by the known multiplicand.
5	b : 230=4 b=230*4 b=920	The dividend is unknown. To find the unknown dividend, multiply the divisor by the quotient.
6	900:c=50 c=900:50 c = 18	The divisor is unknown. To find the unknown divisor, divide the dividend by the quotient.

Solving Example 1:

Given the equation 27+x=2727 + x = 2727+x=27, the unknown number to be found is represented by the letter xxx.

To solve the equation, determine which value of xxx makes the equality true.

The number is 000, because adding 000 to 272727 results in 272727.

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The solution of the equation is written as follows:

27+x=2727 + x = 2727+x=27

Solution:

x=27−27x = 27 - 27x=27−27 x=0x = 0x=0

Verification:

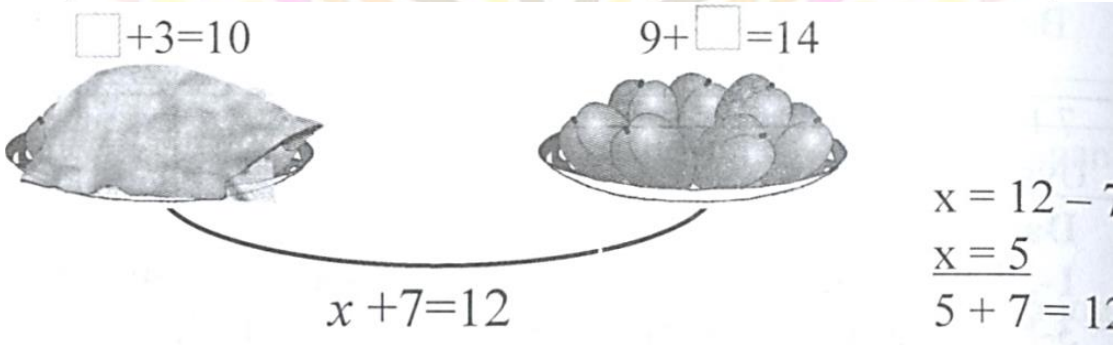
27+0=2727 + 0 = 2727+0=27 27=27(Equality is true).27 = 27 \quad \text{(Equality is true).}27=27(Equality is true).

Solving Example 2 (written):

a) To find the unknown addend, subtract the known addend from the sum:

Unknown addend=Sum−Known addend\text{Unknown addend} = \text{Sum} - \text{Known addend}Unknown addend=Sum−Known addend

7+8=15 15-7=8 15-8=



b) Introducing the Method to Find the Unknown Addend

Example 3 (written): Solving equations and verifying the result.

35+x =70 14+x =24 25+x=50

x=70-35 x=24-14 x = 50-25

x=35 x= 10 x=25

Tek. 35 + 35 = 70 Tek. 14+10 = 24 Tek. 25 + 25 = 50

70 = 70 24 = 24 50 = 50

Using equations to solve problems simplifies many tasks. Solving such problems typically consists of two steps:

Formulating an equation based on the problem's conditions.

Solving the resulting equation.

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Let us solve the following problem using this method:

Problem:

A steamboat carrying tourists departs from a riverside station downstream and must return after 5 hours. The river's current speed is 3 km/h, and the steamboat's speed in still water is 18 km/h. If the tourists rest on the shore for 3 hours before returning, how far did the steamboat travel from the station?

Solution:

1. Let the distance traveled downstream be xxx kilometers.

- The steamboat travels this distance downstream at a speed of 18+3=2118 + 3 = 2118+3=21 km/h, taking $\frac{x}{21}$ hours.
- The steamboat returns upstream at a speed of 18−3=1518 - 3 = 1518−3=15 km/h, taking $\frac{x}{15}$ hours.
- The tourists rest on the shore for 3 hours.

Thus, the total time of the trip is: $(\frac{x}{21} + \frac{x}{15} + 3)$ hours.

According to the problem, the total trip time is 5 hours.

Equation:

$$\frac{x}{21} + \frac{x}{15} + 3 = 5$$

2) Now solving the resulting equation:

$$\frac{x}{21} + \frac{x}{15} = 2$$

By multiplying both sides of the equation by 105 (the least common multiple of 21 and 15), we obtain:

5x+7x=210,12x=2105x + 7x = 210, \quad 12x = 2105x+7x=210,12x=210

From this, x=17.5x = 17.5x=17.5.

Thus, the steamboat traveled 17.5 km from the station.

In the first stage of solving the problem (formulating the equation), it was necessary to understand that the speed of the steamboat and the river's current are added when moving downstream and subtracted when moving upstream. The time taken is equal to the distance divided by the speed.

In the second stage (solving the equation), it was required to apply the properties of equations studied in previous sections.

The correctness of the solution can be verified using the problem's conditions. By considering the found result as known, any other given value

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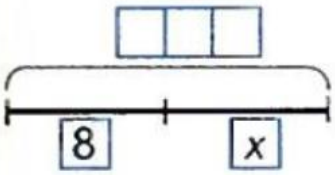
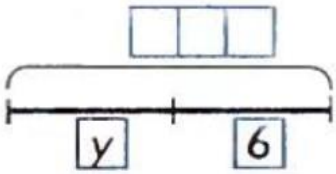
can be calculated. For example, the correctness of the solution can be verified as follows:

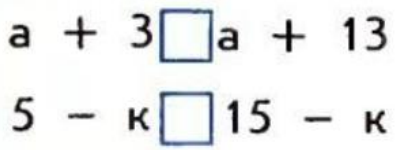
The tourists traveled downstream from the station for 17.5÷21=5/617.5 \div 21 = 5/617.5÷21=5/6 hours. They returned upstream for 17.5÷15=11/617.5 \div 15 = 11/617.5÷15=11/6 hours. Adding these times and the 3-hour rest period gives a total of 555 hours, as stated in the problem conditions.

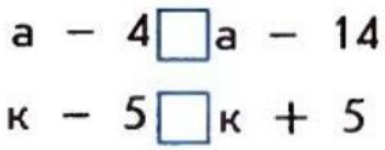
By providing tasks with similar content in primary school mathematics lessons, students can be taught to formulate equations and develop equation-solving skills systematically.





In addition to numerical equalities and inequalities, tasks involving inequalities with variables can also be given.





Solution:

There are x workers in the first workshop.

There are x·5 workers in the second workshop.

There are x+(x+5)=2x +5 workers in the third workshop.

According to the condition:

X+(x·5)+x+(x·5)=624

12·x=624

x=624:12

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x=52

Answer:

- In the first workshop, there are 52 workers.
- In the second workshop, there are 52·5=26052 \cdot 5 = 26052·5=260 workers.
- In the third workshop, there are 260+52=312260 + 52 = 312260+52=312 workers.

Conclusion

Working with algebraic material in primary school mathematics is a crucial process. It involves exploring concepts such as equality and inequality, identities and their transformations, roots of equations, and equivalent equations through examples. These activities help develop students' calculation skills.

The primary school age is an active phase in the development of logical thinking. During this period, children acquire the foundations for analysis, synthesis, generalization, restriction, classification, comparison, abstraction, and other logical operations. These skills form the basis for successfully mastering the general education curriculum.

Regularly incorporating tasks and exercises aimed at developing logical thinking in mathematics lessons enables young learners to approach even the simplest laws of daily life with greater confidence and actively apply their mathematical knowledge in practice.

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