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CALCULATIONS RELATING TO PROPORTIONAL QUANTITIES. WORKING METHODS

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Abstract. *Finding the fourth proportion (according to a simple rule of three parts), proportionality and finding unknown numbers based on two differences, traffic problems, problem solving based on knowledge of the corresponding relationships between quantities.*
Keywords: *proportions, unknown numbers, initial class, problem solving.*

Introduction

Resolution No. 140 of March 15, 2017 of the Cabinet of Ministers of the Republic of Uzbekistan "On Approving the Regulation on General Secondary Education, Resolution No. 187 of April 6, 2017 on Approval of State Educational Standards of General Secondary, Secondary Special, Vocational Education of the Cabinet of Ministers of the Republic of Uzbekistan, President of Uzbekistan Sh. Based on the requirements and content of Mirziyoyev's speech at the celebration of the Day of Teachers and Trainers on October 1, our main task will be to organize teaching processes in a high-quality and efficient manner.

Based on the topic of the article, the following problems related to proportional quantities are made in elementary school: finding the fourth proportion (by the simple three-way rule), proportionality and finding unknown numbers based on two differences. In addition, issues related to movement are considered separately.

The solution of these problems is based on knowing the appropriate relationships between the quantities; For example, if the price, quantity (amount) of a product is known, it can be found by adding the total money (cost), which means that you should consider solving such problems when preparing a successful work. Let's look at the methodology of working with these problems.

Research materials and methodology.

In the problem of finding the fourth proportion, two values of one variable and three corresponding values of one variable are directly or inversely proportional, one constant and two variable. Another variable can be searched for its second value. Using any three proportional quantities, the second value of this variable will be the finder. Using any of the three proportional quantities, you can construct six types of problems to find the fourth proportional.

Table (Table 1) shows the classification of the fourth proportional discovery problems with values such as cost, quantity and total money. As we can see from the table, the first four questions are about direct proportionality of quantities, and the last two questions are about inverse proportionality of quantities.

Table 1

Prob lems	Dimensions			Problems
	Dimensions price	Amount (quantity)	Total cost (value)	

I	Without change	Two values are given	One value is given and the other can be searched	3000 soums were paid for 2 kg of carrots. How much should you pay for 6 kg of carrots at this price?
II	Without change	One value is given and the other can be searched	Two values are given	9000 soums were paid for 6 kilograms of carrots. How many kilograms of carrots can be bought for 3000 soums at this price?
III	Meaning is given	Without change	One value is given and the other can be searched	One meter of fencing material cost 16,000 sums for 2,000 sums, and a long fence cost 8,000 sums. How much is paid for each meter of fencing?
IV	One value is given and the other can be searched	Without change	Two values are given	Silk material costing 4,000 soums per meter was 16,000 soums, and a piece of silk of this length was 8,000 soums. How much is paid for each meter of fencing?
V	Two values are given	One value is given and the other can be searched	Without change	Six children's suits, each of which cost 12,000 soums, were paid for, as well as children's coats, which cost 36,000 soums. How many coats were bought for the children?
VI	One value is given and the other can be searched	Two values are given	Without change	For six children's suits

Search results

Each of these six problems can be solved by finding the value of the constant, that is, you can first find the value of the constant and then use it to find the number you are looking for. For example, the solution of problem I is as follows: 30 : 2 × 6 = 90 (first we know the price of carrots - the set amount, then we know the total amount of 6 kg of carrots). For problems of type I and II, this method is also called the parallel method. This method is often used in elementary school, and from the third grade on, it is used to construct equations. This method is often used in elementary school, and from the third grade on, it is used to construct equations. These issues are covered in classes II and III. Class II deals with more directly proportional problems (types I-IV), which include the following groups of quantities: value, number (total), total money; mass of one object, number of objects, total mass; capacity of one container, number of containers, total capacity; product produced per time unit, working time, total product; material used per item, number of items, total material used. Class III includes all six types of problems. Here are new groups of quantities: speed, time, distance; the length, width and area of the rectangle; in the unit, the product from the field, the field, and the whole crop are included.

Discussions

Preparation for finding the fourth proportion should include an introduction to quantities and their relationships. Introduction to a number of quantities (section length, mass, capacity, time, area) is directly related to the study of arithmetic and geometric material. To include the problem of finding a fourth proportion, children should be introduced to estimates, totals, rates, and other quantities. In this case, their introduction should be accompanied by the discovery of the relationship between proportional quantities. For example, to introduce measurements, amounts, common money and the relationships between them, you can play the game "Shop" in the classroom: "goods" are placed on the board: notebooks, books, rulers, etc., the price of which is: "Price 5000 sums" and so on. .p. Today we will play the game "Shop" and generate trading reports. Here is the store (teacher shows the board). What is sold in the store? (says). The price is in the items. Tell me the price of the notebook. (2000 sums). Tell me the price of the notebook (5000 sums). What does cost mean? (How much does one notebook cost?) 3 notebooks cost. What does the number 3 mean? (How many notebooks were taken.) In other words, the number of notebooks. 4 notebooks were purchased. What does the number 4 mean? (Number of notebooks). The teacher puts 4 notebooks on the blackboard, under each notebook the price "5000 soum" is written. How much should I pay for 4 notebooks? (20,000 sums). How did you know that? (5000 * 4 = 20000.) 20000 soums is the total amount of the notebook. The board will have the following entry:

Price	The number of	Total cost
5000 sum	4 notebook	?

What do you know about it? (Rating and number.) What to know? (Total money.) If the price and quantity are known, how is the total money found? (By multiplication.) Then the game itself begins: one student is appointed as a seller, and several students are appointed as buyers. Buyers come to the seller in turn and buy several goods. Students in the class compose questions about these items, write them in a short table and solve them, each time determining the following relationship: the price and quantity are known, multiplied by the total amount. (This conclusion does not require special memorization). Pupils in the class make up questions about these objects, write them in a short table and solve them, each time they determine the following relationship: determine the price and quantity. if the total amount and the price are known, the amount can be found by dividing the amount, multiplied by the total amount. (This conclusion does not require special memorization). In order to consolidate knowledge about the relationships between quantities, it is necessary to add oral solving problems, in which it is useful to practice the inverse problems of simple problems. In addition, it is necessary to present complex problems related to this amount, for example: "At the beginning of the school year, a student bought 10 notebooks for 2000 soums and a picture book for 6000 soums. How much does the student pay in total?" In such cases, students should not be asked each time to explain how to choose an activity. In class III, the work is performed according to two groups of measurements: speed, time, distance, and the length, width, and area of a rectangle. The relationships between the quantities in each of these groups can be determined by the students themselves, as they can apply their knowledge of relationships learned earlier. In the process of solving simple and complex problems, it is necessary to strengthen the knowledge of relationships between quantities, and at the same time, to observe how the third quantity changes when one of the three quantities does not change and the other does not. For example, a set of one-method exercises is offered: "The notebook costs 5,000 sums." 2 notebooks; 3 notebooks; 5 notebooks; 8 notebooks; How much are the notebooks?" The solution should be written in the table as follows:

Notepad price	5000	5000	5000	5000	5000
Number of notebooks	2	3	4	12	*a*
The total cost of the notebook	10 000	15000	20 000	60000	5**a*

By observing the changes in the number of children, if the notebooks are bought for the same price, they determine whether their total money increases or decreases as the number of notebooks increases or decreases. Another link can be observed: if the price of a notebook does not change, if the number of notebooks is increased or decreased several times, how many times will its total cost increase or decrease? Another link can be observed: if the price of notebooks does not change, the number of notebooks increases or decreases as many times as the number of notebooks increases or decreases. After the preparatory work, it is not difficult for students to solve the problem of finding the fourth proportion by finding the value of the constant. Therefore, it is very important to guide children in solving problems. Let's consider the features of working with this type of problem. It is better to include problems such as value, number and total money first, because children have experience working with these quantities, which should be considered first. It is useful to describe the first of the issues under consideration and write a small note on the table. For example, the following question is proposed: "The student bought 6 notebooks and 3 notebooks of the same price. Pays 12,000 soums for a notebook. How much does it cost to write in a notebook?" After reading the report, the teacher draws a picture on the board or uses a ready-made picture. Then, under the guidance of the teacher, the following brief reminder is given:

Price	Apparently	Total money
The same	6 notebook 3 notebook	12000 sum ?

When repeating the calculation, the child explains what each number represents: 6 is the number of notebooks in the cell, 12,000 sums is their total amount, etc. Before solving a problem, it is useful to estimate, that is, to determine what number will result from the solution: whether the number is greater or less than the given number and to explain why. For example, students will notice that the cost of lined notebooks is less than 12,000 rubles, because they are cheaper to buy than checkered notebooks, and the price of notebooks is the same.

The solution to the first problem should be written with an explanation, then with an explanation, sometimes without an explanation, and then with the guidance of the teacher. Solution verification is carried out by formulating and solving inverse problems, determining the boundaries of the answer. To generalize the method of solution, after considering types I, problems related to quantities such as estimation, number, total money, similar types of problems involving other quantities are introduced, and then other types of problems are presented. Other issues of a creative nature are also covered. It is useful to compare different table types with respect to the quantities in the group. For example, regarding quantities such as price, number, and total money, types I, III, and V are recommended for independent judgment (see Table 1).

After solving the problems, the similarities and differences between them and the ways to solve them are determined. Different groups can be asked to solve the same type of problems involving quantities and then compared. Students should be encouraged to come up with options for different life situations by providing them with exercises to solve different problems. For example, students are asked to write a problem with a solution (24: 2) * 5. They can solve problems related to dimensions, such as price, quantity, total money: “2 meters of drapery costs 24,000 soums. How much is a 5 meter drapery?” Students can also ask questions about speed, travel time, and distance traveled. Exercises similar to the ones given help to see how different life situations, that is, competencies, apply to the same decision.

Proportional problems are included in Class III. These problems involve two proportionally related variables and one or more variables, as well as the sum of corresponding values of one variable whose sum is the number being sought. For each group of proportionally related quantities, there are six types of proportional problems, four of which are for directly proportional quantities and two for inversely proportional quantities. In elementary grades, only proportional problems of directly related quantities are produced. These issues are listed in Table

Table 2

Dimensions				Problems
roblem no	Price	Apparently	Total cost	
	A change you	Two or more layers are provided	Dimensions corresponding values sum is given, compound to find	The student bought 6 checkered notebooks and 4 lined notebooks for the same price. It costs 20,000 soums. How much do checkered notebooks and lined notebooks cost?
I	A change you	The sum of the values corresponding to the total money is given. Find the connector	Two or more values are given	A student bought a total of 10 checkers and ruled notebooks for the same price. Pays 12,000 sums for a ball notebook, 8,000 sums for a lined notebook. How many checkered notebooks and how many lined notebooks were bought?
	Enter two	A change	According to	The store sold the same amount of

II	or more values gen	you	the price the sum of the values is given, additive find the	hats and scarves. A hat costs 50,000 soums, a scarf costs 30,000 soums. 160,000 soums were received for all sold items. How much is a hat and a scarf?
V	Sum of values corresponding to total money give it gen. Connect people find the	A change you	Two or more values are given	The store sold an equal amount of hats and scarves. The cap and scarf together cost 80,000 soums. 100,000 sums were received for all hats, 60,000 sums for all scarves. How much is a hat and a scarf?

Being able to solve the problem of finding the fourth proportion can be considered as preparation for solving the problem of proportion. It is better to do problems with children to find the fourth proportionality than to give ready-made proportional problems. This activity helps children identify connections between these types of problems, which leads children to generalize more quickly about how to solve problems. It is recommended to write a summary of the problem:

Price	Amount (quantity)	Price
The same	6 notebook 4 notebook	12000 sum ?

After making the report according to this condition, the teacher writes the number formed in the answer (8000 soum) instead of the question mark. Then he proposes to find the sum of the numbers that represent the total amount of the notebooks (20,000 sums) and make a calculation according to this new condition:

Price	Amount (quantity)	Total cost
The same	6 notebook 4 notebook	? ? 20000 sum

Children question proportionality by asking the following two questions: "How much will the first buyer pay?" and "How much will the second buyer pay?" The teacher explains that these two questions can be replaced by one question: "How much did each customer pay?". The problem is approximately as follows: "Two children bought notebooks for the same price. They paid a total of 20,000 soums. The first child bought 6 notebooks, the second child bought 4 notebooks. How much did each child pay?". What to know about the problem? What is "each"? Is it possible to immediately find out how much the first child paid? Why not? Can I know the price of the notebook immediately? Why not? Is it possible to know immediately how many notebooks were bought for 20,000 soums? Why is this possible? What do we learn using the first activity; What about the second, third and fourth operations? The solution of the problem is written with explanations in the form of individual actions. Then ready-made problems are introduced. In this case, you should first focus the question on the two questions, then determine which of the numbers you are looking for should be larger and why, and then move from the discussion to the question to the numerical data to develop a solution plan. The solution is checked by the method of determining whether the numbers formed in the answer correspond to the given numbers: adding the numbers formed in the answer should form the number given in the report. Problems related to movement, such as speed, time, distance, are considered in class III. Preparation for motion problems involves summarizing children's perceptions of motion, introducing new quantities such as speed, and discovering relationships between quantities such as speed, time, and distance.

Conclusion

Examples of solving problems.

The problem. The railway bridge consists of three parts. The length of the first section is 50 meters. The second section is 23 meters longer than the first, and the third is twice as short as the first. Find the length of the bridge.

The solution. Solving the problem consists of three stages. First, we find the length of the second section: 50 + 23 = 73 meters, then we find the length of the third section: 50 : 2 = 25 meters, and finally we find the length of the bridge, that is, three sections. 50 + 73 + 25 = 148 meters. Now we will justify these actions. Here we are talking about the three parts of the bridge and its length. It is known that the length of the first section is 50 meters. The second is unknown, but the second part is said to be 23 meters longer than the first, that is, the length of one is 50 meters, the other is 23 meters. So, to find the length of the second part, it is enough to divide the length of the first part by 50 : 2 = 25 meters. The length of the three-part bridge can be found by adding the numerical values: 50 + 73 + 25 = 148 meters.

Self-monitoring questions.

1. What problems in elementary mathematics are called complex problems?
2. What methods are used to solve complex problems?
3. How to prepare for presentation of complex issues?
4. Explain the method of working with questions related to proportional quantities.
5. What steps should be taken to help students develop independent problem-solving skills?
6. How to prepare for action issues?

Exercises to solve independently.

Make the following statements and justify the actions chosen.

1. The girl brought 15 carrots in one bag and 21 carrots in the other. He gave them to 9 rabbits. How many carrots did he give to each rabbit?
2. 24 apple trees and 6 pear trees were given to the school garden. They were planted in 6 rows. How many seedlings were planted in each row?
3. There were 16 fish in each of the three aquariums in the school. Pupils brought 20 fish to the kindergarten. How many fish are left?
4. 12 students took part in the first ski trip, twice as many as the second, and 3 less than the third. How many students attended the third time?
5. 500 bookshelves were brought to the furniture store. 30 buyers bought 4 shelves and 20 buyers bought 8 shelves. How many shelves are left in the store?

6. 75 people came to the library on Wednesday, 25 less people on Thursday than on Wednesday, and twice as many people on Friday as on Thursday. How many people came to the library in these three days?

7. Bakhtiyar found 12 mushrooms, and Karim found 4 less mushrooms. Nurlan also found twice as many mushrooms as Karim. How many mushrooms did the children find?

8. 63 tons of coal were taken out of the warehouse on Monday, 27 tons more than Monday, 3 times less coal than Monday. How many tons of coal were taken from the warehouse in these three days?

9. The traveler traveled 131 km by steamer and 3 times more by train than by steamer. He walked the rest of the way. If the total length of the road is 560 km, how many kilometers did the traveler travel?

10. 24 kg of flour was delivered to the dining room in 8 identical packages. They used 5 packets a day. How many kilograms of flour are left in the kitchen?

11. A milkman gave 174 liters of milk per day: 6 cows gave 20 liters, the rest gave 18 liters of milk. How many cows did the milkman milk?

12. There were 32 meters of fabric in the package. 6 meters of fabric was cut for one customer and twice as much for the second customer. How many meters of fabric are left in the package?

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