Methods of teaching to solve non-standard problems

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Abstract: *This article focuses on the problem and its types, and describes the methodology for solving non-standard problems. Recommendations are given for solving non-standard issues by dividing them into specific categories.*

Keywords: *Problem, simple problem, content problem, text problem, typical problem, non-standard problem, recommendations for solving non-standard problems*

In the problem-solving process, we use the terms "standard" and "non-standard". Most problems in elementary school math textbooks are problems with a standard solution. That is, the given problem belongs to some type and there is a solution according to its specific features. For example, the solution of the problem of adding the sum to a number or subtracting the sum from a number is subject to a definite rule (property). Even if the methods of solving such problems are different, the methods of solving them depending on the type of problem are carried out according to clear instructions (rules).

In the case of problems that have a non-standard solution, the solution is not sought on the basis of specific instructions, but on the basis of the content of the problem, the "new", "original" solution of the problem is sought. So is his non-standard.

Curriculum assignments with a non-standard solution account for 0.5% of the total assignments provided in mathematics textbooks.

The advantage of such learning tasks is that they develop the student's logical thinking, develop the ability to think independently, increase interest in mathematics, the task of finding a solution to the problem, a sense of difficulty, purposefulness, patience, resourcefulness.

Consider the following task involving the student drawing some geometric shapes:

Task 1: Provide that you do not cross a line twice without removing the pen from the notebook

a) a triangle; b) rectangle; c) a rectangle with one diagonal d) a rectangle with two diagonals; d) Draw geometric shapes in the form of an open envelope.

This task consists of 5 tasks, which form a certain system. It ranges from simple to complex. When a first-grader has skills such as making cross-sections of a certain length with a ruler, measuring the sides of a triangle with a ruler, the student first marks 3 points on a sheet of paper (not in a straight line) (teacher demonstrates this on the board), connecting the marked points with the ruler. , teaches how to make a triangle. Once the student has developed the skill of making a triangle, they will learn to mark 3 points on a sheet without a ruler and connect them using a series of cuts (without removing the pen from the sheet). Here, the teacher can ask the student to draw a triangle that passes through these three points, regardless of which point to start with when drawing the triangle. A student who is able to draw a triangle on a flat sheet of paper (without removing the pen from the sheet) can draw a right rectangle independently (without removing the pen from the sheet) on the sheet (it is advisable to take a

checkered sheet as early as possible). For a student who is having difficulty completing this task, the teacher can instruct them to complete the task: "Mark 4 points on the sheet so that 2 points are on the same column and 2 points are on the same line. Put the tip of the pen on one of these points and connect the pen to the second point without disconnecting it from the notebook, then connect it with the 3rd point and again with the 4th point without disconnecting the hand.

Completion of c), g), d) tasks in this task requires a lot of knowledge, skills and abilities from the student. First, the teacher must explain to the student the concept of a rectangular "diagonal".

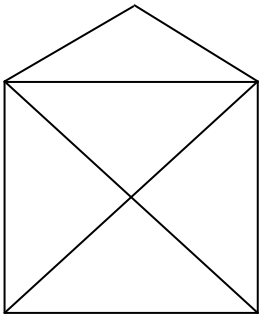


Figure 1

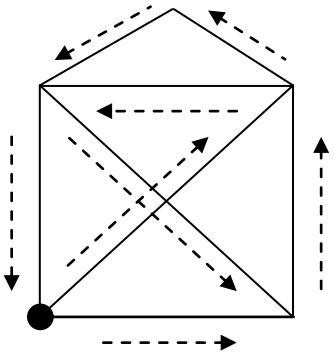


Figure 2

There is no clear definition of the concept of 'diagonal'. The 1st and 3rd ends (or connecting the 2nd and 4th ends) of a right rectangle can be given an indistinct definition in the form of a straight line section. c) Assignment - 2nd graders can complete the task of drawing a diagonal rectangle (without removing the pen from the notebook and without crossing a line 2 times). It is worth noting that the teacher has different options for drawing this shape. Because from any end of the rectangle, if the pen is held either on the side of the rectangle or diagonally, of course, the desired shape can be drawn. g) Assignment - is a problem assignment for 2nd graders. Because no matter how hard a student tries, he cannot draw a two-diagonal rectangle under the terms of the assignment. This task is an unsolvable task, i.e. it is not possible to draw two diagonal rectangles without crossing a line 2 times without removing the pen from the notebook. It is important to note here, "Is it possible to give unsolvable (unsolvable) tasks to primary school students?" to the question, some Methodists said "it is impossible to give," while others said "it is possible." Experience has shown that discussing 'unsolvable tasks' and showing that it cannot be solved is one way to solve a task correctly. As a result of creative tasks of this content, the primary school student helps them to develop such skills as partial inquisitiveness, resourcefulness, the ability to find fault, the ability to think independently and draw conclusions. d) When completing the task, the teacher shows the 2nd grade students a geometric figure in the form of an "open envelope" (Figure 1). This form should be drawn in the student's notebook (according to the condition of drawing the form). The shape can be drawn in different variants. One of these options can be recommended after the students have completed the task independently (e.g., Figure 2).

Task 2: What is the sum of the same numbers equal to the product of these numbers?

The solution to this task for second graders will be in two options:

$2 + 2 = 2 \cdot 2$ $0 + 0 = 0 \cdot 0$

One form of problem-solving with a non-standard solution is mathematical rebuses. The use of mathematical rebuses in the classroom increases students' interest in the science of mathematics, develops student thinking. Students complete such assignments with enthusiasm.

Task 3:

**** + 1 = *****

If we add 1 to a four-digit number, we get a five-digit number. This is only done when 9999 + 1 =

10000.

Such assignments not only develop students 'computational skills and abilities, but also serve to build the logical thinking and comprehension skills needed to compute.

When completing some tasks through a standard solution, the student has to perform many actions. With a non-standard solution, the task can be completed quickly.

Task 4: Calculate: a = 100-99 + 98-97 +… + 4-3 + 2-1

In performing this task, we discuss: 100-99 = 1; 98-97 = 1; 96-95 = 1; …; 4-3 = 1; 2-1 = 1;

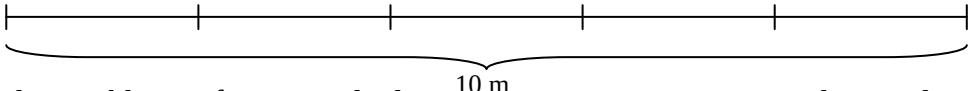
This means that even numbers adjacent to it are separated from even numbers. Each difference is equal to 1. Such differences are (100: 2). The value of the expression is $1 \cdot 50 = 50$.

Non-standard issues cannot be classified into specific groups. However, it is possible to provide methodological guidelines for solving some non-standard issues (similar issues). To do this, students must first develop general skills in solving textual problems (mastering the text of the problem, distinguishing between the given and the sought in the problem, describing the connections between them, discussing the problem, making a solution plan, searching for a solution, checking the problem). The next step is to teach students to discuss problems independently and seek solutions based on their general problem-solving skills. The next task is to teach students methodological recommendations for solving some non-standard problems.

Recommendation 1. Use an issue-related drawing or drawing to solve non-standard problems. It should be noted that students also used pictures and diagrams to solve non-standard problems, but the solution to non-standard problems can be found not only by performing arithmetic operations by drawing, but also by performing arithmetic operations using drawing.

Issue 1. The 10-meter wire rope was cut into 5 equal pieces. How many times was it cut?

Once students have read this issue, students will be asked to solve the problem. It is natural to find a student who concludes that 10: 5 = 2m because the problem is divided into 5 equal parts by a 10-meter wire. This is because the students sought solutions by performing actions on the numerical data in the problem when solving standard problems. To make sure that the numerical information found is not the answer to the 2-meter question, the teacher asks, "What do I need to find in the question?" he says. When the reader recalls the question in the text: "How many times did they intersect?", He notices that he has found the wrong solution. Some students also say that the answer to the question was cut five times because they misunderstood that five equal cuts were cut five times. The teacher then suggests making a sketch of the problem: Draw a rectangle 10 cm long and 1 square wide in your notebook. Students perform in their notebooks. Then the teacher divide this right rectangle into five equal parts. Draw each line you draw separately. How many lines were formed? appeals to students. (4ta). So they cut 4 times. The solution to this problem was determined by drawing.



To solve problems of non-standard appearance, it is necessary to draw a drawing or picture. In some cases, the problem is solved by drawing or drawing.

Category 2 problems that can be solved based on this recommendation include non-standard problems, some of which are solved on the basis of diagrams, and the other part is solved on the basis of arithmetic operations.

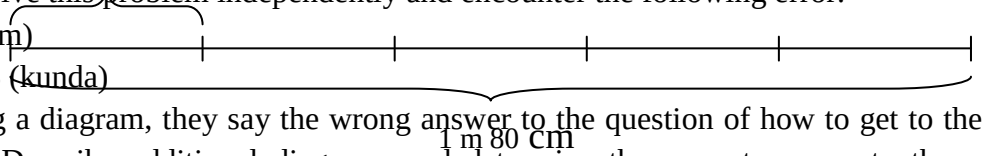
Issue 2. To fasten the curtain to the window pane, you need to fasten 6 clamps of equal length. (the first and last clamps are on the edges of the curtain). If the width of the curtain is 1 m 80 cm, find the distance between the clamps. To solve this problem, students draw a conditional diagram, divide it into equal parts, and mark 6 places. It is clear from the drawing that the width of the curtain should be equal to 5 m instead of 6 m 1 80 cm, and the problem is solved considering that 1 m 80 cm = 180 cm. 180: 5 = 36 (cm)

In addition to some non-standard problems that can be solved based on this recommendation, it is necessary to make a few drawings that will help to find a solution to the problem, especially to prevent the student from making a mistake in solving this type of problem.

Issue 3. The spider is climbing to the top of a 10 m high pole. It rises 5 m during the day and descends 3 m in the evening. In how many days will the spider climb to the top of the wire?

Students solve this problem independently and encounter the following error.

1. 5-3 = 2 (m)
2. 10: 2 = 5 (kunda)



By drawing a diagram, they say the wrong answer to the question of how to get to the top of the wire in 5 days. Describe additional diagrams and determine the correct answer to the problem by thinking.

Day 1 rises 5 m and falls 3 m. Then the difference of 5-3 = 2m is reduced, i.e. the distance of 10-2 = 8m is left to go up. Now the spider rises 5 m during the day and falls 3 m in the evening. Then the difference remains 6-2 = 4m. On the 4th day, the wire climbs to the top

It is obvious that in solving such non-standard problems, along with drawing, thinking is also of great importance.

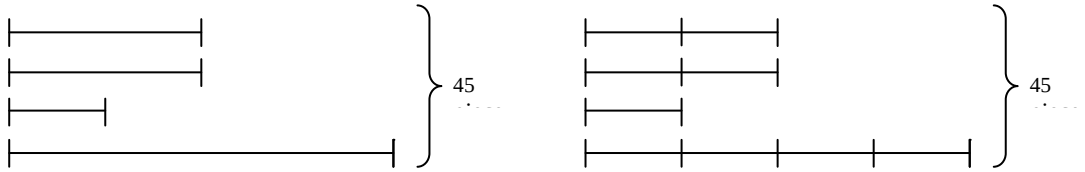
Issue 4. Nadir and Bobur met in the 6th carriage of the train. If Nadir got off the train at the beginning and Bobur got out of the last carriage, how many carriages did the train have? (11 wagons)

Issue 5. The front of the melon was 16 m, and piles were dug every 2 m to cover it with a hoop. How many straw piles did they use? (9 of them)

Recommendation 2 It is advisable to include an auxiliary element (part) in solving non-standard problems.

Issue 6. Place 45 pencils in 4 boxes so that if the pencils in box 3 are doubled and the pencils in box 4 are reduced by 2 times, and the pencils in the first and second boxes remain the same, the number of pencils in the four boxes remains the same. How many pencils did each box initially have?

Once the reader has mastered the text of this problem, he will try to express the condition of the problem in the drawing.



This diagram is not enough to find the solution of the problem, the teacher suggests to the student to do additional work in such a way that the solution of the problem is more precisely the number of pencils is proportional to the number of equal cuts. Then the number of pencils in box 3 will be 1 part, the pencils in boxes 1 and 2 will be 2 parts and the pencils in box 4 will be 4 parts. The

solution to the problem can be found in the following order: We solve the problem by asking a question.

1. If we say that the pencils in box 3 are 1 part, how many parts are the pencils in the total pencil? 2 + 2 + 1 + 4 = 9 (part)

2. How many pencils are in box 3? 45: 9 = 5 (pieces)

3. How many pencils are in pens 1 and 2? 5 * 2 = 10 (ta)

4. How many pencils are in pencil 4? 5 * 4 = 20 (ta)

Answer: There were 10 pencils in pencil 1, 10 in pencil 2, 5 in pencil 3, and 20 pencils in pencil 4.

Issue 7. The rope was divided into 2 pieces, one of which was 4 times longer than the other, and it was 18 m long. Find the length of each piece of rope.

Recommendation 3 The selection method can be used to solve some non-standard problems. Consider the following issue;

Issue 8.. The sum of the four different numbers is 13. The smallest number is 5 less than the largest number. Find these numbers.

The selection method is used in the search for a solution to this problem. Let's check the number 0. 0 + □ + □ + 5 = 13. We try to find the numbers in the empty cells. □ + □ = 8. The second and third numbers are different, they must be between the numbers 0 and 5. No numbers can be found that satisfy this condition. So 0 does not match. Now let's check by putting the number 1: 1 + □ + □ + 6 = 13. Hence □ + □ = 6. There are different numbers between 1 and 6, the sum of which is 6. So the sum of 2 different numbers is 6: 2 and 4. We check the correctness of the numbers we find: 1 + 2 + 4 + 6 = 13

Now are there any other numbers that satisfy this condition? By placing the numbers 2,3,4 in order, it can be seen that the condition of the problem is not satisfied. Therefore, the solution to this problem is: 1,2,4,6.

It should be noted that in the process of solving by the method of selection, depending on the content of the task, it is always advisable to start with numbers, not small, but large, or, if possible, numbers that satisfy the condition.

The following issues are among the tasks to be solved by the selection method.

Issue 9. The sum of 3 different 2-digit numbers is 34. What are these numbers? (10, 11, 13)

In completing this task, the student may consider the following: Since 3 is a two-digit number, the numbers must be 2-digit. It is clear that the number in the decimal place in each number is 1. Because 3 decimals make up 30. According to the condition of the problem, the sum of 3 2-digit numbers must be 34. Therefore, the following scheme would be appropriate:

1□ + 1□ + 1□ = 34

Now you need to find the numbers in the unit room. The solution to the problem

□ + □ + □ = 4. With the selection method, it can be seen that these numbers are 0.1.3. Because the composition of the number 4 is 0 + 1 + 3 = 4. The other option is unsatisfactory. J: 10,11,13.

Issue 10. Anwar, Bobur and Kemal caught 14 fish. Anwar caught the least fish. Kemal caught 3 times more fish than Bobur. How many fish did each catch? (Anvar - 2, Bobur - 3, Kamol - 9)

Issue 11. The sum of the combined ages of the scientist, his father, and his grandfather is 114. If their age represents a 2-digit number and the number in the unit room is the same, what is the age of the Scientist, his father, and grandfather? (Scientist-18, father-38, grandfather-58)

Recommendation 4 Explain the problem by changing the form so that the reader understands the problem. This thing is a retelling of a textual problem in mathematical language. In other words, this

method can be called a "method of changing the text of the case."

Issue 12. The number of apples in the basket is 2 rooms. These apples can be given to 2, 3, 5 children equally. But 4 kids can't be equal. How many apples are in the basket?

When this problem is given to students, students try to draw a diagram for the condition of the problem, making it difficult to find a solution to the problem by the method of selection. At this point, it will be much easier to find a solution if the text of the issue is changed as follows.

Problem: "Find a 2-digit number that is divisible by 2,3,5 and not divisible by 4. Students find that 2 * 3 * 5 = 30 by the selection method. So there are 30 apples in the basket.

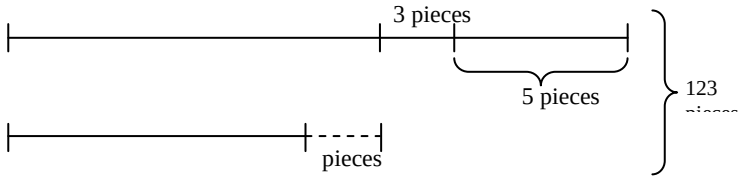
The "Change the text of the case" method can be used to solve the following problems.

Issue 13. If we divide the candies into 2, 3, 4, there will always be 1 more candy. If we divide them into 5 pieces, there will be no excess candy. If the number of candies is less than 50, how many candies are there? (25)

Recommendation 5 When solving some non-standard problems, it is advisable to solve them using the "solve the problem in parts" method. The following problem is divided into parts, and the problem for each part is solved.

Issue 14. There were 123 passengers on the two buses. Eight people got out of one bus and 3 got on the second bus. The rest went by another car. After that, they became travelers on the bus. How many passengers did each bus initially have?

For this problem, students first draw the following diagram:



The teacher suggests solving the problem in parts. Students read and think about 2 sentences in the text of the problem and determine the solution to the part of the condition:

1. 8-3 = 5 (passenger) - left in another car

2. 123-5 = 118 (passengers) - the remaining passengers on 2 buses.

Then they look for a solution to part 2 of the problem.

3. 118: 2 = 59 (passenger) -was on every bus

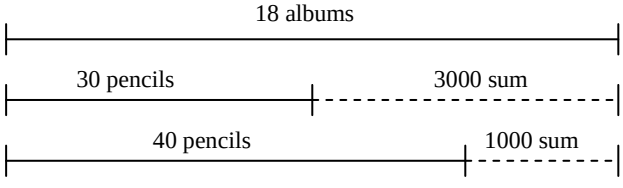
4. 59 + 8 = 67 (passenger) was on bus -1

5. 59-3 = 56 (passenger) was on bus -2.

Sometimes the method of solving the question in parts is used instead of the condition of the problem.

Issue 15. 18 albums cost 3,000 soums out of 30 pens. These 18 albums are 1000 soums cheaper than 40 pens. How much is 1 album? How much is 1 pencil?

A diagram can be used for a brief condition of this matter.



Depending on the drawing, the problem question is divided into 2. First, “How much does a pen cost? Then how much does one album cost? ” etc. are determined

Solution for Part 1:

1. 40-30 = 10 (pencils) -difference of pens
2. 3000-1000 = 2000 (soums) -10 pennies
3. 2000: 10 = 200 (sum) - the price of 1 pen

The solution for Part 2 (How much does 1 album cost?):

4. 200 * 30 = 6000 (soums) -30 pencils
5. 6000 + 3000 = 9000 (sum) -18 albums
6. 9000: 18 = 500 (sum) -1 album price

Answer: 1 pen costs 200 soums, 1 album costs 500 soums.

The following problems can be solved based on the method of "solving a problem condition or question in parts".

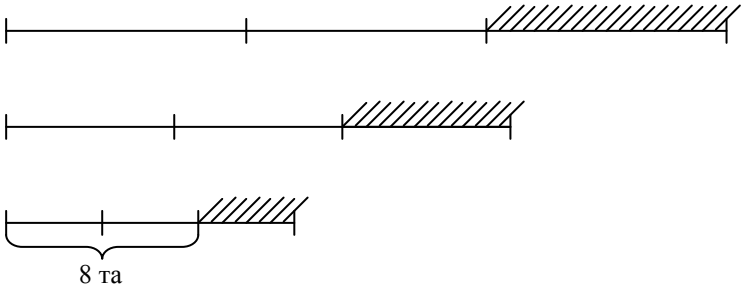
Issue 16. 16 birds landed on 2 branches. 2 birds flew from the 2nd horn and after landing 5 birds from the 1st horn to the 2nd horn, the number of birds on both horns was equal. How many birds initially landed on each branch? (A: 12 and 4)

Issue 17. 3 friends wanted to buy 12 soms for a holiday table. Girl 1 bought 5 soms and girl 2 bought 7 soms. The third girl gave 1,200 soums. How do the first and second girls get this money? (300 soums 900 soums)

Recommendation 6. In solving some non-standard problems, it is advisable to find a solution from the end.

Issue 18. For breakfast, the mother baked a pancake and put it on a plate. The eldest son ate a third of the infusions and went to work. The average boy went to school after eating a third of the remaining infusions. After the younger son ate one-third of the remaining infusions, there were 8 infusions left on the plate. How many pancakes did the mother bake?

A conditional drawing option that clarifies the content of the problem is given and a solution is found from the end of the problem.



Solution:

1. 8: 2 = 4 (pieces) - the number of ingots eaten by the youngest son
2. 4 * 3 = 12 (ta)
3. 12: 2 = 6 (pieces) The average number of infusions a boy eats

4. 6 * 3: 2 = 9 (pieces) - the number of ingots eaten by the eldest son

5. 9 * 3 = 27 (pieces) - infusions cooked by the mother

A: 27 infusions

In solving the following problems, the recommendation to find a solution from the end is used.

Issue 19. The reader thought of a number. He multiplied it by 3. He subtracted 10 from the multiplication. Added 16 to the result, resulting in 21. What number did the reader think? (5)

Issue 20. The student drew 4 cuts. Each vessel is 2 cm longer than the previous one. If the length of section 4 is 12 cm, find the length of section 1 (6 cm).

Thus, by teaching primary school students to solve problems with non-standard solutions, they develop the skills of logical thinking, independent thinking, partial research, resourcefulness, inquisitiveness, goal-orientedness in searching for solutions depending on the conditions of the task.

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