
OPTIONS FOR COMPILING WORD PROBLEMS WITH TABULATED NUMERICAL DATA

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Abstract: In the light of the current educational reform, the focus of objectives, including of mathematics training, has been shifted. Initial learning process is realized on the basis of the approved new curricula for the first and second grades, the third-grade study documentation is being prepared and the fourth-grade curriculum is due to be finally adopted. Mathematics training in the initial stage of the primary education is already competence-oriented. At the end of the fourth grade students are expected to have basic mathematical knowledge and skills, but also key mathematical competence and key competences in the field of natural sciences and technologies. This is intended to be done through a number of activities such as: searching, collecting and processing information when creating a task; modelling of practical situations with numbers and arithmetic actions; modelling mathematical models of specific life situations by compiling word problems ...; retrieving information from different sources (illustrations, drawings, tables, specific didactic material, text, measurement, web, etc.); searching for information (data) from the Internet for the compilation of a mathematical task; developing, enrolling, realizing and evaluating thematic projects in the frames in which the mathematics and other curriculum content is applied, built and formed.

The realization of these and other similar activities by the students is also related to the work with tabulated numerical data, the use of pre-fabricated albums with numerical data or demonstration boards with interesting and curious numerical facts; that boards being exposed in the classroom. Another possible approach is to assign short-term research tasks to students in the fourth grade for Internet research and to collect the necessary numerical data on the basis of which a project is being developed or text-based problems are drawn up and solved in obligatory or free math studies.

By reviewing the text-based self-writing exercises by primary school students in mathematical textbooks operating until 2016/2017, trends are emerging that give rise to important conclusions for new training kits. The lessons to be learned are that in the previous training kits, the number and distribution of tasks for composing word problems are of different numbers and of different types. The article also presents the results of a comparative analysis of the approved and introduced in the mathematics training in first and second grade new textbooks created under the new curricula. And there is a significant imbalance in the number and types of tasks for compiling problems in different authors' collectives. There is no systemic and methodical consistency. The paper presents opportunities for compiling word problems with numerical data in tables. The information in these tables is related to some European countries (Bulgaria, Serbia, Slovenia, Italy, Switzerland, France, Liechtenstein, Austria, Croatia), as well as cities, rivers, lakes etc. in these countries.

Keywords: Mathematics, Word Problems, Data, Tables.

1. INTRODUCTION

The realization of the competence approach in the education at primary school age implies a wider use of interrelationships. Most of these links are realized between mathematical learning content (in particular, mathematical word problems) and content in Man and Society and Man and Nature. The provision of tabulated numerical data such as populations of European countries, territory/area of European countries, river lengths, mountain heights, urban populations, historical facts as well as data on famous landmarks in Europe broaden and enrich the overall culture of pupils in the fourth grade, give rise to reflexion and stimulate their interest in seeking further information. The modern 10-11 year old students' free handling with technology is a prerequisite for short research assignments to collect and graphically form numerical data related to a European country, for example. On the basis of the collected numerical data, word problems are drawn up and solved by the students themselves. The data in one such table serves to compile a variety of word problems.

2. OPTIONS FOR COMPILING AND RESOLVING PROBLEM UPON DATA FROM TABLES

The following are some of the creative exercises on writing word problems by the students:

- 1) reference information – the reference data is compiled in albums made by the teacher or by the pupils themselves. With their help, children are more easily able to select real data for their problems;
- 2) by preliminary self-collected numeric data – this type of exercise is closest to modelling. Students get convinced that mathematics is in the world around us. The activity and productive activities associated with the collection of

numerical material correspond to the dynamic nature of the children of primary school age and give a sense of importance to their educational activities;

3) on numerical data from Internet resources.

Numerical data can be collected in connection with a European tour route. They refer to the countries visited, some of their cities, the distance travelled, data on remarkable natural and historical sites, etc. Here I will give examples of an European trip and tabulated numerical information related to the visited countries and some of their landmarks. First of all, information on the population of the individual countries and their area in square kilometers is the most accessible. See table. 1.

Table 1. POPULATION AND AREA OF CERTAIN EUROPEAN COUNTRIES

Country	Population	Territory / area (square km)
Bulgaria	7 153 784	110 994
Serbia	7 076 372	77 470
Slovenia	2 064 188	20 273
Italy	60 665 551	301 338
Switzerland	8 325 194	41 290
France	67 595 000	675 714
Liechtenstein	33 000	160
Austria	8 700 471	83 872
Croatia	4 190 669	56 613

On the basis of the data in Table 1, students in the fourth grade who study the multi-digit numbers and arithmetic actions of addition and subtraction with multi-digit numbers can compile a number of word problems and solve them. These are word problems of finding the sum of two or more numbers, word problems of finding the difference of two or more numbers, and so-called word problems for comparing by difference.

“The population of Slovenia is 2 064 188, and the population of Croatia is 4 190 669 people. How many more people is the population of Croatia?”

“The territory of France is 675 714 sq. km and the territory of Italy is 301 338 sq. Km. How many square kilometers is the territory of Italy less than that of France?”

Along with word problems in a straightforward form, students can write and solve word problems in indirect form such as:

“The population of Switzerland is 8 325 194 and is 375 277 less than the population of Austria. How much is the population of Austria?”

Other numerical data that can be formatted in tables and provided to fourth grade students for compiling and solving word problems is the population data of different cities.

Table 2. POPULATION OF CERTAIN EUROPEAN CITIES

Town	Country	Population in town
Postoina	Slovenia	8 548
Lugano	Switzerland	56 889
Varese	Italy	81 613
Geneva	Switzerland	194 565
Lausanne	Switzerland	129 902
Montreux	Switzerland	24 520
Bern	Switzerland	130 015
Lucerne	Switzerland	81 057
Zurich	Switzerland	404 783
Vaduz	Liechtenstein	5 429
Innsbruck	Austria	119 584
Wattens	Austria	7 604
Zagreb	Croatia	973 667

Here are some examples of word problems on the data in Table 2.

“With how many people the largest city (Zagreb) is bigger than the population of the smallest city – the capital of Liechtenstein Vaduz?”

“How many people generally live in the Swiss cities listed in the table?”

Data on natural objects such as rivers, lakes, islands, etc. can also be given in tabular form and these data are used to compile and solve word problems by the fourth-graders. (Table 3)

Table 3. LAKES IN EUROPE

Lake	Area (in sq km)	Length (m)	Altitude (m)
Lugano	49	35	271
Geneva	580	73	372
Maggiore	213	66	193

In Lake Maggiore there is a group of islands with different areas, which are a tourist attraction. These are the islands of Madre, Bella and Pescador. See Table 4.

Table 4. THE BORROMEAN ISLANDS IN LAGO MAGGIORE

Island	Length (m)	Width (m)
Isola Madre	330	220
Isola Bela	320	80
Isola de Pescatori	375	100

With this data, students can compile and solve word problems by comparing them for differences. With the data for Isola Bela students can solve a problem finding the island's area.

3. OPTIONS FOR SELF-RETRIEVING NUMBER DATA FROM INTERNET

Students can do a self-study on the Internet, for example on the lengths of the rivers (some rivers) in Switzerland (Table 5). The data should be formatted in a table and, together with another tabulated numeric information, an album should be made. At different moments in math lessons and with students with different levels of mathematical preparation, the table data in the album can be provided for compiling and solving word problems as a type of additional work. In this way, a differentiated approach to learning takes place.

Table 5. RIVERS IN SWITZERLAND

Name	River length (km)
Limat	35
Aar (Aare)	295
Reuss	164
Rhine	1233
Rhône	812
Ticino	248
Inn	517

Here are examples of some curious facts about the route of this European trip.

The longest tunnel in the world is under the Swiss Alps. This is the 57-km long Gotthard tunnel. The longest tunnel in Norway and the second largest in the world is the Laerdal Tunnel – 24 km 51 m.

In the city of Zurich is the famous St. Peter Church. It features the largest church bell clock in the world. Its diameter is 8 m 70 cm.

There are only a few covered bridges in Europe. One of them is the bridge in Lucerne, built in 1333. It is 170 m long and is decorated with 122 paintings. The Bulgarian covered bridge in Lovech is 106 meters long. It dates back from 1838. The Ponte Vecchio Bridge in Florence was built around 1340 and is 84 meters long.

In 1891, violinist Daniel Swarovski invented a mountain crystal processing machine. The Swarovski Museum in the town of Wattens, Austria, is visited by 600,000 people annually. It was opened in 1995 by André Heller on the occasion of the 100th anniversary of the Swarovski factory. The smallest processed Swarovski stones are smaller than 1 mm, and the largest stone weighs 62 kg and is 40 cm in diameter. The museum has a glass wall with 12 tons of processed crystals. This is only half of the factory's production per day.

4. CONCLUSION

The mathematical knowledge and skills of students at the end of the fourth grade are the basis of their mathematical competence. One of the important indicators for mathematical competence is the ability to model life situations by mathematical means, as well as the reading of information presented in various ways – tabular, graphical, etc. Handling numerical data in tables and the ability to compiling and solving word problems with these data are important elements of work in mathematics in the initial stage of the primary education. In this respect, the new mathematics curriculum should be substantially different from the training kits used during the period 2002-2016. Mathematics is everywhere around us, and it is valuable for students to learn to discover, recognize, search for such numerical information independently, and use it and interpret it adequately.

LITERATURE

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