



Improving the processing of competition results using publicly available digital tools

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Abstract

Objective of the study is aimed at creating, arguing and implementing a digital model for calculating and analyzing the results of sports events, providing for the transformation of primary indicators into a point system using Microsoft Excel tools.

Methods and structure of the study. The research and creation of the product was carried out on the basis of the Faculty of Physical Culture of the Leningrad State University named after A.S. Pushkin. The following criteria were defined in the terms of reference for this program: the ability to simultaneously register the results of competitions in nine disciplines; automatic conversion of recorded totals from time and numerical indicators into a point system with subsequent calculation of the arithmetic mean and rounding to an integer; consideration of gender and age of competitors in calculations; preventing accidental changes to the source data of the "standards" section when working with the program; providing the user with only basic information about the participants and the actual results of the competition as available functions.

Results and conclusions. The presented competition data processing methodology, implemented in Microsoft Excel, provides recording of results in various formats, taking into account the gender and age categories of participants. It automatically converts time and numerical indicators into a point system, calculates the average value, rounding it to an integer. The product is designed with protection against unauthorized editing of primary data and adapts to various sports disciplines due to the easily changeable parameters on the "Standards" sheet. The practical value of this development was confirmed during the entrance exams in the subject "Physical Culture" at the LSU named after A.S. Pushkin in the period from 2021 to 2024, where the results were recorded in nine different sports exercises.

Keywords: *information systems, software product, software, Microsoft Excel, 1C: Enterprise, physical education, sports, competitions, actual results of competitions.*

Introduction. In order to process the results of competitions, users are usually recommended to use open-source software such as Google Sheets, LibreOffice Calc, Microsoft Excel. The presented programs allow you to create table templates in which you can enter and structure the data of competition participants, results, etc. However, in the field of physical education and sports, in addition to structuring data in tables, there is a need to recalculate the original time or number data into points or scores. For such operations, you can use Google Sheets – an online service that allows you to create and edit tables in real time together with other users. A similar free online service is Microsoft Excel Online. At the same time, for competitions you can use the

open system OpenSpi or Sporty, which allow you to keep track of results, calculate points and scores, as well as analyze competitions online and can be used for free. Mobile applications are also used for similar tasks. In particular, Scorekeeper, available for iOS and Android devices, but in the free version with very limited functionality. Along with the well-known universal electronic tables, today organizations have their own programs for calculating various ratings and promptly summing up the results.

Objective of the study is to substantiate and develop a computer model for calculating and processing competition results with the ability to convert data from original units of measurement to points using the Microsoft Excel software environment.



Methods and structure of the study. Scientific development was carried out on the basis of the Faculty of Physical Education of the Leningrad State University named after A.S. Pushkin.

The technical specifications for the program put forward the following requirements: the ability to record competition results in nine types simultaneously; automatically convert the obtained results from the categories of time and number to points and calculate the arithmetic mean, reducing to an integer; take into account the gender and age of the participants in the calculations; when using the program, exclude the possibility of accidental changes in the initial data in the “standards” category; from the “open” options for the user, leave only the functionality for entering general data on the participants and the actual results of the competitions.

Input data. In this software, the input data were divided depending on the user’s role in processing the competition results. For methodologists-developers of the evaluation system, the input data are represented by tables of standards in points, taking into account gender and age for a given discipline. For the competition judging panel, the input data are represented by information about the participants, such as: full name, gender, age and other data. Calculation model. For a more detailed examination of the method for obtaining final scores for a discipline, let’s consider the formula for calculating the results using the 60-meter dash standard as an example:

```
=IF(students!E3="»»;»»;IF(students!C3="»m»;INDEX(standards!$B$3:$Z$3;1;MATCH(students!E3;OFFSET(standards!$B$4:$Z$4;IF(students!D3<=29;0;1);0;-1));INDEX(standards!$B$6:$Z$6;1;MATCH(students!E3;OFFSET(standards!$B$7:$Z$7;IF(students!D3<=29;0;1);0;-1))))
```

The basis of the expression structure is the IF function, which allows you to vary the number of points received depending on the gender of the subject. Next, depending on the gender, the appropriate table is selected. Then, using the MATCH function, the closest value from the standard table is found, rounding down. Additionally, to vary the output score depending on age, the OFFSET function is used, which shifts the table row by which indexing occurs by 0 or 1 row.

This formula is universal and requires minimal changes when adding a new standard. The range of cells \$B\$3:\$Z\$3 is an array of scores sorted in ascending order for males, \$B\$4:\$Z\$4 is an array of results for subjects under 29, \$B\$5:\$Z\$5 is for subjects 30 years and older. The part of the table for assessing the results of women is similarly structured: \$B\$6:\$Z\$6 are scores, \$B\$7:\$Z\$7 are the results of persons under 29, \$B\$8:\$Z\$8 is for persons 30 years and older. If a different rounding principle is required (for example, for tests where a higher result means a higher score), the comparison type in the OFFSET functions must be replaced with 1 instead of -1.

Output data. As noted above, users are divided into two types: methodologists responsible for the assessment standards, and the judging panel, which fills in general information, as well as the results obtained by the subjects. For methodologists, the output data is not defined, since users of this category perform the task of administering the table. As for the judging panel, the output data are the results in points, which are displayed on the “result” sheet.

Results and conclusions. The table presents a description of the sheets with the contents of the columns of the created resource. Due to the division of data into sheets, as well as the protection of some

Contents of the information resource

Sheet 1	Sheet 2	Sheet 3	Sheet 4
General information	Students	Standards	Result
General information about applicants/students (to be completed by an employee)	Results of completed standards (filled in by the employee)	The sheet is hidden from employees and is a set of tables reflecting the ratio of the original units of measurement to points taking into account gender and age. Editing is possible in case of changes in standards	Consolidation of data from the general information section, as well as the result of converting standards into points
Columns: Full name, Registration, type of training (status), specialization, category, rank, additional points, etc.	Columns: Gender, Age, 60m, 1000m, Shot, Jump, Incline, Pull-ups, Press, Obstacle Course		Columns: Full name; columns of the «Students» section; converted to points; grade - average value of the points received; OFP - grade rounded to an integer; swimming points; points from the «General Information» sheet; sum – final score



№ п/п	FCs	floor	age	60m	1000m	the core	jump	tilt	pull-up	press	stripe
1	Alekseeva Olga Viktorovna	acc	19	10	4.2	9.5	2.02	12	12	12	19.1
2											

Fig. 1. Example of filling out the "Students" sheet

ranges, the possibility of an error by the verifier is excluded, since the calculation is carried out automatically.

User Manual. After filling in Sheet 1 "General Information", work with the created software resource begins with entering the initial information on Sheet 2 "Students". Here, a representative of the judging panel enters the results obtained at the competition; information about the participants, such as full name, gender, age, is transferred automatically from Sheet 1.

After entering the actual results on Sheet 2 "Students", automatic data processing occurs using the standard tables located on the hidden Sheet 3 "Standards". In this case, the program automatically determines the age category and gender of the participant, selects the appropriate table row, and then, using the embedded algorithm for finding the closest value, calculates the number of points.

The points obtained are automatically transferred to Sheet 4 "Result". Here, the user can see the final numerical values for each standard, as well as summary information: the average score rounded to an integer, the total score for all types, including additional indicators, if provided. Thus, the user receives a comprehensive assessment of the student's level of training without the need for manual calculations.

To compare the created product with other information systems used for similar tasks, we reviewed the experience of the South-Russian State Polytechnical University (NPI) named after M.I. Platov and the Federal State Budgetary Educational Institution of Higher Professional Education "State University – UNPK" in Orel.

Thus, an information system for processing the results of sports competitions was developed at SUPU on the 1C: Enterprise platform [7]. Integration of the Telegram bot, implemented on the 1C: Enterprise platform, into the created system became a continuation of the above-described technical solution of the authors [8]. When judging competitions, users of the program talk about the possibility of using it both when

holding competitions within educational institutions and in servicing larger-scale events [4].

Despite the undoubted advantages of the platform, a significant drawback is the low competence of workers in the physical education and sports industry, which does not allow creating resources similar to those described above. In addition, the system requirements of this platform may be excessive for the required functionality, since for the simultaneous work of several employees it is necessary to rent a server or deploy a similar infrastructure independently. It should also be taken into account that in order to use "1C: Enterprise" it is necessary to purchase a commercial license.

Employees of the Federal State Budgetary Educational Institution of Higher Professional Education "State University – UNPK" in Orel also use Microsoft Excel tables [5,6]. The authors describe in detail the creation of their resource, which allows users to develop functionality in accordance with their own requirements, based on the instructions of the authors. It should be noted that in this solution, if it is necessary to change the assessment system, it will be more appropriate to create a table from scratch. To confirm this statement, we will refer to the formula for the table cell [5] given in the article and conduct a comparative analysis with the solution developed at the Leningrad State University. A.S. Pushkin. Formula of the authors of the article, Orel [5]: =IF (D2>32;10;0) +IF (((D2>30)* AND (D2<33));9;0)+IF (((D2>28)* AND (D2<31));8;0)+IF (((D2>25)* AND (D2<29));7;0)+IF (((D2>23)* AND (D2<26));6;0)+IF (((D2>20)* AND (D2<24));5;0)+IF (((D2>18)* AND (D2<21));4;0)+IF (((D2>15)* AND (D2<19));3;0)+IF (((D2>13)* AND (D2<16));2;0)+IF (((D2>8)* AND (D2<14));1;0)+IF (D2<9;0;0).

Solution developed at Leningrad State University named after A.S. Pushkin: =IF (students!E3="»»;»»; IF (students!C3="»m»; INDEX (standards!\$B\$3:\$Z\$3;1; MATCH (students!E3; OFFSET (standards!\$B\$4:\$Z\$4; IF (students!D3<=29;0;1);0;-1)); INDEX (standards!\$B\$6:\$Z\$6;1; MATCH (students!E3; OFFSET (standards!\$B\$7:\$Z\$7; IF (students!D3<=29;0;1); 0;-1))))

As we can see, in the solution of the authors of the article [5], all standards are written directly in the formula, which may prevent a user with little experience in using Microsoft Excel from editing the standards. In the information resource we have developed, the table of standards is presented in a more convenient form, divided by gender and age. The formula we have created allows a user with little experience in using this

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
33																					
34																					
35	М	29.0	30	40	50	64	65	66	67	68	70	72	74	76	78	80	82	85	90	95	100
36	до 29	-1.0	0	1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
37	30 лет	-1.0	0	1	1	2	2	3	3	4	4	5	5	6	6	7	8	9	10	11	12
38	Ж	29.0	30	40	50	64	65	66	67	68	70	72	74	76	78	80	82	85	90	95	100
39	до 29	-1.0	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
40	30 лет	-1.0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19

Fig. 2. The table of the standard of assessment of flexibility



The screenshot shows an Excel spreadsheet. Cell C6 contains the formula: `=IF(students!E3="";"";IF(students!C3="m";INDEX(standards!$B$3:$Z$3;1;SEARCH3(students!E3;OFFSET(standards!$B$4:$Z$4;IF(students!D3<=29;0;1);0;-1));INDEX(standards!$B$6:$Z$6;1;SEARCH BOX(students!E3;OFFSET(`

	A	B	C	D	E	F	G	H	I	J	K	L
1												
2												
3												
4												
5	N/A	FCs	60m	100m	the core	jump	tilt	pull-up	press	stripe	mark	estimation
6	1	Olga A.	68	50	76	66	74	66	67	78	545	68,125
7	2											

Fig. 3. An example of calculating scores according to standards

software to make changes to the standards by adding a new table to the “Standards” sheet and selecting a range by analogy with the presented formula.

The advantages of the software product created at the A.S. Pushkin Leningrad State University are the ability to use it in any competition conditions with the ability to transfer data via cloud technologies in the presence of mobile Internet. Also, if it is necessary to change the assessment system or add a new standard, minimal intervention in the existing functionality will be required.

The ease of use of the presented product is confirmed by the tests and results of practical use in the period 2021–2024.

Conclusions. The proposed option for calculating competition results in the Microsoft Excel environment provides the ability to record them in several types at once, taking into account gender and age; allows you to automatically convert the results obtained from the categories of time and number into points and calculate the arithmetic mean, reducing it to an integer; eliminates the possibility of accidental changes in the original data; can be used in different sports due to the ease of changing the data on the “Standards” sheet. The effectiveness of the product was tested during 2021–2024 at the Leningrad State University named after A.S. Pushkin during the entrance examinations in the discipline “Physical Education” with the recording of results in nine types.

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