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D I D A C T I C S O F M A T H E M A T I C S

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# AN EVALUATION OF THE SELECTED MATHEMATICAL COMPETENCE OF THE FIRST-YEAR STUDENTS OF ECONOMIC STUDIES

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**Abstract.** In Poland, since 1985 when the matura exam in mathematics was no longer compulsory, low-level of math skills and poor learning results have been constantly talked about. The academic community warned that young people were massively avoiding the technical, mathematical fields of study and fields with mathematics as a compulsory subject. We are seeing a constantly decreasing level of mathematical knowledge of first-year students, and sometimes even their ignorance of the elementary issues, basic concepts or an awkwardness in performing calculations. The situation would radically change after the reintroduction of the compulsory matura exam in mathematics in 2010. This article presents the results of the evaluation of the mathematical competence of students (who were obliged to pass the matura exam in mathematics). The evaluation was carried out every year at the beginning of the first year of the economic undergraduate studies during 2012-2014. We have analyzed the level of mathematical competence in the area of knowledge and skills over the subsequent years as well as the knowledge of selected content from the core curriculum of mathematics taught in upper-secondary schools.

**Keywords:** mathematical competence, student assessment, questionnaire survey.

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## 1. Introduction

We constantly talk about the low level of skills in mathematical subjects among people who undertake engineering and economic studies. Hopes to improve the condition were associated with the introduction in 2010 of the obligation to pass the matura exam in mathematics and with the implementation of the recommendations of the European Parliament and the Council of Europe in December 2006, in which one of the key competences defined in the document was mathematical competence and basic competences in science and technology.

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This year, five years have passed since the introduction of the compulsory exam in mathematics, but in recent years the growth in mathematical literacy among those who begin studies in economics has not been observed. In contrast, the performance of students in the largest international assessment of competence of 15-year-olds (students who had their 15th birthday in the year preceding the assessment) in the Programme for International Student Assessment (PISA)[1] shows that Polish students achieve better and better results and are among the leading European Union countries.

PISA is conducted every three years and every period of assessment focuses on one of the three competence fields of reading, math and science. So far, six PISA assessments were carried out in: 2000, 2003, 2006, 2009, 2012, and 2015, the results of the study conducted in 2015 will be published in December 2016. In 2003 and 2012, mathematical literacy was the leading field. Table 1 summarizes the average results (scores) in mathematics in the period 2003-2012. As a reference, a level of 500 points was used which is the average score obtained in OECD countries in 2003.

Table 1. Average scores in mathematics in the PISA assessments

| Year | Number of countries | Rank of Poland | Average score in OECD | Maximum score | Average score in Poland |
|---|---|---|---|---|---|
| 2003 | 41 | 24 | 500 | 550 | 490 |
| 2006 | 57 | 25 | 498 | 549 | 495 |
| 2009 | 65 | 25 | 496 | 600 | 495 |
| 2012 | 65 | 14 | 494 | 613 | 518 |

Source: own elaboration based on [PISA 2012].

In a recent study in 2012, Poland was at the forefront of the results of 15-year-olds from 65 countries and regions in the world. There has been spectacular progress in comparison to other countries participating in the study, and for the first time Poland has obtained results above the average of the OECD countries.

The study in 2012 involved the first generation of students who learned in lower-secondary schools according to the new core curriculum for general education and who in 2015 were passing the matura exam under the

[1] This is a worldwide assessment conducted by the OECD (Organisation for Economic Cooperation and Development) in member and non-member countries.

new rules. The answer to the question, whether the good results in PISA obtained by this year's first-year students in 2012 will be repeated in our evaluation of their mathematical competence, we will get after the test in October 2015.

It would seem that the better and better results of Polish students achieved during the consecutive international comparative studies of the skills of 15-year-olds (PISA) will also be observed in the higher pass rates of the matura exam and the higher mathematical competence of students. Unfortunately, the mathematical competence of our undergraduate students is still at a low level.

The mathematical competence of students who undertake the undergraduate studies at the University of Economics in Katowice in the fields of Computer Science (INF) and Computer Science and Econometrics (IiE) were tested using the test with 18 multiple choice questions covering elementary mathematical knowledge and basic computation skills. The study involved people who passed the obligatory matura exam in mathematics. We assume that the student will pass the test if he or she correctly answers at least 50% of the questions. The criterion used for passing the matura exam in mathematics is to obtain at least 30% of the maximum score. Table 2 shows the pass rate of the matura exam in mathematics in the basic scope carried out in May (i.e. without a second try) and the pass rate of the competence test in a group of students of the Computer Science field of study for the criterion of 30% and 50% of the maximum score.

Table 2. Pass rates of the matura exam and the competence test in 2012-2015

| Year | Matura exam (basic scope of mathematics) | Matura exam (all subjects) | Competence test criterion 50% | Competence test criterion 30% |
|---|---|---|---|---|
| 2012 | 85% | 80% | 57.4% | 83.0% |
| 2013 | 85% | 81% | 56.0% | 89.3% |
| 2014 | 75% | 71% | 47.4% | 78.3% |
| 2015 | 82% | 80% | – | – |

Source: own elaboration based on [*Results of the matura exam in 2005-2015*] and our test.

We note that if in the evaluation of the pass rate of the test we use the criterion of 30%, which is a criterion for the matura exam, the results do not differ much (about 3 percentage points) from the pass rates of the matura exam in the basic scope of mathematics. We can guess that using the 30% criterion, the pass rate of the competence test in 2015 will be about 82%,

whereas the competence test pass rate for the 50% criterion is lower by about 30 percentage points than the pass rates of the matura exam in mathematics. If the threshold for passing the matura exam increased to 50%, in the light of the results of our competence test we can assume that only 50% of students would pass the matura exam in mathematics. In 2014 we obtained interesting results. In this year the upper-secondary school graduates showed the weakest preparedness in the entire five-year period in which the matura exam in mathematics was obligatory. In this year we also reported the lowest pass rate of the competence test. After the announcement of the results of the matura exam in May 2014 in the majority of comments their authors discerned the reasons for this situation in the difficulty of the tasks. However, the lowest pass rates of the competence test (which contains exactly the same tasks each year) were also obtained in 2014, and therefore the cause of the poor results of the matura exam is not rooted in the difficulty of the tasks but in the lower level of preparedness of young people. Perhaps teachers in the upper-secondary schools were less careful in preparing young people for the last (according to the previous rules) matura exam in 2014, and they were more focused on the new core curriculum and modification of the matura exam rules which came into force in 2015.

In the evaluation of multiple choice tests there is often concern that the students provide answers at random. When analyzing the percentage of correct answers, wrong answers, and no answers on particular tasks given by students of the Computer Science (INF) and Computer Science and Econometrics (IiE) in 2012-2014, we can estimate the probability distribution of answers to any question in our test. Table 3 presents the probability distributions of answers.

Table 3. Probability distribution of answers

| Field of study and year | Correct answers | Wrong answers | No answers |
|---|---|---|---|
| INF, IiE 2014 | 0.45 | 0.51 | 0.04 |
| INF, IiE 2013 | 0.47 | 0.51 | 0.02 |
| INF, IiE 2012 | 0.48 | 0.49 | 0.03 |
| INF 2014 | 0.46 | 0.49 | 0.05 |
| INF 2013 | 0.50 | 0.48 | 0.02 |
| INF 2012 | 0.50 | 0.48 | 0.02 |
| INF 2009 | 0.23 | 0.29 | 0.48 |

Source: own elaboration.

The distributions obtained for 2012-2014 are all similar. The probability to give a correct or wrong answer to any task fluctuates around 0.5. For each task there were five possible answers, so if a student randomly chose the answer then the probability of giving a correct answer would equal 0.2 while a wrong answer – 0.8. However, if we assume that for each task a student would decide at random with a probability of 0.5 whether to give a random answer, or leave the task without an answer, then the probability of giving a correct answer equals 0.1, wrong answer – 0.4 and no answer – 0.5. The empirical distributions significantly differ from a random distribution of answers, so we can assume that students did not choose the answer at random, but they tried to solve a particular task.

A competence test was also conducted in 2009 in a group of 20 students of the Computer Science field of study. That was the last year when the matura exam in mathematics was optional. We obtained completely different distributions, in which the probability of a correct answer was 0.23 and for no answer was about 0.5, while the pass rate at the 50% criterion was zero. Although the sample was very small, it can be seen that the introduction of the compulsory matura exam significantly raised the mathematical competence of students beginning the undergraduate studies.

## 2. Questionnaire of competence and the teaching content

In order to test the competence of the first-year university students we prepared a questionnaire which comprised 18 tasks. The tasks concerned the content of the core curriculum of mathematics [*Regulation of the Polish Minister of National Education of 23rd August 2007*] taught in upper-secondary schools e.g. real numbers, equations and inequalities, elementary functions, presentation of curves and sets in a two-dimensional Cartesian coordinate system.

In the questionnaire, special attention was paid to the issues which are repeated in the subsequent stages of education from primary school to upper-secondary school. The first group of tasks was formed by tasks whose purpose was to test the competence in the field of real numbers, particularly sets of numbers (tasks Z1, Z2 and Z3) and skills in calculating a value of deposit (task Z6). The second major group consisted of tasks whose content concerned functions and require students to demonstrate competence in: calculating the value of a function at a point (task Z11) and understanding the concept of a zero of a function (task Z8), determining a set of values of a function (task Z9), and drawing graphs of linear functions, functions with

absolute value and trigonometric functions (tasks Z5 and Z14). Considerable attention was given to the content relating to the geometry on a Cartesian plane as the equation of a straight line, the equation of a circle and finally the distance between two points in Cartesian coordinates (tasks Z15, Z16, Z17 and Z18). The questionnaire also included a few tasks whose aim was to test the competence of students in solving simple linear, quadratic, trigonometric equations and inequalities as well as inequalities with absolute value (tasks Z2, Z4, Z7, Z10 and Z13). Less numerous but equally important was a group of tasks which tested the students' mathematical competence concerning algebraic expressions, in particular their transformations (tasks Z3 and Z12).

Table 4 shows competences (in relation to the existing core curriculum), which a student should have when solving a particular task.

Table 4. Mathematical competence included in tasks

| Task | Competence |
|---|---|
| Z1 | Knowledge of sets of numbers |
| Z2 | Knowledge of sets of numbers, solving quadratic inequalities with one unknown |
| Z3 | Computing roots and powers (knowledge of properties of power with real exponent), transformation of algebraic expressions |
| Z4 | Solving inequalities with absolute value |
| Z5 | Drawing of graphs of linear functions including functions with absolute value |
| Z6 | Percent, skills to calculate a value of a deposit |
| Z7 | Intervals on a number line, solving simple linear inequalities with one unknown |
| Z8 | Calculation of the value of function at a point, understanding the concept of a zero of a function |
| Z9 | Determining a set of values of function |
| Z10 | Intervals on a number line, solving quadratic inequalities with one unknown |
| Z11 | Calculation of the value of function at a point |
| Z12 | Transformation of algebraic expressions |
| Z13 | Trigonometric inequalities |
| Z14 | Drawing graphs of linear and trigonometric functions |
| Z15 | Equation of circle |
| Z16 | Distance between points in a Cartesian coordinate system |
| Z17 | Equation of a straight line in the plane |
| Z18 | Equation of a straight line in the plane, equation of a circle |

Source: own elaboration.

## 3. Description of the questionnaire

The research testing the mathematical literacy of first-year students was based on the questionnaire of the competence comprising 18 tasks. The questionnaire was conducted on a group of students of the Faculty of Computer Science and Communication at the University of Economics in Katowice. The aim of the questionnaire was to evaluate the level of mathematical competence of people enrolled in the Computer Science (INF) and Computer Science and Econometrics (IiE) fields of study. The questionnaire was carried out at the beginning of the first year of undergraduate studies in 2012-2014.

The tasks in the questionnaire were multiple choice questions for which the students chose one of the five given answers. In each question one of the answers was "another answer" which ensured the completeness of a set of answers. For each correctly solved task the student received one point.

According to the most commonly used principles of evaluating examination papers, gaining at least 50% of the points meant passing the test, which was equivalent to gaining at least 9 points. In Poland in order to pass the matura exam it is sufficient to obtain at least 30% of the maximum score. Therefore, in the studies we considered separately the results of those students who had received from 30% to 50% of the maximum score. Table 5 lists the percentage ranges of scores together with the corresponding scores.

Table 5. Percentage ranges of scores and corresponding scores

| Percentage ranges | Scores |
|---|---|
| ⟨0%, 30%) | 0-5 |
| ⟨30%, 50%) | 6-8 |
| ⟨50%, 100%⟩ | 9-18 |

Source: own elaboration.

The questionnaire of competence also included the respondent's particulars in which students provided the following information: sex, scope of classes in mathematics in upper-secondary school (basic or extended), year of the matura exam (current or previous), previous attempts to study (study undertaken for the first time or once again), simultaneous studies in another field of study or another university, and the evaluation of test difficulty (easy, moderate or difficult).

Concerning the Computer Science field of study in 2012, 94 people took part in the questionnaire (60 men, 29 women and 5 not stated), in 2013 – 75 people (67 men and 8 women), in 2014 – 97 people (85 men, 11 women and 1 not stated). Concerning the Computer Science and Econometrics field of study in 2012, 22 people took part in the questionnaire (12 men, 8 women and 2 not stated), in 2013 – 59 people (34 men and 25 women), in 2014 – 62 people (48 men and 14 women).

Table 6 presents data on the number of people declaring basic or extended scope of classes in mathematics in upper-secondary school, and evaluating the degree of difficulty of the test as easy, moderate or difficult. Students who did not provide the relevant information in the respondent's particulars are not included in this table.

Table 6. Details on the scope of classes in mathematics and assessment of the level of difficulty of the test

| Field of study | Year | Scope of classes | | Level of difficulty | | |
|---|---|---|---|---|---|---|
| | | Basic | Extended | Easy | Moderate | Difficult |
| Computer Science | 2012 | 49 | 40 | 16 | 61 | 9 |
| | 2013 | 49 | 24 | 1 | 59 | 12 |
| | 2014 | 51 | 44 | 10 | 57 | 21 |
| Computer Science and Econometrics | 2012 | 12 | 8 | 1 | 10 | 6 |
| | 2013 | 34 | 24 | 3 | 37 | 18 |
| | 2014 | 31 | 29 | 10 | 37 | 12 |

Source: own elaboration.

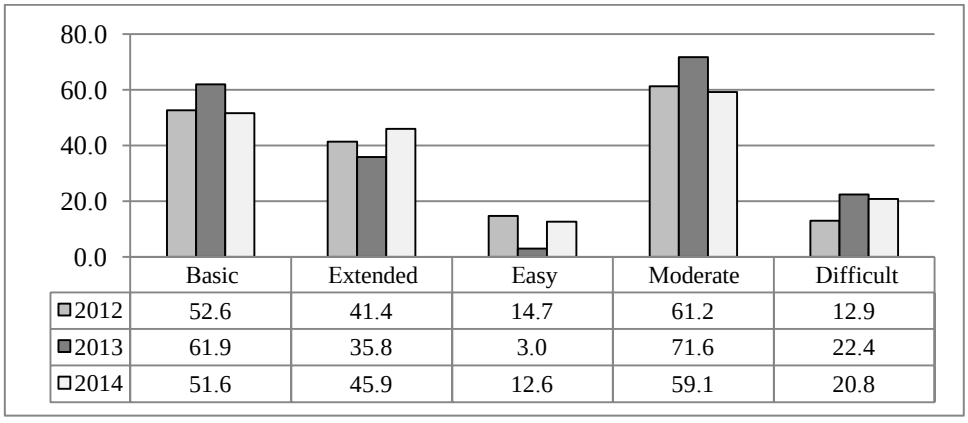



Fig. 1. The percentage of students who declared basic or extended scope of math classes and evaluated the test as easy, moderate or difficult in 2012-2014

Source: own elaboration.

In all the years, most students evaluated the test as moderately difficult (Figure 1). The percentage of people evaluating the test as difficult was the smallest in 2012. In 2013 the percentage of people evaluating the test as easy was the smallest and at the same time the percentage of people declaring the basic scope of classes in mathematics in upper-secondary school was the highest.

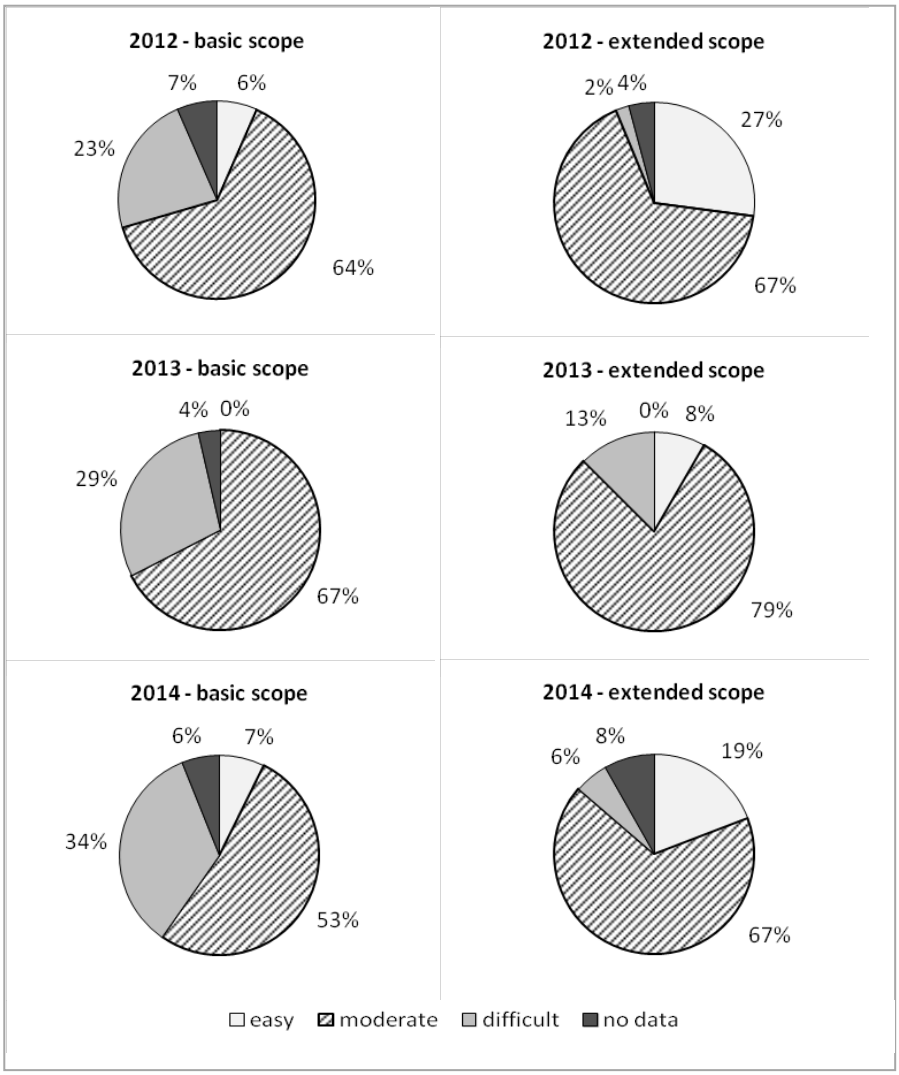



Fig. 2. Percentage of students evaluating the test as easy, moderate or difficult in groups of those who learnt the math classes in the basic or extended scope in 2012-2014

Source: own elaboration.

Interesting regularities are presented in Figure 2, namely among students who learnt mathematics in the basic scope from year to year there is an increase in the percentage of students who evaluated the test as difficult. Moreover, data for 2013 differ from other years, in that among students who learnt mathematics in the basic scope no one evaluated the test as easy, and among students who learnt mathematics in the extended scope the percentage of people evaluating the test as easy is more than twice lower than in other years.

## 4. Analysis of the results

The results obtained in the questionnaire were analyzed by comparing the test scores in both fields of study (Computer Science and Computer Science and Econometrics) in subsequent years 2012-2014. Also analysed was the relationship between respondents' subjective evaluation of the test difficulty (easy, moderate, difficult) and the earned score and the relationship between the scope (basic or extended) of math classes in the upper-secondary school and the gained score.

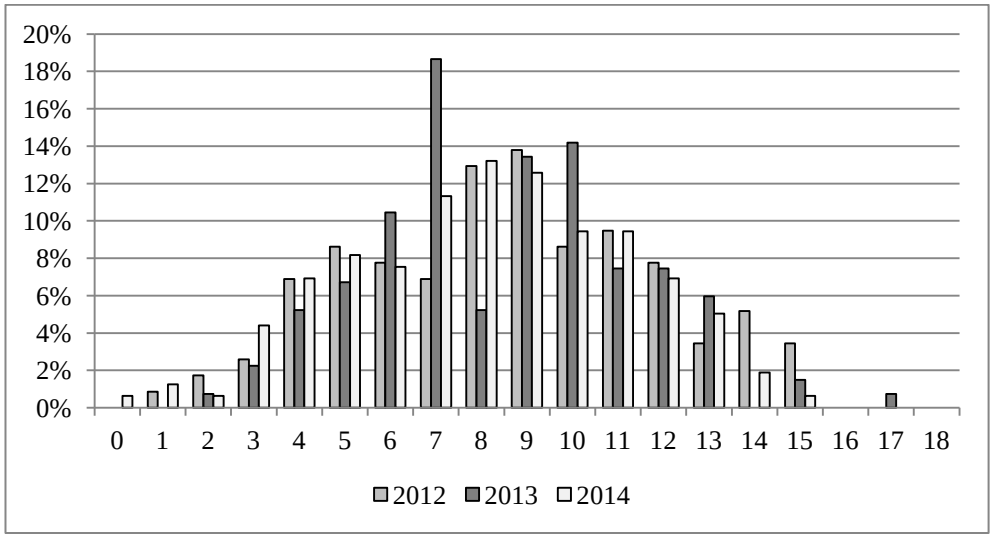



Fig. 3. The percentage of students who earned a certain score in 2012-2014

Source: own elaboration.

The study began by summarizing the results of the test written in subsequent years. Figure 3 shows a graph illustrating the percentage of students who gained a certain score (from 0 to 18) in the questionnaire conducted in 2012-2014.

Analyzing the test results broken down by field of study (Table 7), significantly better results were achieved by students of Computer Science (INF) than of Computer Science and Econometrics (IiE) field of study but the pass rate did not exceed 60% of the respondents (in a given year in a given field of study). This pattern applies to all the analyzed years. In addition, approximately one third of the respondents in each group received between 6 and 8 points, which means that they would pass the matura exam, but they would not pass our test. Quite surprising are the results of the students of Computer Science and Econometrics in 2012, when 36.4% of the respondents achieved less than 30% of the points.

Table 7. The percentage of people who earned a certain score in 2012-2014 grouped by the field of study

| Earned score | 2012 | | 2013 | | 2014 | |
|---|---|---|---|---|---|---|
| | INF | IiE | INF | IiE | INF | IiE |
| 0-5 | 17.0 | 36.4 | 10.7 | 20.3 | 21.6 | 22.6 |
| 6-8 | 25.5 | 36.4 | 33.3 | 35.6 | 30.9 | 33.9 |
| 9-18 | 57.5 | 27.2 | 56.0 | 44.1 | 47.5 | 43.5 |

Source: own elaboration.

Analyzing the results of the test in respect of the scope of math classes (basic or extended) (Table 8), we can state that the second group (with extended scope) performed much better. Every year in this group the pass rate was over 60%.

Table 8. The percentage of people who earned a certain score in 2012-2014 grouped by the scope of math classes

| Earned score | 2012 | | 2013 | | 2014 | |
|---|---|---|---|---|---|---|
| | Basic | Extended | Basic | Extended | Basic | Extended |
| 0-5 | 32.8 | 2.1 | 14.5 | 16.7 | 32.9 | 8.2 |
| 6-8 | 36.1 | 18.7 | 41.0 | 22.9 | 35.4 | 27.4 |
| 9-18 | 31.1 | 79.2 | 44.5 | 60.4 | 31.7 | 64.4 |

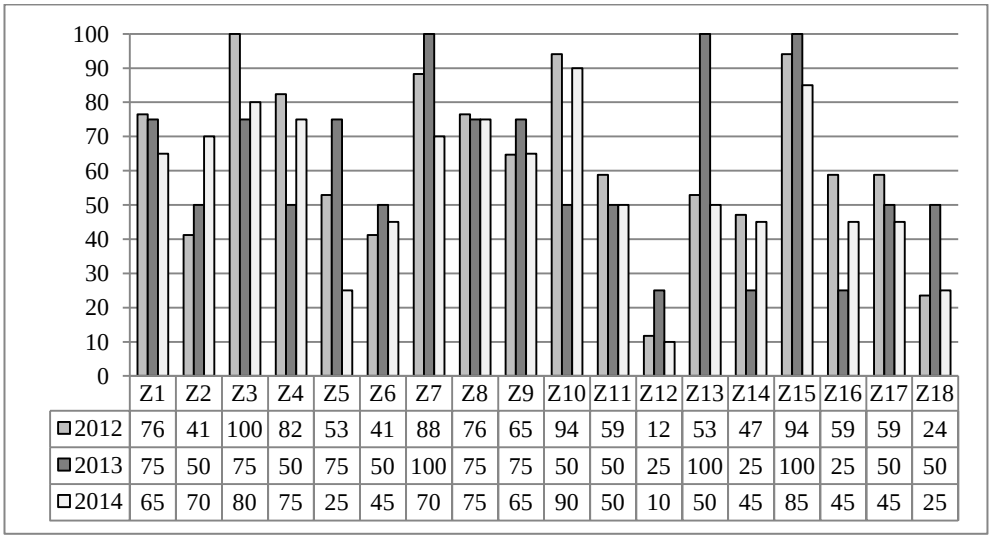
Source: own elaboration.

In the subsequent years we can also observe another regularity, the highest pass rate (at least 75%) was among those who evaluated the test as easy (Table 9). Encouraging is that among the people who evaluated our test as difficult, there is no decrease in the percentage of people passing our test from year to year.

Table 9. The percentage of people who earned a certain score in 2012-2014 grouped by the test difficulty

| Earned score | 2012 | | | 2013 | | | 2014 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Easy | Moderate | Difficult | Easy | Moderate | Difficult | Easy | Moderate | Difficult |
| 0-5 | 0.0 | 16.9 | 40.0 | 0.0 | 13.5 | 20.0 | 15.0 | 14.9 | 48.5 |
| 6-8 | 23.5 | 23.9 | 46.7 | 25.0 | 32.3 | 46.7 | 10.0 | 36.2 | 18.2 |
| 9-18 | 76.5 | 59.2 | 13.3 | 75.0 | 54.2 | 33.3 | 75.0 | 48.9 | 33.3 |

Source: own elaboration.




| | Z1 | Z2 | Z3 | Z4 | Z5 | Z6 | Z7 | Z8 | Z9 | Z10 | Z11 | Z12 | Z13 | Z14 | Z15 | Z16 | Z17 | Z18 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2012 | 76 | 41 | 100 | 82 | 53 | 41 | 88 | 76 | 65 | 94 | 59 | 12 | 53 | 47 | 94 | 59 | 59 | 24 |
| 2013 | 75 | 50 | 75 | 50 | 75 | 50 | 100 | 75 | 75 | 50 | 50 | 25 | 100 | 25 | 100 | 25 | 50 | 50 |
| 2014 | 65 | 70 | 80 | 75 | 25 | 45 | 70 | 75 | 65 | 90 | 50 | 10 | 50 | 45 | 85 | 45 | 45 | 25 |

Fig. 4. The percentage of correct answers in groups of people who evaluated the test as easy in years 2012-2014

Source: own elaboration.

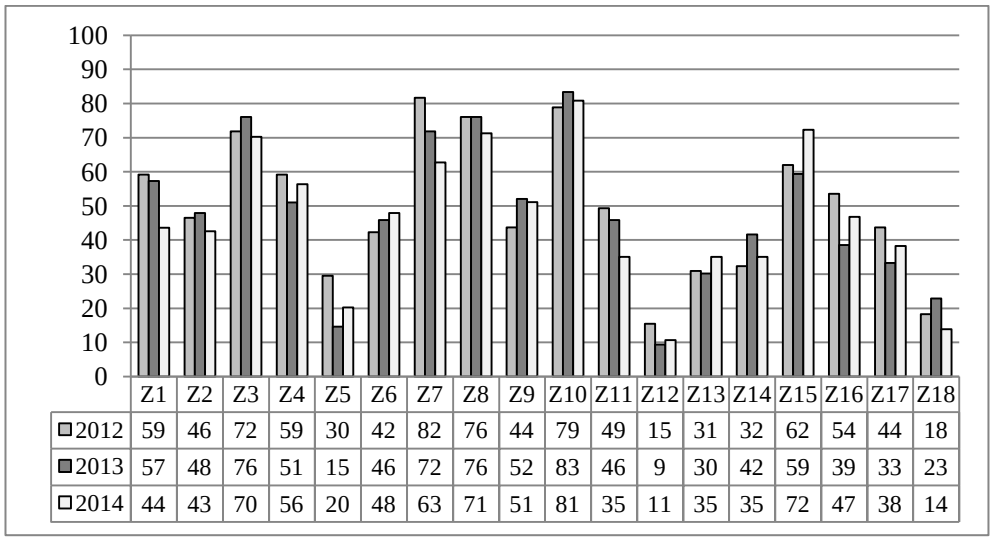
Comparing the test results in the groups of people who found the test easy (Figure 4), moderate (Figure 5) or difficult (Figure 6), the highest percentage of correct answers for most tasks was earned in the group of

people evaluating the test as easy. At the same time only in this group 100% of answers were correct for several tasks. These were the tasks: Z3 in 2012 and Z7, Z13 and Z15 in 2013.

Among the tasks that could affect the perception of the test as easy (Figure 4) we can point out those for which the percentage of correct answers was the highest (i.e. not less than 70%). These were the following tasks:

- Z1, Z3, Z4, Z7, Z8, Z10, Z15 in 2012,
- Z1, Z3, Z5, Z7, Z8, Z9, Z13, Z15 in 2013,
- Z2, Z3, Z4, Z7, Z8, Z10, Z15 in 2014.

Tasks that recur each year related to knowing the properties of powers, solving simple linear inequalities with one unknown, calculating the value of the function at a point, understanding the concept of a zero of a function and knowing the equation of the circle. It can be assumed that the knowledge of these issues in this population is established.




| | Z1 | Z2 | Z3 | Z4 | Z5 | Z6 | Z7 | Z8 | Z9 | Z10 | Z11 | Z12 | Z13 | Z14 | Z15 | Z16 | Z17 | Z18 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2012 | 59 | 46 | 72 | 59 | 30 | 42 | 82 | 76 | 44 | 79 | 49 | 15 | 31 | 32 | 62 | 54 | 44 | 18 |
| 2013 | 57 | 48 | 76 | 51 | 15 | 46 | 72 | 76 | 52 | 83 | 46 | 9 | 30 | 42 | 59 | 39 | 33 | 23 |
| 2014 | 44 | 43 | 70 | 56 | 20 | 48 | 63 | 71 | 51 | 81 | 35 | 11 | 35 | 35 | 72 | 47 | 38 | 14 |

Fig. 5. The percentage of correct answers in groups of people who evaluated the test as moderate in years 2012-2014

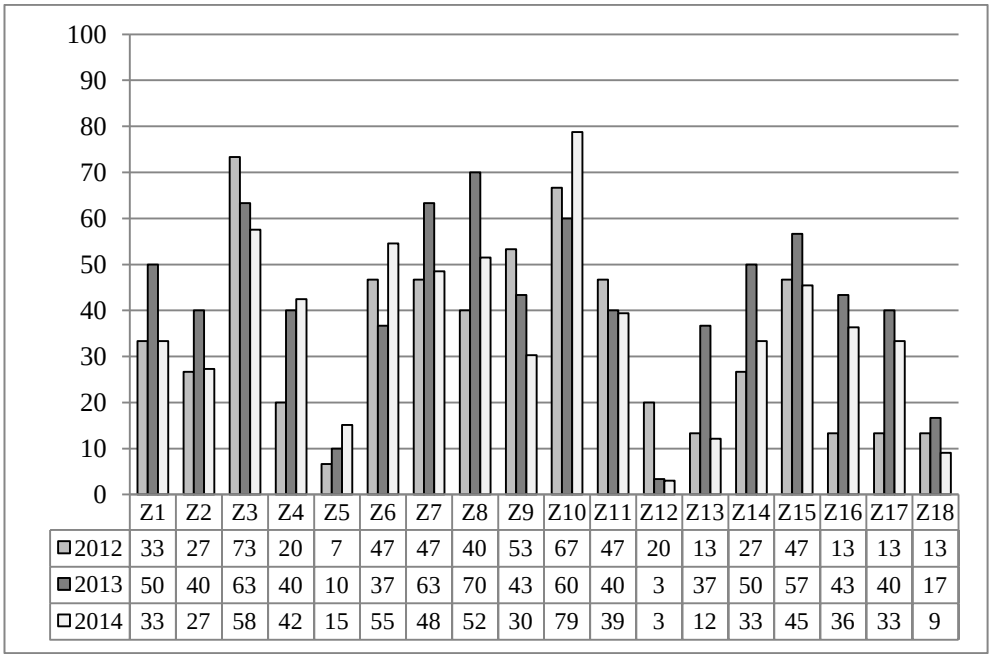
Source: own elaboration.

People who found the test difficult (Figure 6), solved the test the best in 2013 (that year 10 tasks had the highest percentage of correct answers). The perception of the test as difficult (Figure 6) could be affected by the tasks

for which the percentage of correct answers was the smallest (e.g. at most 20%). These were the tasks:

- Z4, Z5, Z12, Z13, Z16, Z17, Z18 in 2012,
- Z5, Z12, Z18 in 2013,
- Z5, Z12, Z13, Z18 in 2014.

In subsequent years there recur tasks Z5, Z12 and Z18 that concern drawing of the graph of a function with an absolute value and the understanding of the concept of a circle and straight line in the plane.




| | Z1 | Z2 | Z3 | Z4 | Z5 | Z6 | Z7 | Z8 | Z9 | Z10 | Z11 | Z12 | Z13 | Z14 | Z15 | Z16 | Z17 | Z18 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2012 | 33 | 27 | 73 | 20 | 7 | 47 | 47 | 40 | 53 | 67 | 47 | 20 | 13 | 27 | 47 | 13 | 13 | 13 |
| 2013 | 50 | 40 | 63 | 40 | 10 | 37 | 63 | 70 | 43 | 60 | 40 | 3 | 37 | 50 | 57 | 43 | 40 | 17 |
| 2014 | 33 | 27 | 58 | 42 | 15 | 55 | 48 | 52 | 30 | 79 | 39 | 3 | 12 | 33 | 45 | 36 | 33 | 9 |

Fig. 6. The percentage of correct answers in groups of people who evaluated the test as difficult in years 2012-2014

Source: own elaboration.

Among the tasks to which the respondents gave incorrect answers, the most frequent was task Z12 (regarding the transformation of algebraic expressions) and task Z18 (which require knowledge of the number of common points of a straight line and a circle). In task Z12, the same incorrect answer was selected by almost 50% of respondents. This was probably the result of ignorance of the formula for the difference of squares. On the other hand, the lack of ability to distinguish between the concepts of a circle and

a disk (the region in a plane bounded by a circle) caused that up to nearly two thirds of the respondents chose the same wrong answer in task Z18.

The same conclusions regarding the ignorance of transformations of algebraic expressions and distinguishing the concepts of a circle and a disk were obtained in our research conducted at the Faculty of Economics of the University of Economics in Katowice in the academic year 2012/13 [Kopańska-Bródka et al. 2015].

## 5. Conclusions

The absence of the compulsory matura exam in mathematics for 25 years has caused the lowering in teaching standards and the decline in the mathematical literacy of students, which has consequently led to a mass avoidance of those fields of study whose programs include mathematical subjects. Furthermore, the elimination of the obligation of passing the math exam has led to the fact that economic studies programs began to be slimmed down by reducing the teaching time and content of quantitative subjects – especially mathematics. We had to deal with students with very weak math skills, on the one hand, and with the trend for promoting economics without math, on the other hand. The situation was about to change dramatically after the reintroduction of mathematics as a compulsory subject during the matura exam in 2010. Conducted in 2012-2014 the research of the mathematical competence of students undertaking undergraduate studies in the fields of Computer Science and Computer Science and Econometrics showed that the selection of tasks (repeated every year) was appropriate. The pass rate at the criterion of a minimum of 30% of the score in our test is close to the national pass rate of the matura exam (taken in May) in mathematics in the basic scope. The good results obtained in 2012 by Polish 15-year-olds in the international PISA assessment give a good prediction of the mathematical competence of students beginning their undergraduate studies in 2015.

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