

ÉRETTSÉGI VIZSGA • 2016. május 3.

**MATEMATIKA
ANGOL NYELVEN**

**KÖZÉPSZINTŰ
ÍRÁSBELI VIZSGA**

2016. május 3. 8:00

I.

Időtartam: 45 perc

Pótlapok száma	
Tisztázati	
Piszkozati	

**EMBERI ERŐFORRÁSOK
MINISZTERIUMA**

Instructions to candidates

1. The time allowed for this examination paper is 45 minutes. When that time is up, you will have to stop working.
2. You may solve the problems in any order.
3. On solving the problems, you may use a calculator that cannot store and display textual information. You may also use any edition of the four-digit data tables. The use of any other electronic device or printed or written material is forbidden!
4. **Enter the final answers in the appropriate frames.** You are only required to detail your solutions where you are instructed by the problem to do so.
5. Write in pen. Diagrams may be drawn in pencil. The examiner is instructed not to mark anything written in pencil, other than diagrams. If you cancel any solution or part of a solution by crossing it over, it will not be assessed.
6. Only one solution to each problem will be assessed. In case of more than one attempt to solve a problem, indicate clearly which attempt you wish to be marked.
7. Please, **do not write in the grey rectangles.**

1. Solve the following equation in the set of real numbers: $2x^2 - 5x = 0$.

The solution(s) of the equation:	2 points	
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2. Decide whether the statements below are true for all sets A and B .

Statement 1: If $c \in (A \cup B)$, then $c \in A$.

Statement 2: If $d \in (B \cap A)$, then $d \in B$.

Statement 3: If $e \in (A \setminus B)$, then $e \in A$.

Statement 1:	1 point	
Statement 2:	1 point	
Statement 3:	1 point	

3. Calculate the value of x if $\log_5 x = \log_3 9$.

$x =$	2 points	
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4. How many four-digit numbers are there that are divisible by 3, end with a 5, and in which each of the digits 3; 4; 6 occurs among the digits? Explain your answer.

	2 points	
The number of four-digit numbers that meet the conditions:	1 point	

5. Vector $\mathbf{a}(2; 5)$ is perpendicular to vector $\mathbf{b}(5; b_2)$. Determine the value of b_2 .

$b_2 =$	2 points	
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6. Five businessmen are arriving at a meeting. The numbers of other participants they each have met before are: 1, 2, 2, 2, 3. (Acquaintances are mutual). Represent the acquaintances in a graph.

A graph representing the acquaintances:	2 points	
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7. Determine the equation of the circle centred at the point $C(1; -1)$ passing through the point $E(-2; 3)$. Explain your answer.

	2 points	
The equation of the circle:	1 point	

8. Let A denote the event that we obtain a five by rolling a regular die once. Let B denote the event that the sum of the numbers on two regular dice rolled simultaneously is five. Find the probability of each event.

$P(A) =$	1 point	
$P(B) =$	2 points	

9. Given are four numbers: 3; -2; -2; 0. Give a fifth number, such that the median of the five numbers is 0.

The fifth number:	2 points	
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- 10.** The function $x \mapsto \cos x + 1$ is defined over the set of real numbers. Find the zeros of the function in the interval $[-2\pi; 2\pi]$.

The zero(s) of the function:	2 points	
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- 11.** The ratio of the perimeters of two squares is 1:4. The area of the smaller square is 25 cm^2 . What is the area of the larger square? Explain your answer.

	2 points	
The area of the larger square: cm^2 .	1 point	

- 12.** A survey carried out among 1000 people revealed that 470 of them had a life insurance, 520 had home insurance, and 240 people had neither life insurance nor home insurance. How many of the participants of the survey had both kinds of insurance? Explain your answer.

	2 points	
The number of participants having both kinds of insurance:	1 point	

		maximum score	points awarded
Part I	Question 1	2	
	Question 2	3	
	Question 3	2	
	Question 4	3	
	Question 5	2	
	Question 6	2	
	Question 7	3	
	Question 8	3	
	Question 9	2	
	Question 10	2	
	Question 11	3	
	Question 12	3	
TOTAL		30	

_____ date

_____ examiner

	elért pontszám egész számra kerekítve / score rounded to the nearest integer	programba beírt egész pontszám / integer score entered in program
I. rész / Part I		

_____ javító tanár / examiner

_____ jegyző / registrar

_____ dátum / date

_____ dátum / date

Megjegyzések:

1. Ha a vizsgázó a II. írásbeli összetevő megoldását elkezdte, akkor ez a táblázat és az aláírási rész üresen marad!
2. Ha a vizsga az I. összetevő teljesítése közben megszakad, illetve nem folytatódik a II. összetevővel, akkor ez a táblázat és az aláírási rész kitöltendő!

Remarks.

1. If the candidate has started working on Part II of the written examination, then this table and the signature section will remain blank.
2. Fill out the table and signature section if the examination is interrupted during Part I or it does not continue with Part II.

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II.

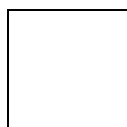
Időtartam: 135 perc

Pótlapok száma	
Tisztázati	
Piszkozati	

**EMBERI ERŐFORRÁSOK
MINISZTERIUMA**

Instructions to candidates

1. The time allowed for this examination paper is 135 minutes. When that time is up, you will have to stop working.
2. You may solve the problems in any order.
3. In part **B**, you are only required to solve two of the three problems. **When you have finished the examination, enter the number of the problem not selected in the square below.** *If it is not clear* for the examiner which problem you do not want to be assessed, the last problem in this examination paper will not be assessed.



4. On solving the problems, you may use a calculator that cannot store and display textual information. You may also use any edition of the four-digit data tables. The use of any other electronic device or printed or written material is forbidden!
5. **Always write down the reasoning used to obtain the answers. A major part of the score will be awarded for this.**
6. **Make sure that calculations of intermediate results are also possible to follow.**
7. On solving the problems, theorems studied and given a name in class (e.g. the Pythagorean Theorem or the height theorem) do not need to be stated precisely. It is enough to refer to them by name, *but their applicability needs to be briefly explained.*
8. Always state the final result (the answer to the question of the problem) in words, too!
9. Write in pen. Diagrams may be drawn in pencil. The examiner is instructed not to mark anything in pencil, other than diagrams. If you cancel any solution or part of a solution by crossing it over, it will not be assessed.
10. Only one solution to each problem will be assessed. In case of more than one attempt to solve a problem, **indicate clearly** which attempt you wish to be marked.
11. Please **do not write in the grey rectangles.**

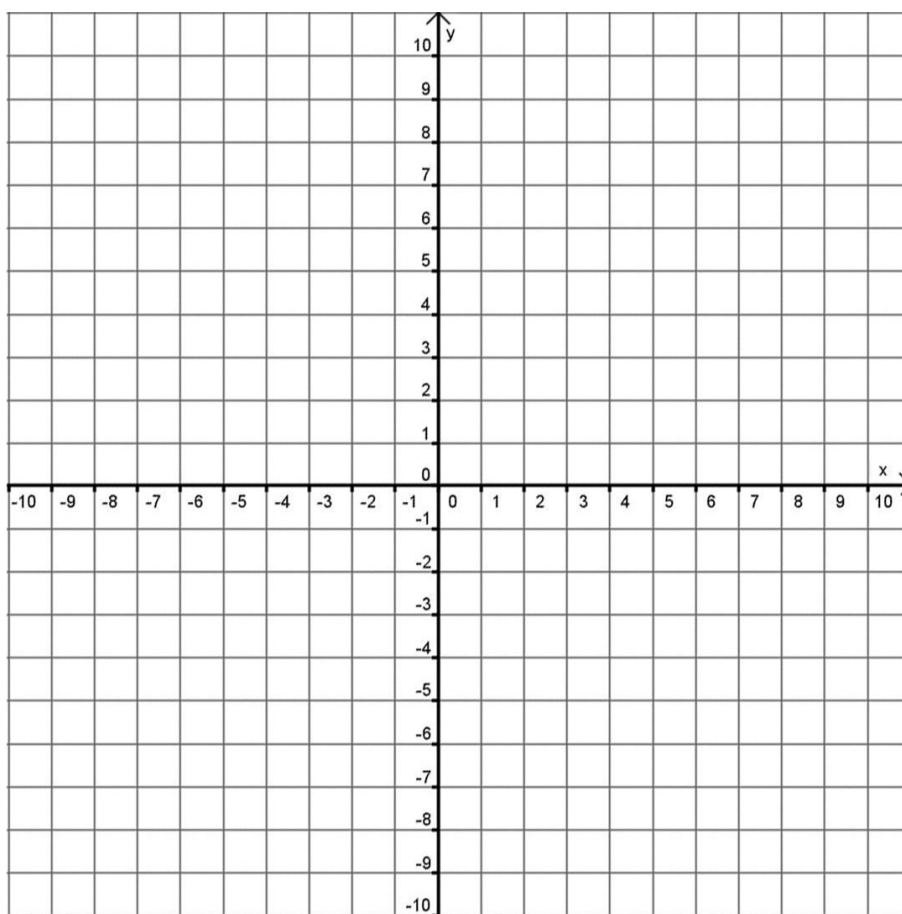
A

- 13.** Let the domain of the function f be the interval $[-4;3]$,
and let $f(x) = 2 - |x|$ for all $x \in [-4;3]$.

- a) Calculate the value of the function f at -2.85 .
- b) Graph the function f , and determine its range.
- c) Solve the following equation in the set of real numbers:

$$5^{2-|x|} = \frac{1}{5}$$

a)	2 points	
b)	5 points	
c)	5 points	
T.:	12 points	



- 14.** It is known that there are four blood groups: 0 (zero), A, B and AB, and it is also known that within each blood group, the Rh factor may be of two kinds: positive or negative. There were 400 donors participating in a recent campaign of a blood centre. Each of them gave one unit of blood. The table below represents the 400 units of blood collected from them.

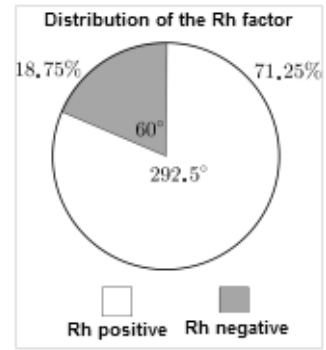
	Blood Group			
	0	A	B	AB
Rh positive	100	148	51	26
Rh negative	25	31	13	6

- a) Use the table to calculate the relative frequency of each blood group in the sample of 400 elements. Round your answers to two decimal places, and enter them in the appropriate fields of the table below.

	Blood Group			
	0	A	B	AB
Relative frequency				

- b) Two donors are selected at random from blood group zero. What is the probability that one of them is Rh positive and the other is Rh negative?
Round your answer to two decimal places.

- c) Some further statistics were made using the data of the 400 donors, and represented in a pie chart. Before the pie chart is published, the data in it need to be checked. Check the data in the pie chart and then fill in the table below.
 (The shaded fields of the table have already been checked. Do not write anything in those fields.)



	Is the value given in the diagram correct? (yes/no)	If the value in the diagram is not correct, the correct value is this:
Percentage of donors with Rh positive blood type		
Percentage of donors with Rh negative blood type	yes	—
Central angle of sector representing Rh positive		
Central angle of sector representing Rh negative		

a)	3 points	
b)	4 points	
c)	5 points	
T.:	12 points	

15. In a circle of radius 19 metres, chord AC encloses an angle of 40° with diameter AB . The line segments AB and AC divide the circle into three parts.

- a)** Calculate the area of each part.
Give your answer in m^2 , rounded to the nearest integer.
- b)** Calculate the length of the line segment BC .
Give your answer in metres, rounded to one decimal place.

a)	8 points	
b)	4 points	
T.:	12 points	

B

You are required to solve any two out of the problems 16 to 18. Write the number of the problem NOT selected in the blank square on page 3.

- 16.** The town of Orange in the South of France has one of the best preserved antique theatres of the world. The seats for spectators are arranged in semicircles. There are 60 seats in the first row. From the second row onwards, each row has 6 more seats than the previous row.
(The picture shows a part of the theatre.)



- a) How many seats are there in the 17th row?
- b) A tourist information booklet states that there are 6786 seats altogether in the theatre. How many rows are there?

The first term of a geometric sequence is 60 and its common ratio is 1.1 .

- c) Starting with the first term, at least how many terms of this sequence need to be added so that the sum reaches 6786?

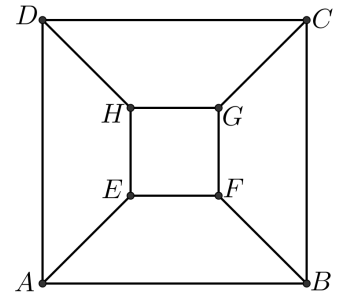
a)	3 points	
b)	7 points	
c)	7 points	
T.:	17 points	

You are required to solve any two out of the problems 16 to 18. Write the number of the problem NOT selected in the blank square on page 3.

- 17.** In a regular four-sided truncated pyramid, the length of the base edges is 30 cm, the length of the top edges is 18 cm, and the length of the lateral edges is 19 cm.

- a) Determine the angle enclosed by the lateral edge of the truncated pyramid with the plane of the base.
- b) Calculate the volume of the truncated pyramid.

The diagram shows the network of the edges of the truncated pyramid, as viewed from above (not to scale). It can be considered a graph on 8 points.



- c) Calculate the number of further edges that need to be added to the graph so that every point be connected to every other point by exactly one edge.

a)	8 points	
b)	4 points	
c)	5 points	
T.:	17 points	

You are required to solve any two out of the problems 16 to 18. Write the number of the problem NOT selected in the blank square on page 3.

18. In 2012, the Central Statistical Office published some preliminary figures of the 2011 census.

a) The following table represents the change in the population of the three counties of the Western Transdanubia region. Calculate the percentage change of the population in the entire region between 2001 and 2011.

In your answer, round the value of the change to the nearest tenth of a percent.

	Population in 2011 (thousand)	Change relative to year 2001 (%)
Győr-Moson-Sopron County	449	2.4
Vas County	258	-3.8
Zala County	283	-4.7

b) Another table represents the population of the region of Central Hungary that consists of the city of Budapest and Pest County. Calculate the number of women per thousand men in the entire region of Central Hungary.

	Population in 2011 (thousand)	Number of women per thousand men in 2011
City of Budapest	1737	1210
Pest County	1223	1084

a)	8 points	
b)	9 points	
T.:	17 points	

	number of problem	maximum score	points awarded	total
Part II A	13.	12		
	14.	12		
	15.	12		
Part II B		17		
		17		
	← problem not selected			
TOTAL		70		

	maximum score	points awarded
Part I	30	
Part II	70	
Total score on written examination	100	

_____ date

_____ examiner

	elért pontszám egész számra kerekítve / score rounded to the nearest integer	programba beírt egész pontszám / integer score entered in program
I. rész / Part I		
II. rész / Part II		

_____ javító tanár / examiner

_____ jegyző / registrar

_____ dátum / date

_____ dátum / date