Név: .... osztály:......

ÉRETTSÉGI VIZSGA ● 2014. május 6.

MATEMATIKA ANGOL NYELVEN

KÖZÉPSZINTŰ ÍRÁSBELI VIZSGA

2014. május 6. 8:00

I.

Időtartam: 45 perc

Pótlapok száma	
Tisztázati	
Piszkozati	

EMBERI ERŐFORRÁSOK MINISZTÉRIUMA

Instructions to candidates

1. The time allowed for this examination paper is 45 minutes. When that time is over, you will have to stop working.

2. You may solve the problems in any order.

3. In solving the problems, you are allowed to use a calculator that cannot store and display verbal information. You are also allowed to use any book of four-digit data tables. The use of any other electronic device, or printed or written material is forbidden!

4. **Write the final answers in the appropriate frames.** You are only required to write down details of the solutions where you are instructed by the problem to do so.

5. Write in pen. The examiner is instructed not to mark anything in pencil, other than diagrams. Diagrams are also allowed to be drawn in pencil. 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 the case of more than one attempt to solve a problem, indicate clearly which attempt you wish to be marked.

7. Please **do not write anything in the grey rectangles.**

1. A class consists of 35 students. The ratio of the number of boys to the number of girls is 3:4. How many boys are there in the class?

There are boys in the class.	2 points	

2. Which real number x satisfies the following equality?

$$2^{\frac{x}{2}} = \sqrt{2}$$

$x =$	2 points	

3. A function defined on the set of real numbers has the following rule of assignment: $x \mapsto -2x + 4$.

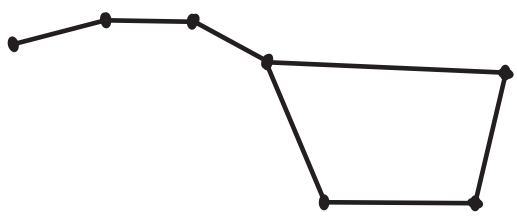
a) Determine where the graph of the function intersects the y-axis of the right-angled coordinate plane.
b) To which number does the function assign the value of 6?

a) y-intercept:	1 point	
b) The number in question:	2 points	

4. In a test, students wrote three-letter codes made up of the letters A, B and C on their papers instead of their names. Every possible code from AAA to CCC was given to a student, and there were no students with the same code.
How many students took the test?

students took the test.	2 points	

5. What is the sum of the degrees of the vertices in the following graph on 7 points?



The sum of the degrees:	2 points	

6. Let the set A consist of those non-negative integers x for which the expression $\sqrt{5-x}$ is meaningful. List the elements of the set A.
Write down your solution in detail.

	2 points	
$A = \{ \quad \}$	1 point	

7. The radius of a circle is 3 cm. Calculate the area of the sector of this circle that belongs to a central angle of 270 degrees.
Write down your solution in detail.

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

8. The table below shows the distribution of grades on a test.

grade	1	2	3	4	5
frequency	0	2	7	8	3

Determine the relative frequency of each grade.

grade	1	2	3	4	5	2 points	
relative frequency							

9. Decide about each of the following statements whether it is true or false.

A) If the first term of a geometric progression is (–2) and its third term is (–8), then the second term is 4 or (–4).
B) The regular triangle is a figure with central symmetry.
C) If all sides of a quadrilateral are equal then the quadrilateral is a parallelogram.

A)	1 point	
B)	1 point	
C)	1 point	

10. Calculate the radius of the circumscribed sphere of a cube of edge 7 cm. Round your answer to one decimal place.

The radius of the sphere: cm.	3 points	

11. Consider the function $x \mapsto |x-2|-4$ defined on the set of real numbers.
What is the minimum value of the function?

A: (– 2) B: (– 4) C: 2 D: 0 E: (– 6)

The letter marking the correct answer:	2 points	

12. The length of a side of the rhombus *ABCD* is 6 cm, and angle *BCD* is 120º.
How long is the diagonal *AC* of the rhombus?
Explain your answer.

	2 points	
The length of diagonal *AC*: cm.	1 point	

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

date examiner

	elért pontszám egész számra kerekítve/ score rounded to **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 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.

ÉRETTSÉGI VIZSGA ● 2014. május 6.

MATEMATIKA ANGOL NYELVEN

KÖZÉPSZINTŰ ÍRÁSBELI VIZSGA

2014. május 6. 8:00

II.

Időtartam: 135 perc

Pótlapok száma	
Tisztázati	
Piszkozati	

EMBERI ERŐFORRÁSOK MINISZTÉRIUMA

Instructions to candidates

1. The time allowed for this examination paper is 135 minutes. When that time is over, 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 out of the three problems**. When you have finished the examination paper, write in the square below the number of the problem NOT selected.** *If it is not clear* for the examiner which problem you do not want to be assessed, then problem 18 will not be assessed.

4. In solving the problems, you are allowed to use a calculator that cannot store and display verbal information. You are also allowed to use any book of 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 in obtaining the answers, since a large part of the attainable points will be awarded for that.**

6. **Make sure that the calculations of intermediate results are also possible to follow.**

7. In solving the problems, theorems studied and given a name in class (e.g. the Pythagorean theorem or the altitude theorem) do not need to be stated precisely. It is enough to refer to them by the 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. The examiner is instructed not to mark anything in pencil, other than diagrams. Diagrams are also allowed to be drawn in pencil. 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 the case of more than one attempt to solve a problem, **indicate clearly** which attempt you wish to be marked.

11. Please **do not write anything in the grey rectangles.**

A

13. **a)** Solve the following equation on the set of real numbers:

$$\log_3(7x + 18) - \log_3 x = 2$$

b) Solve the following equation on the closed interval $[0; 2\pi]$:

$$2\cos^2 x = 7\cos x + 4$$

a)	5 points	
b)	7 points	
T.:	12 points	

14. The Mathematics without Frontiers competition is organized for 9th-grade classes of high schools. Each participating class solve the same set of problems at the same time. The table below shows the scores of 28 classes.

Score (points):	83	76	69	67	65	61	60	58	56	55
Frequency:	2	4	2	2	4	3	2	4	4	1

a) Calculate whether the mean and median of the scores differ by at least 1 point.

Those classes with 70 points or more are rated "Excellent", those with 60 or more but less than 70 points are rated "Very good", and those with 50 or more but less than 60 points are rated "Good".

b) Use the data given in the table to represent the frequencies of the three ratings in a bar chart.

The six best papers turned in by the 28 classes are re-read by the organizers to make sure that the marking is correct. The six papers are stacked on top of each other in a random order.

c) What is the probability that the uppermost paper is one with 83 points and the paper lying right below is one with 76 points?

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

15. In the coordinate plane, consider the points A and B with coordinates $A(8; 9)$ and $B(12; 1)$, the circle k of radius 5 units centred at the origin, and the line e that touches circle k at the point E (4;3).

a) Calculate the distance between the points A and B.

b) Determine the equation of line e.

Line f passes through the given points A and B.

c) Calculate the coordinates of the intersection of lines e and f.

a)	2 points	
b)	3 points	
c)	7 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. A circus tent consists of the lateral surface of a cylinder and the lateral surface of a cone on top, fitting the cylinder. The base radius of the cylinder and of the cone is 18 metres. The height of the whole tent is 10 metres, and the height of the vertical wall is 4 metres. According to safety regulations that determine the maximum number of spectators allowed in this type of tent, the volume of air per spectator must be at least 6 m^3. (The total volume of air is to be calculated with an empty tent.)

a) What is the maximum number of spectators allowed in this tent?

The manager of the circus decided to let 1000 paying spectators in. A ticket for the show costs 800 forints for adults, and 25% less for children. After the show, it turned out that the total income from the 1000 tickets sold was 665 800 forints.

b) How many adult tickets and how many children's tickets were sold for this show?

In a part of the show, 10 acrobats form a human pyramid of four levels, with their backs to the stage entrance: Four of them are standing next to each other on the ground, three others are standing on their shoulders, two on the shoulders of those, and finally, one acrobat on the top. Each acrobat belongs to a certain level, but within a level the order of the acrobats is arbitrary.

c) In how many different arrangements may the human pyramid be set up?

a)	7 points	
b)	6 points	
c)	4 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. Consider the increasing sequence of all positive integers that leave a remainder of 2 when divided by 3.
The first term of the sequence is the smallest number of this property.

a) What is the 25th term of this sequence?

b) The sum of the first *n* terms of the sequence is 8475. Find the value of *n*.

c) How many terms of the sequence are three-digit numbers divisible by 5?

a)	3 points	
b)	6 points	
c)	8 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. A graduating class of 32 students held a vote on the colour of the invitation card to the graduation ceremony. Every student took part in the vote. There were three colours (yellow, white and wine red) listed on the ballot paper, and everyone marked either one or two of the three colours. Out of those marking two colours, 4 students marked yellow and white, and 3 marked white and wine red. No one marked yellow and wine together. When they counted the votes, it turned out that each colour had received the same number of votes.

a) What is the probability that a student selected at random from the class marked a single colour on the ballot paper?

b) How many students marked white only?

An eleventh-grade student has 7 friends in the graduating class: 5 boys and 2 girls. This student is planning to say goodbye to them by giving a rose to each of three friends of his. He wants to give a rose to at least one boy and at least one girl.

c) In how many different ways – satisfying the above conditions – may he select which three out of his seven friends will receive the flowers?

a)	3 points	
b)	8 points	
c)	6 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 **integer**	programba beírt **egész** pontszám/ **integer** score entered in program
I. rész		
II. rész		

javító tanár/examiner

jegyző/registrar

dátum/date

dátum/date