MATEMATIKA ANGOL NYELVEN

KÖZÉPSZINTŰ ÍRÁSBELI VIZSGA

2017. május 9. 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 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:

$$x^2 + 2x = 0$$

	2 points	

2. LESZ and FOLYÓ are two big summer festivals. In a survey during the spring students, who planned to attend at least one of these two events, were interviewed which festival they would attend in summer. Of the 29 students who have been interviewed, 23 indicated that they would go to LESZ, and 19 said they would attend FOLYÓ. How many of the students interviewed would attend both festivals?

	2 points	

3. The base-10 (decimal) form of a number is 23. Write up this number in base-2 (binary) form.

	2 points	

4.   Five friends greeted each other when they met. Some of them shook hands, too. The number of handshakes performed by each person were: 2, 3, 4, 3, 2.
How many handshakes took place altogether? Explain your answer.

	2 points	
The number of handshakes:	1 point	

5.   Solve the following equation in the set of positive real numbers:

$$\log_2(4x) = 6$$

	2 points	

6.   Given is the function $f\colon \mathbf{R} \to \mathbf{R}$, $x \mapsto 2 - 3x$. To which number does this function assign the value 5?

$x =$	2 points	

7. There are 50 numbers in a set of data. The mean, median, mode, range and standard deviation of the data are all known. Which of the following does **certainly** appear among the numbers in the dataset, too?

A: the mean   B: the median   C: the mode   D: the range   E: the standard deviation

	2 points	

8. The base of a straight prism is a regular triangle. All edges of the prism are 4 cm long. Calculate the volume of the prism. Show your work.

	3 points	
$V =$ cm^3	1 point	

9. Find the real values of x for which the expression $\sqrt{5x+8}$ is defined!

	2 points	

10. Determine the truth value (true or false) of the following statements:

A: If a number is divisible by 24 then it is also divisible by both 4 and 6.
B: If a number is divisible by both 4 and 6 then it is also divisible by 24.
C: If a number is divisible by 24 then the sum of its digits is divisible by 3.

A:		
B:	2 points	
C:		

11. Let $A = \{a; b; c; d; e; f\}$, $B = \{d; e; f; g; h\}$, $C = \{c; d; e; f; g\}$.
By listing their elements, give the sets $A \cap B \cap C$ and $(A \cup B) \setminus C$.

$A \cap B \cap C =$	2 points	
$(A \cup B) \setminus C =$	2 points	

12. One red and one white fair gambling dice are thrown together.
What is the probability that the product of the numbers thrown is 9?
Explain your answer.

	2 points	
The probability is:	1 point	

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

_____	_____
date	examiner

	pontszáma **egész számra** kerekítve	
	elért	programba beírt
I. rész		

_____	_____
dátum	dátum
_____	_____
javító tanár	jegyző

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!

ÉRETTSÉGI VIZSGA • 2017. május 9.

MATEMATIKA ANGOL NYELVEN

# KÖZÉPSZINTŰ ÍRÁSBELI VIZSGA

2017. május 9. 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 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.
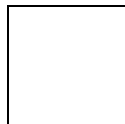
4. On solving the problems, you may use a calculator that cannot store and display textual information. You may also use any edition of the four-digit data tables. The use of any other electronic device or printed or written material is forbidden!

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. **The use of calculators** in the reasoning behind a particular solution **may be accepted without further mathematical explanation in case of the following operations**: addition, subtraction, multiplication, division, calculating powers and roots, $n!$, $\binom{n}{k}$, replacing the tables found in the 4-digit Data Booklet (sin, cos, tan, log, and their inverse functions), approximate values of the numbers π and e, finding the solutions of the standard quadratic equation. No further explanation is needed when the calculator is used to find the mean and the standard deviation, as long as the text of the question does not explicitly require the candidate to show detailed work. **In any other cases, results obtained through the use of a calculator are considered as unexplained and points for such results will not be awarded.**

8. 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.*

9. Always state the final result (the answer to the question of the problem) in words, too!

10. 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.

11. 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.

12. Please **do not write in the grey rectangles**.

A

13. **a)** Solve the following equation system in the set of real numbers.

$$\begin{cases} 3x + y = 1 \\ x + 2y = 12 \end{cases}$$

b) Solve the following equation in the set of real numbers.

$$2 \cdot 5^x + 3 \cdot 5^{x+1} = 425$$

a)	5 points	
b)	5 points	
T.:	10 points	

14. Given are the functions $f\colon [-2;\ 5] \to \mathbf{R}$, $f(x) = |x-4|$, and
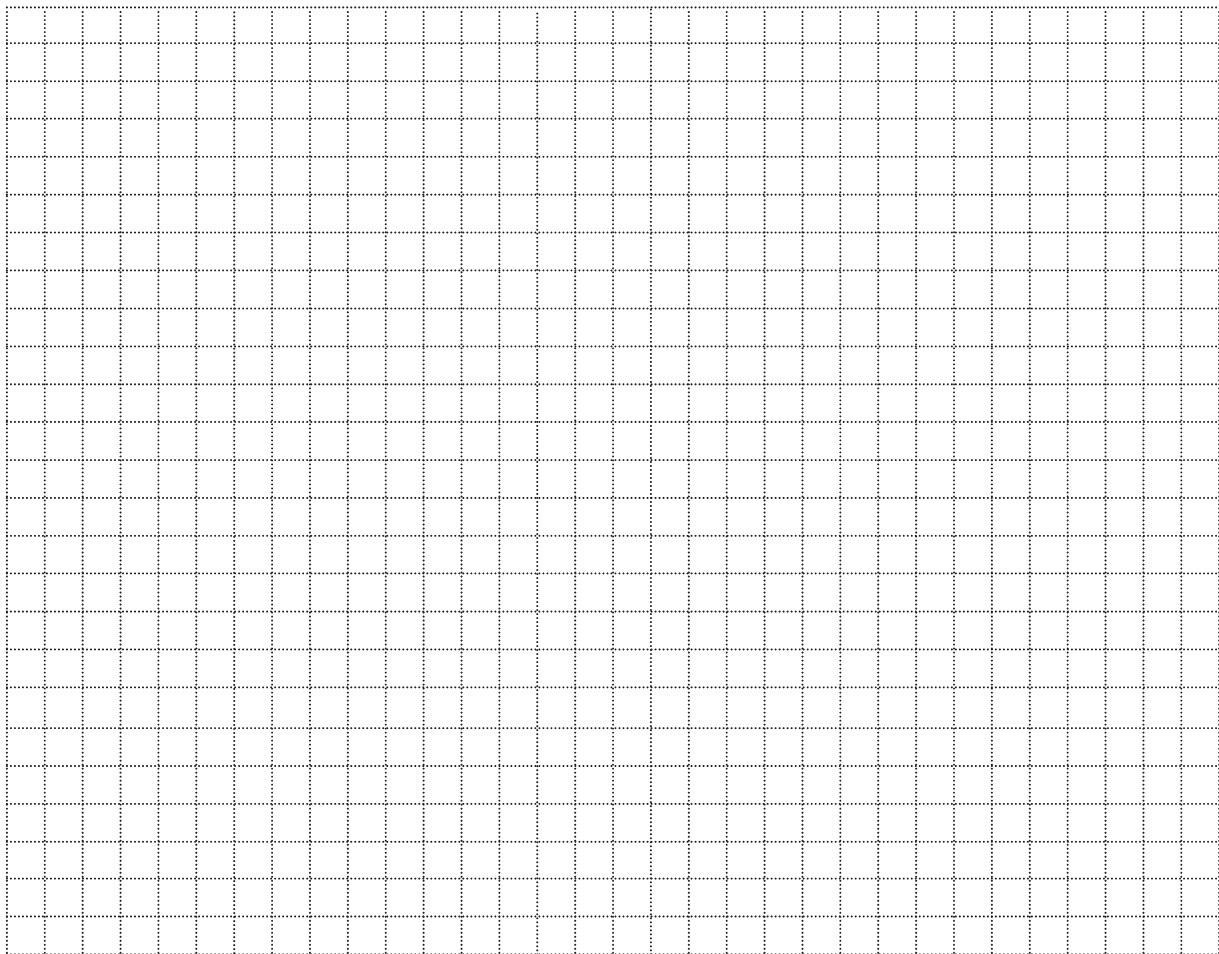
$$g\colon \mathbf{R} \to \mathbf{R},\ g(x) = 2x+1.$$

a) Draw the graph of function f.

b) Determine the value of x for which the values of the functions f and g are equal.

Consider the arithmetic sequence whose first term is 3 and its common difference is 2. Add the terms of this sequence starting with the 5th term and ending with the 50th.

c) Calculate the above sum.

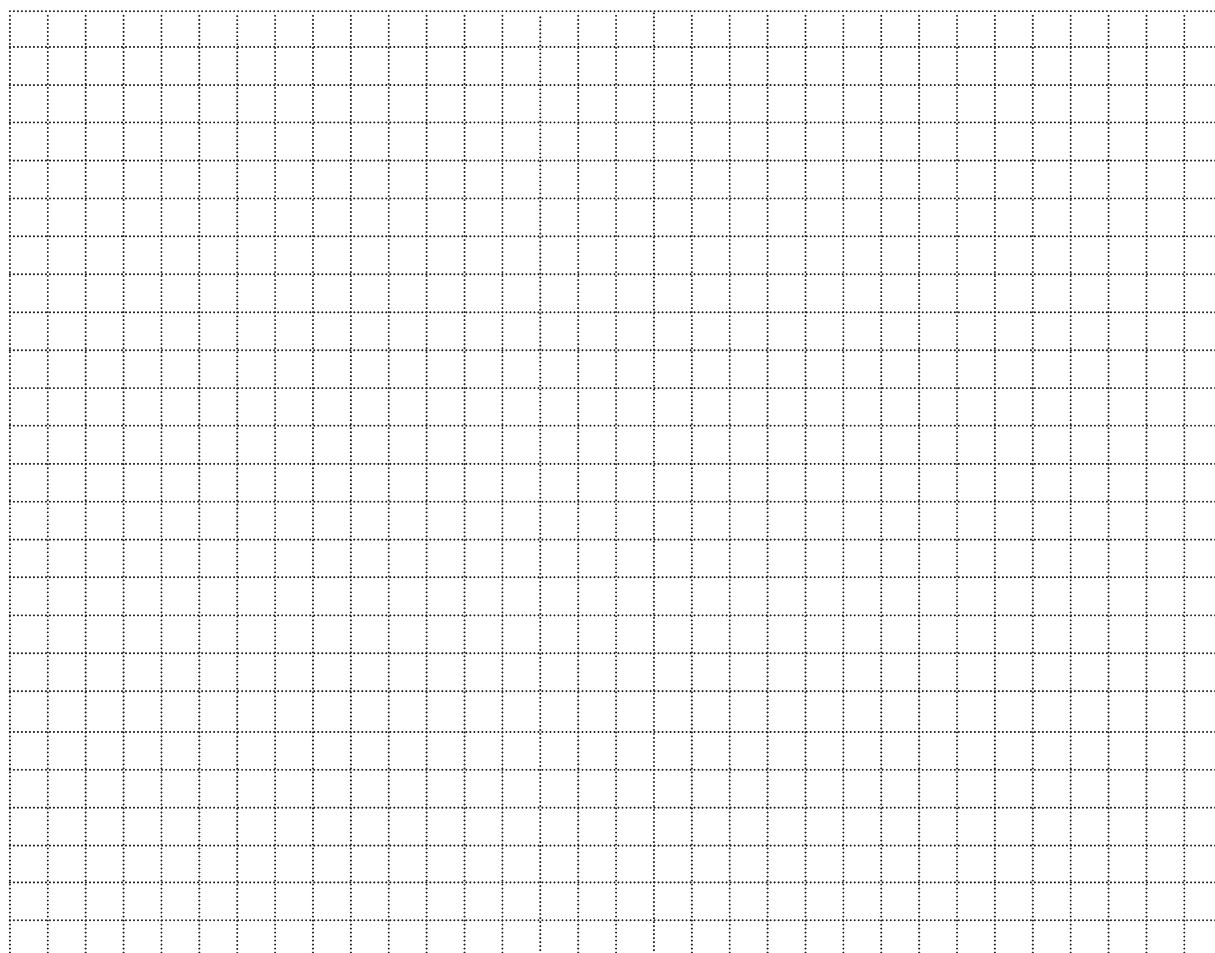|		
a)	3 points	
b)	4 points	
c)	5 points	
T.:	12 points	

15. The three vertices of a triangle are: $A(-4; -10)$, $B(6; 14)$, $C(11; -2)$.

a) Calculate the length of the midsegment that is parallel to side AB of triangle ABC.

b) Give the equation of the altitude that belongs to side AB of triangle ABC.

c) Calculate the measure of the interior angle at vertex A of the triangle.

a)	4 points	
b)	5 points	
c)	5 points	
T.:	14 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 2.

16. Mum is making a plush toy snowman for her son. The body of the snowman is made of two spheres sewn together, filled with bits of sponge. While stuffed into the spheres, the sponge loses 20% of its original volume.

    a) How many litres of (uncompressed) sponge was needed to fill the body, given that the diameters of the spheres were 20 cm and 16 cm?

The nose of the snowman is a straight cone. The base of the cone is a circle of 2 cm radius, the height of the cone is 4.8 cm. To make the lateral surface of the cone, a sector is cut out of orange cloth.

    b) Calculate the radius and the central angle of the sector.
      (Ignore the extra bits required to sew the nose together.)

Mum also marked the places for the two eyes and three front buttons of the snowman. She found six different sizes of black buttons in her sewing box, at least three of each size. She would sew on two buttons of equal size for the eyes, while the three front buttons will increase in size from top to bottom. The three front buttons may be the same size, smaller, or greater than the eyes.

    c) How many different plans could Mum make?
      (Two plans are considered different if the snowmen that are made according to these plans can be distinguished from one another by the size of the buttons used.)

a)	6 points	
b)	6 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 2.

17. In Hungary, the gas consumption of cars is given in litres, over 100 kilometres. On one of his journeys, Mr. Kovács first drove at an average speed of 70 km/h for one hour. The onboard computer calculated a gas consumption of 6.0 litres (per 100 km) for this part of the journey. During the next hour, Mr. Kovács drove at an average 120 km/h. The gas consumption was now calculated as 8.5 litres (per 100 km).

   a) Calculate the average gas consumption of the car for the whole journey.
   Round your answer to one decimal place.

A business trip takes Mr. Kovács to Washington. When he arrives, he wants to rent a car.
The note on the car says: "Average gas consumption: 25 miles per gallon".
One gallon is about 3.8 litres, 1 mile is 1600 metres.

   b) How many litres of gas does this car consume over a distance of 100 kilometres?

Mr. Kovács drove his rented car every day for 7 days. He noticed that, starting on the second day, each day he drove a distance 10% shorter than that on the day before.

   c) How many miles did he drive on the first day, given that on the seventh he drove 186 miles?

License plates in Washington consist of 7 characters: three letters followed by four digits (e.g. APR 0123). (It is also possible that all four digits are zero.) All license plates beginning with the letters APR are already issued, one of these is randomly chosen.

   d) Which event has a higher probability: that the four digits following the letters APR are all different, or that there are at least two identical digits among them?

a)	6 points	
b)	3 points	
c)	3 points	
d)	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 2.

18. The device shown in the diagram is used in a Physics experiment to measure gravitational acceleration (g). Ten identical iron balls are loaded into the machine which are then dropped one after the other. The value of g can be calculated from the combined fall-time of the 10 balls.

Five pairs of students were doing the experiment with this machine, each of them repeating it 8 times. Here are the results obtained by one of the pairs:
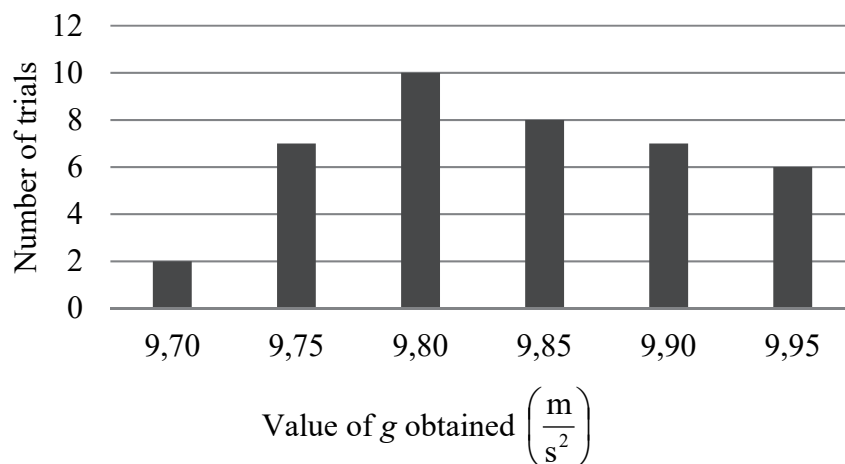
$$9.90; \quad 9.95; \quad 9.70; \quad 9.85; \quad 9.80; \quad 9.95; \quad 9.75; \quad 9.90 \left(\frac{\text{m}}{\text{s}^2}\right).$$

The experiment, with its 8 repeated trials, is considered a success if the standard deviation of the 8 values is no more than $0.1 \dfrac{\text{m}}{\text{s}^2}$.

a) Would the above results qualify as success?

The diagram below shows the results of all 40 trials of the 5 pairs of students.

b) Give the mean and the median of the 40 results.

Two iron balls were missing from one of the experiment kits, these were replaced by two identical brass balls.

c) Taking the sequential order into account, how many different ways are there in which the 10 balls can be loaded into the machine if the two brass balls may not be placed next to each other and balls made of the same material are not distinguished?

It sometimes happens that a ball gets stuck in the machine, in which case that trial fails. The probability of such failure is known to be 0.06.

d) Calculate the probability that none of the 40 trials will fail.
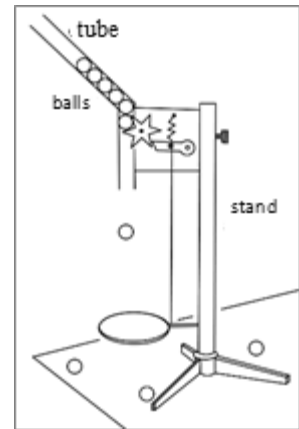
a)	4 points	
b)	5 points	
c)	5 points	
d)	3 points	
T.:	17 points	

	number of question	score		
		maximum	awarded	total
Part II A	13.	10		
	14.	12		
	15.	14		
Part II B		17		
		17		
	← question not selected			
TOTAL		**70**		

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

_____   _____
            date   examiner

	pontszáma **egész számra** kerekítve	
	elért	programba beírt
I. rész		
II. rész		

_____   _____
            dátum   dátum

_____   _____
        javító tanár   jegyző