Név: ..... osztály:.....

ÉRETTSÉGI VIZSGA • 2025. május 6.

MATEMATIKA
ANGOL NYELVEN

KÖZÉPSZINTŰ
ÍRÁSBELI VIZSGA

2025. május 6. 9:00

I.

Időtartam: 57 perc

Pótlapok száma	
Tisztázati	
Piszkozati	

OKTATÁSI HIVATAL

Instructions to candidates

1. The time allowed for this examination paper is 57 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. Given the two sets: $A = \{2; 3; 4; 5; 6\}$ and $B = \{5; 6; 7; 8; 9\}$, list the elements of the sets $A \cap B$ and $B \setminus A$.

$A \cap B =$	1 point	
$B \setminus A =$	1 point	

2. Emma scored 68 points out of 80 points on a test. What is Emma's percentage result on this test?

Emma scored percent.	2 points	

3. How many different three-digit numbers can be formed with the digits 4, 5, 6, 7, 8 if each digit can be used more than once?

	2 points	

4. Give the value of x if $2^x = 8^4$.

$x =$	2 points	

5. Give the decimal (base 10) form of the binary (base 2) number 10101_2.

	2 points	

6. The third term of a geometric sequence is 8, the fourth term is 4. Give the common ratio (quotient) of the sequence, the first term, and the sum of the first 7 terms.

The common ratio:	1 point	
The first term:	1 point	
The sum of the first 7 terms:	2 points	

7. Members of a party of 7 people greet each other by shaking hands: everybody shakes hands with everybody else once. So far, there have been 10 handshakes.
How many more handshakes are there to go? Show your work.

	2 points	
	1 point	

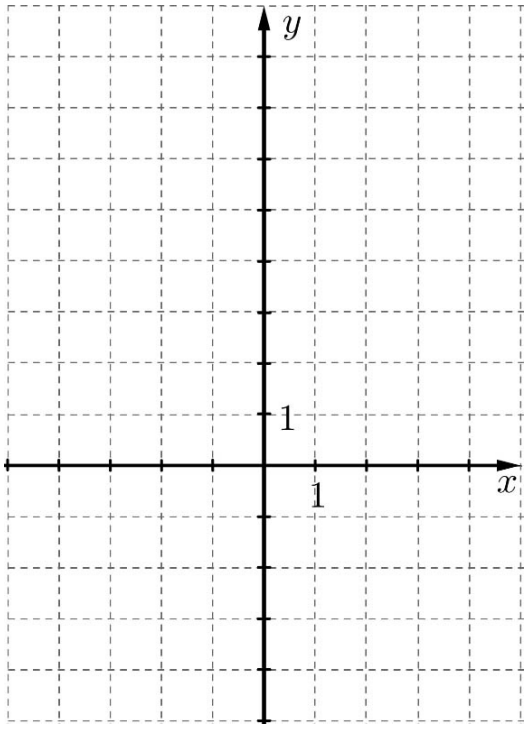
8. The three sides of a triangle are 4 cm, 8 cm and 10 cm long. The shortest side of another triangle, similar to this one, is 6 cm long. What is the length, in centimetres, of the longest side of this similar triangle?

The longest side of the triangle is cm.	2 points	

9. A four-digit, positive integer is divisible by 3 and each digit of it is less than 2.
List all such integers.

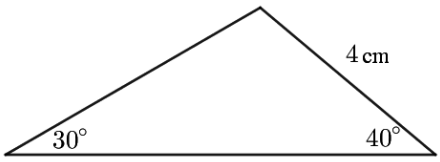
	3 points	

10. Write down the equation of the line that has a gradient of 2 and passes through the point $P(1; 3)$.



	2 points	

11. The side opposite the 30° angle of the triangle shown in the diagram below is 4 cm long. How long is the side opposite the 40° angle? Show your work.



	2 points	
	1 point	

12. Two fair octahedral (8 faces) gaming dice, one black and one white, are rolled. Each octahedral die shows the numbers 1, 2, 3, 4, 5, 6, 7, 8 on its faces. (For example, in the picture below a 1 and a 3 are rolled.)
What is the probability that the sum of the two numbers rolled will be 5? Show your work.

	2 points	
	1 point	

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

date examiner

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	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!

Név: ..... osztály:.....

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MATEMATIKA
ANGOL NYELVEN

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ÍRÁSBELI VIZSGA

2025. május 6. 9:00

II.

Időtartam: 169 perc

Pótlapok száma	
Tisztázati	
Piszkozati	

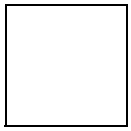
OKTATÁSI HIVATAL

Instructions to candidates

1. The time allowed for this examination paper is 169 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. When 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. When 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. Solve the following equations over the set of real numbers.

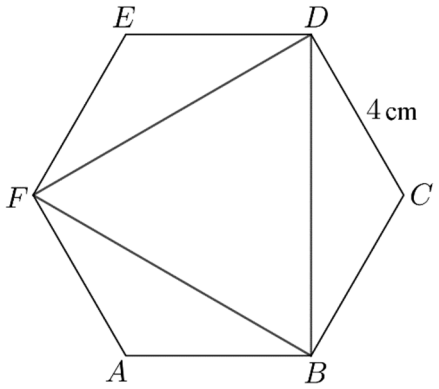
a) $\frac{x-1}{6}+\frac{x+5}{9}=\frac{x+3}{4}$

b) $(x+1)^2+(x+1)(x-1)=0$

a)	5 points	
b)	6 points	
T.:	11 points	

14. **a)** Prove that the measure of one interior angle of a regular hexagon (6 sides) is 120°.

The diagram shows the regular hexagon *ABCDEF*, each side of which is 4 cm.
Consider the regular triangle *BDF* drawn into this hexagon.



b) Calculate the area of triangle *BDF*.

c) Calculate the circumference (perimeter) of the circumcircle of hexagon *ABCDEF*.

d) Give the results of the following vector operations:

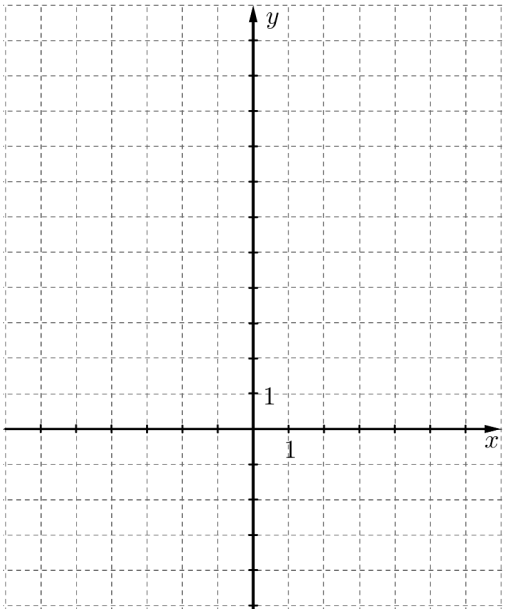
$\overrightarrow{BF}+\overrightarrow{FD}=$ $\overrightarrow{AB}-\overrightarrow{AF}=$

a)	3 points	
b)	5 points	
c)	2 points	
d)	3 points	
T.:	13 points	

15. The domain of the function $f: x \mapsto (x+1)^2 - 2$ is the closed interval [–2; 2].

a) What number does the function *f* assign to $x = -1.5$?

b) Draw the graph of the function *f*.



The functions *e* and *g*, given below, are defined over the set of real numbers.

$e: x \mapsto -2x+1$ $\qquad\qquad$ $g: x \mapsto 2^x$

c) Decide whether the statements below are true or false for each of the functions *e* and *g*. Fill in the table. In this part of the question you do not need to explain your answers.

	e	*g*
Has a zero.		
Strictly monotone increasing.		
Has a maximum.		

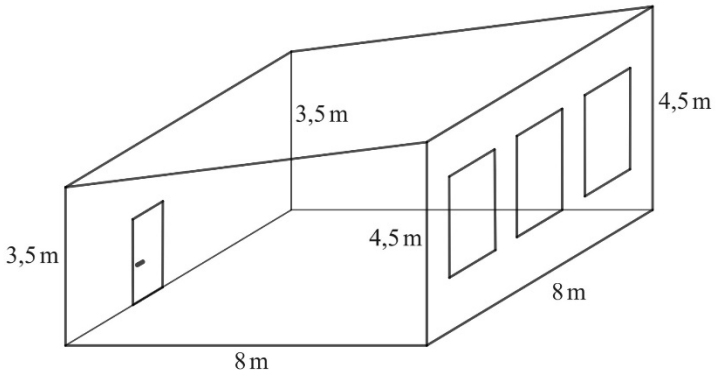
d) Determine the number to which the function *g* assigns 3.
Round your answer to 3 decimal places.

a)	2 points	
b)	3 points	
c)	4 points	
d)	3 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 2.

16. The diagram shows a sketch of a classroom. The floor is a square with 8 m long sides. The height of the wall with the door is 3.5 metres, while the height of the wall with the windows is 4.5 metres.



The dimensions of the three rectangular windows of the classroom are 1.6 m × 2.5 m, the door is 90 cm wide and 210 cm tall.
The two opposite, rectangular, vertical walls of the classroom have been painted light blue (except, of course, the door and the windows), while the rest of the wall surface has remained unpainted.

a) How many square metres of wall surface has been painted light blue in this classroom?

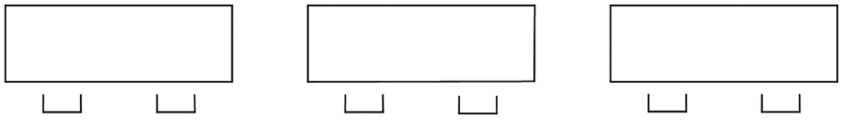
b) Calculate the volume of the classroom.

This classroom is mainly used for mathematics and natural sciences classes, so one of the walls is decorated with the surnames of a total of 196 famous mathematicians and natural scientists. The decoration follows the triangular pattern below with only the top 4 rows shown here, and then it continues down, with two more names in each new row than in the one above.

			Euclid			
		Gauss	Euler	Pythagoras		
	Fibonacci	Karikó	Cardano	Bolyai	Leibniz	
Cantor	Krausz	Neumann	Erdős	Lovász	Szemerédi	Newton

c) How many rows, in total, did it take to write up all 196 names?

There are three benches next to one another in the classroom, each for 2 students. Anna, Balázs, Csaba, Dóra, Eszter and Fülöp are about to sit down to these desks.



d) How many different seating arrangements are possible if Eszter and Csaba sit next to each other at one of the desks? (Two arrangements are considered different if there is a student who sits at a different position in the two arrangements.)

a)	4 points	
b)	4 points	
c)	5 points	
d)	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 2.

17. An online shop sells board games. One of the board games were rated by 14 customers by awarding a score of 1, 2, 3, 4 or 5 points. The table below shows the results:

points	**1**	**2**	**3**	**4**	**5**
frequency	0	2	3	2	7

a) Use the above data about the point scores to fill in the table below.

minimum	lower quartile	median	upper quartile	maximum

b) Calculate the mean and the standard deviation of the 14 scores.

The names of two of the customers, out of the 14 rating the game, are randomly selected (without replacement).

c) What is the probability that both of them rated the game at no less than 4 points?

The three most popular games this year were *The Garden*, *Islanders* and *Duna–Tisza*. In a particular week 20 customers bought *The Garden* and 16 bought *Islanders*. Of all customers, 18 bought exactly one game: twice as many of them bought *Islanders* only, as bought *The Garden* only, and three times as many bought *Duna–Tisza* only, as bought *The Garden* only. In this particular week there was nobody buying all three games, but 10 customers bought both *The Garden* and *Islanders*.

d) How many customers bought the game *Duna–Tisza* this particular week?

a)	5 points	
b)	3 points	
c)	3 points	
d)	6 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 bathroom sink in András's house is in the shape of a cylinder, the inner diameter of which is 38 cm and the inner height of which is 12 cm. The faucet, emptying into this sink, broke and leaks a drop of water into the sink in each second. The volume of a drop of water is 1/20 ml. András's family has left the house for three whole days. They forgot to remove the drain plug, so the sink will be collecting the dripping water for three days.

a) Calculate the volume of the sink and decide whether the dripping water will spill out of it in three days.

During their trip, András's family visited the same confectionery twice. On their first visit they bought 4 desserts and 2 scoops of ice cream for 4100 forints, while on the second occasion they bought 2 desserts and 4 scoops of ice cream for 3400 forints.

b) What is the price of a dessert and how much does a scoop of ice cream cost?

The confectionery offers 10 different ice cream flavours, pistachio among them. Bandi, András's son, likes to pick his ice cream flavour randomly. Accordingly, he selects his three-scoop ice cream in the following fashion: he writes all the different flavours on slips of paper and draws three of them **with replacement**.

c) What is the probability that at most one of the three scoops will be pistachio?

a)	6 points	
b)	6 points	
c)	5 points	
T.:	17 points	

	number of question	score		
		maximum	awarded	total
Part II A	13	11		
	14	13		
	15	12		
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

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

dátum dátum

javító tanár jegyző