

**ÉRETTSÉGI VIZSGA • 2012. október 16.**

**MATEMATIKA  
ANGOL NYELVEN**

**KÖZÉPSZINTŰ  
ÍRÁSBELI VIZSGA**

**2012. október 16. 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 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 if 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. **Do not write anything in the grey rectangles.**

1. The first term and the common difference of the arithmetic sequence  $\{a_n\}$  are both 4. What is the 26th term of the sequence?

$a_{26} =$	2 points	
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2. Given the following information about the sets  $A$  and  $B$ , list the elements of  $A$  and the elements of  $B$ .

$$A \cup B = \{1;2;3;4;5;6\}, A \setminus B = \{1;4\} \text{ and } A \cap B = \{2;5\}.$$

$A = \{ \quad \quad \quad \}$	1 point	
$B = \{ \quad \quad \quad \}$	1 point	

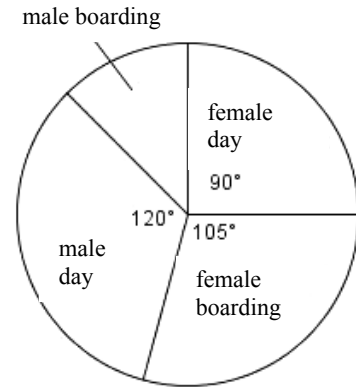
3. Find the real number  $x$  that satisfies the equation

$$\frac{1}{2} \cdot \sqrt{x} = 2.$$

$x =$	2 points	
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4. A high school has 480 students. Some are boarding students, and the rest of them are day students. The pie chart represents the gender distribution of day students and boarders.

Calculate the number of male boarding students. Explain your answer.



	2 points	
The number of male boarding students:	1 point	

5. There was no “1” among the first-semester mathematics grades of a graduating class of students, but each of the other grades occurred. What is the minimum number of students to be selected out of the class, to be certain that there will be two among them with the same first-semester mathematics grade?

The number of students to select:	2 points	
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6. 20% of  $\frac{5}{6}$  of a certain number is 31. What is this number? Explain your answer.

	2 points	
The number is	1 point	

7. Decide about each of the statements below whether it is true or false.

- A) The graph of the function defined by the assignment  $f(x) = 4$  on the set of real numbers is a straight line parallel to the  $x$ -axis.
- B) There is no pair of prime numbers, such that their difference is also a prime.
- C) For a circle of radius 1 cm, the measure of the perimeter in cm is twice the measure of the area in  $\text{cm}^2$ .
- D) If the mean of a set of data is 0 then their standard deviation is also 0.

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

8. Draw a graph that has 5 vertices and 5 edges, and in which the degree of at least one vertex is 3.

A graph satisfying the conditions:	2 points	
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9. The functions below are defined on the set of real numbers. Determine their ranges.

$$f(x) = 2 \sin x$$

$$g(x) = \cos 2x$$

The range of $f$ :	1 point	
The range of $g$ :	1 point	

10. The vectors  $\mathbf{a}$  and  $\mathbf{b}$  enclose a  $120^\circ$  angle with each other.  
The length of each vector is 4 cm.  
Find the length of the vector  $\mathbf{a} + \mathbf{b}$ .

The length of vector $\mathbf{a} + \mathbf{b}$ : cm.	2 points	
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- 11.** Calculate the measure of an interior angle of a regular twelve-sided polygon.  
Explain your answer.

	2 points	
The measure of an interior angle is _____ degrees.	1 point	

- 12.** The common ratio of a geometric sequence  $\{b_n\}$  is 2, and the sum of the first six terms is 94.5.  
Calculate the first term of the sequence. Explain your answer.

	2 points	
$b_1 =$ _____	1 point	

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

\_\_\_\_\_ date

\_\_\_\_\_ examiner

	elért pontszám <b>egész számra</b> kerekítve /points awarded, rounded to <b>integer</b>	programba beírt <b>egész</b> pontszám / <b>integer</b> 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.



**MATEMATIKA  
ANGOL NYELVEN**

**KÖZÉPSZINTŰ  
ÍRÁSBELI VIZSGA**

**2012. október 16. 8:00**

**II.**

Időtartam: 135 perc

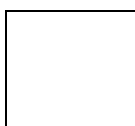
Pótlapok száma	
Tisztázati	
Piszkozati	

**EMBERI ERŐFORRÁSOK  
MINISZTERIUMA**



## Instructions to candidates

1. The time allowed for this examination paper is 135 minutes. When that time is 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.



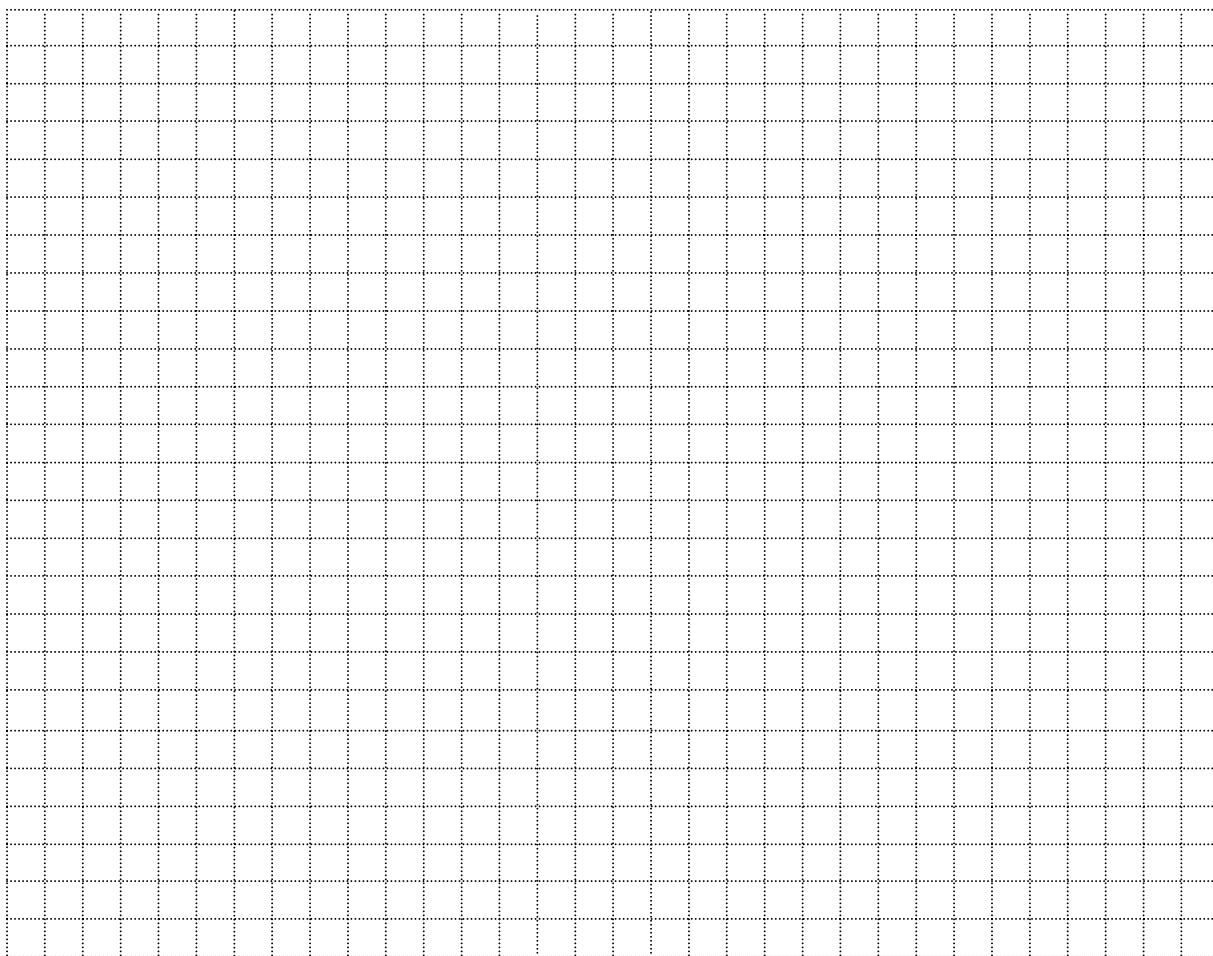
4. In solving the problems, you are allowed to use a calculator that cannot store and display verbal information. You are also allowed to use any book of four-digit data tables. The use of any other electronic device, or printed or written material is forbidden.
5. **Always write down the reasoning used 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. **Do not write anything in the grey rectangles.**

**A**

**13.** The coordinates of the vertices of a triangle are  $A(-2; -1)$ ,  $B(9; -3)$  and  $C(-3; 6)$ .

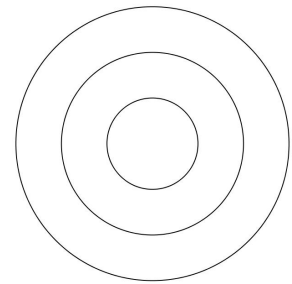
- a) Find the equation of the line of side  $BC$ .
- b) Calculate the length of the midline parallel to side  $BC$ .
- c) Calculate the measure of the interior angle at vertex  $C$  of the triangle.

<b>a)</b>	3 points	
<b>b)</b>	3 points	
<b>c)</b>	6 points	
<b>T.:</b>	12 points	





- 14.** A craftsman runs a business that manufactures small gifts, as well as flags and decorative pins. The figure shows the design on a particular kind of decorative pin that he makes. The colour of each of the three fields is chosen from 5 colours (red, blue, white, yellow and green). Each field has a single colour, and different fields may also have the same colour.



- a)** How many different pins may the craftsman make that have three colours on them?
- b)** How many different pins may he make that have two colours?

The craftsman manufactures one piece of every possible pin (with one, two or three colours), and selects one out of the set of pins at random.

- c)** What is the probability that he will select a pin on which one field is blue, another field is yellow and the third field is green?

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



**15.** The functions  $f$  and  $g$  are defined on the set of real numbers as follows:

$$f(x) = 5x + 5.25 \text{ and } g(x) = x^2 + 2x + 3.5$$

**a)** Calculate the missing entries in the tables below.

$x$	3
$f(x)$	

$x$	
$g(x)$	2.5

**b)** Determine the range of function  $g$ .

**c)** Solve the inequality  $5x + 5.25 > x^2 + 2x + 3.5$  on the set of real numbers.

<b>a)</b>	3 points	
<b>b)</b>	3 points	
<b>c)</b>	6 points	
<b>T.:</b>	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.** Stefi covers her cell phone costs by buying prepaid cards. In that case, the cell phone company do not charge a flat rate and there is no connection fee per call. The peak rate per minute is 25 forints higher than the off-peak rate. During the past four weeks, Stefi talked 2 hours on the phone altogether, and that cost her 4000 forints. She spent the same amount of money on phone talks in peak hours as on talks in off-peak hours.
- a)** How many minutes did she talk on her cell phone in peak hours during the past four weeks?

On January 1, the cell phone company are launching a new mobile internet plan called Telint. They are expecting 10 000 new subscribers for January, and then for each successive month they are expecting 7.5% more new subscribers than in the previous month. They are planning to change the price of the Telint plan in the month when the number of new subscribers of the month reaches 20 000.

- b)** Calculate in which month the number of new subscribers per month will reach 20 000 if the expectations of the company are fulfilled.

<b>a)</b>	11 points	
<b>b)</b>	6 points	
<b>T.:</b>	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.** The base edges of a regular four-sided (square based) pyramid are 12 cm long, and its lateral faces enclose  $60^\circ$  angles with the plane of the base.

- a)** Calculate the surface area of the pyramid (in  $\text{cm}^2$ ), and the volume of the pyramid (in  $\text{cm}^3$ ).  
Round your answers to the nearest whole number.

The pyramid is divided into two parts with a plane parallel to the base. The plane intersects the height of the pyramid in a 1 : 2 ratio, with the longer segment next to the apex.

- b)** Find the ratio of the volumes of the resulting pyramid and truncated pyramid.  
Give your answer as a ratio of whole numbers.
- c)** Calculate the surface area of the resulting truncated pyramid in  $\text{cm}^2$ .

<b>a)</b>	7 points	
<b>b)</b>	5 points	
<b>c)</b>	5 points	
<b>T.:</b>	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.** The following table shows the age distribution of the 13 members of the Hungarian women's water polo team participating in a world tournament.

Age	17	18	19	21	22	23	24	25	26	31
Frequency	2	1	1	1	2	1	2	1	1	1

- a)** Calculate the mean age of the team.

Let  $A$  denote the event that there is at most one player under the age of 20 among 7 players selected at random from the team.

- b)** Calculate the probability of event  $A$ .

Consider the following information on the 6 field players of the Hungarian starting team in a particular game of the tournament:

- the difference between the ages of the oldest and youngest players is 12 years,
- the single mode of the ages of the players is 22 years,
- the median of the ages of the six players is 23 years,
- the mean of the ages of the six players is 24 years.

- c)** List the ages of the six field players of the starting team.

<b>a)</b>	2 points	
<b>b)</b>	8 points	
<b>c)</b>	7 points	
<b>T.:</b>	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			
<b>TOTAL</b>		<b>70</b>		

	maximum score	points awarded
Part I	30	
Part II	70	
<b>Total score on written examination</b>	<b>100</b>	

\_\_\_\_\_

date

\_\_\_\_\_

examiner

	elért pontszám <b>egész számra</b> kerekítve /points awarded, rounded to <b>integer</b>	programba beírt <b>egész</b> pontszám / <b>integer</b> score entered in program
I. rész / Part I		
II. rész / Part II		

\_\_\_\_\_

javító tanár / examiner

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jegyző / registrar

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dátum / date

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