

ÉRETTSÉGI VIZSGA • 2012. május 8.

**MATEMATIKA
ANGOL NYELVEN**

**KÖZÉPSZINTŰ
ÍRÁSBELI VIZSGA**

2012. május 8. 8:00

I.

Időtartam: 45 perc

Pótlapok száma	
Tisztázati	
Piszkozati	

**NEMZETI ERŐFORRÁS
MINISZTERIUM**

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 devices, 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 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.**

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1. The function f is defined by the formula $f(x) = \frac{1}{x-3}$ on the set of real numbers not equal to 3. For what real number x is the value of function f equal to $\frac{1}{20}$?

$x =$	2 points	
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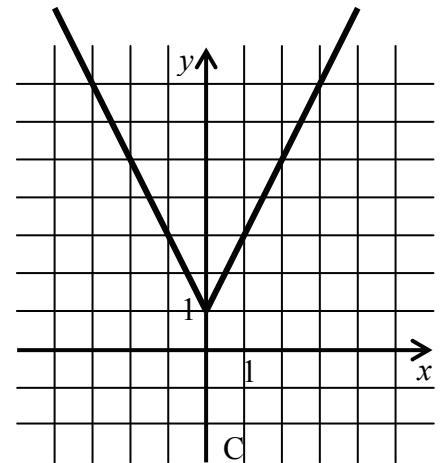
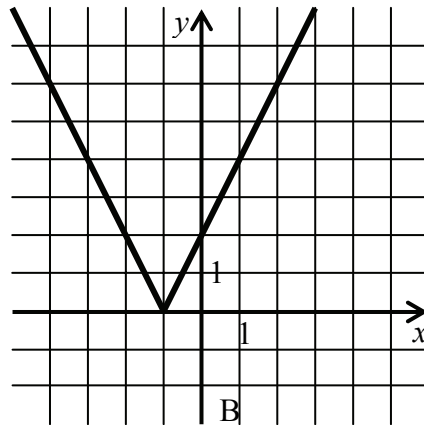
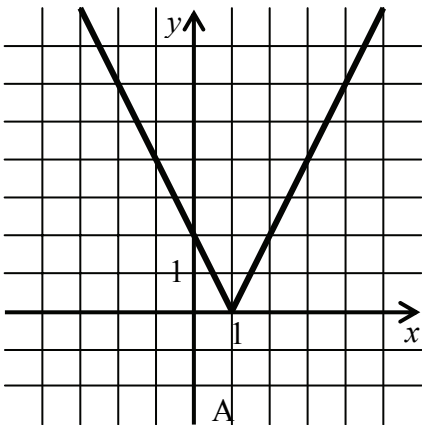
2. The vectors \mathbf{a} and \mathbf{b} are the two vectors drawn from an acute-angled vertex of a rhombus to the two adjacent vertices. Express in terms of \mathbf{a} and \mathbf{b} the vector of the diagonal drawn from the same vertex.

The vector in question is	2 points	
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3. Find the real number x for which the following equation is true:
 $2^{-x} = 8$

$x =$	2 points	
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4. Which of the graphs below represents the function $g: \mathbf{R} \rightarrow \mathbf{R}$, $g(x) = 2|x + 1|$?
 What is the zero of the function g ?



The letter marking the graph of g :	2 points	
The zero of the function is at	1 point	

5. In how many different ways is it possible to select exactly four out of six books recommended for reading?

The number of possible selections:	2 points	
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6. Given the information below, represent the sets A and B in a diagram, and list the elements of the set $A \cap B$.

$$A \cup B = \{ x; y; z; u; v; w \}, A \setminus B = \{ z; u \}, B \setminus A = \{ v; w \}.$$

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

7. The percentage increase of the value of an investment paper is 10% every year. If its present value is 50 000 forints, how much will it be worth in two years? Explain your answer.

	2 points	
The value of the paper will be	1 point	

8. $N=437y51$ denotes a six-digit number in decimal notation. Given that N is divisible by three, find the possible values of the digit y .

The possible values of the digit y :	2 points	
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9. At which point of the domain does the function $f: \mathbf{R} \rightarrow \mathbf{R}$, $f(x) = -(x-6)^2 + 3$ have its maximum, and what is the maximum value?

The maximum occurs at	1 point	
Maximum value:	1 point	

10. There are five passengers travelling in a railway compartment. One passenger knows three of the others, there are three who know two fellow passengers each, and there is one who knows only one other passenger. (Acquaintances are mutual.) Draw a possible graph representing the acquaintances in this group of five people.

A possible graph of acquaintances:	3 points	
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- 11.** Determine the coordinates of the centre of the circle of equation $x^2 + y^2 - 4x + 2y = 0$.
What is the radius of the circle? Explain your answer.

	2 points	
Centre:	1 point	
Radius:	1 point	

- 12.** Decide about each of the statements below whether it is true or false.

A: Out of two real numbers, the one with a larger square is larger.

B: If a number is divisible by both 5 and 15, then it is also divisible by their product.

C: The cosine of the smaller angle out of two different acute angles is larger.

A:	1 point	
B:	1 point	
C:	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	2	
	Question 7	3	
	Question 8	2	
	Question 9	2	
	Question 10	3	
	Question 11	4	
	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 maradjon üresen!
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.

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II.

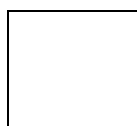
Időtartam: 135 perc

Pótlapok száma	
Tisztázati	
Piszkozati	

**NEMZETI ERŐFORRÁS
MINISZTERIUM**

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 devices, 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 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 tenth term of an arithmetic progression is 10 and its common difference is 4.

- a)** Paul states that the tenth term of the sequence in binary notation is 1011. Is he right? Prove or disprove his statement.
- b)** What is the first term of the sequence?
- c)** Find the smallest term in the sequence that is a three-digit number. What is the index of this term?
- d)** Consider the set of two-digit positive terms of the sequence. How many elements does the set have?

a)	3 points	
b)	2 points	
c)	4 points	
d)	3 points	
T.:	12 points	

14. The population of Ailington is 12 320. According to statistics issued by Ailington Hospital, 1978 of the inhabitants were hospitalised during the previous year.

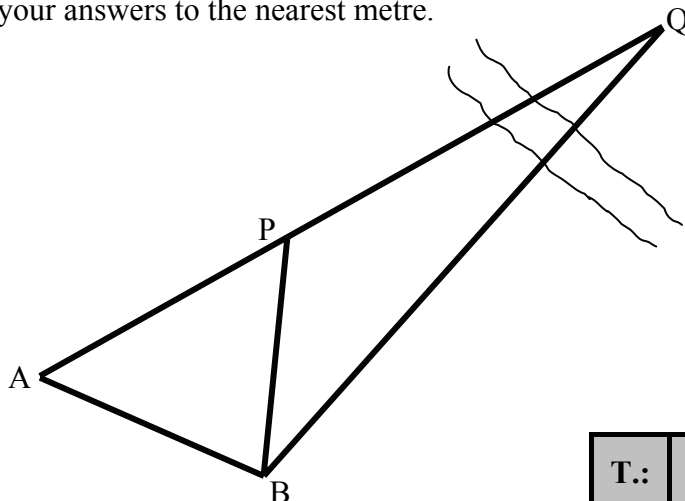
- a)** What is the probability that an inhabitant of Ailington selected at random was treated in the hospital of the town in the previous year?
Round the probability to two decimal places.

Among those treated in hospital in that year, there were 138 people under the age of 18 years, 633 people between 18 and 60 years, and the rest of them were older. 24% of the population of the town are over 60 years, 18% are under 18. (In calculations, you can assume that there was no significant change in the given data during the course of the year.)

- b)** Draw a pie chart representing the age distribution of the people treated in hospital.
Write down all calculations used in making the pie chart.
- c)** How much will the probability calculated in **a)** increase or decrease if the random person is selected from the inhabitants over the age of 60 years?

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

- 15.** The diagram below was created by surveyors. It represents points in a horizontal plane. Point Q is separated from the other points by a river. The surveyor working in point A was 720 metres away from point P, and he saw the points P and Q in a straight line. He measured the angle PAB to be 53° . The surveyor standing at point B, 620 metres away from A, measured the angle ABQ to be 108° . Use the given information to calculate the distances BP , PQ and BQ . Round your answers to the nearest metre.



T.:	12 points	
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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.** Teams A and B are the national teams of chess players of two countries. They are training together for the world tournament. During the first week of the training, each national team play a round robin, that is, every player plays a game against every other player in the same team. Team A consists of 7 players, team B plays 55 games altogether.

- a)** How many games are played in team A, and how many members does team B have?

During the second week, each of 6 selected members of team A opposes each of 8 members of team B once.

- b)** How many games are played during the second week altogether?

At the end of the training, four identical gifts are given to players selected at random from all participants of the training. Each player may only get at most one gift.

- c)** What is the probability that one gift is received by a member of team A and three are received by members of team B?

a)	7 points	
b)	3 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.

- a)** Solve the following equation on the set of real numbers.
 $\lg(2x-1) + \lg(2x-3) = \lg 8$
- b)** An angle x of a triangle satisfies the equation $4\cos^2 x - 8\cos x - 5 = 0$.
Find the angle x .
- c)** Solve the following equation on the set of real numbers.
 $4y - 5 = 8\sqrt{y}$
- d)** Seven different real numbers are given. One of them is a solution of the equation in question **c)**. The numbers are listed in some order. How many possible orders of the given numbers are there in which the number from **c)** stands in the middle position?

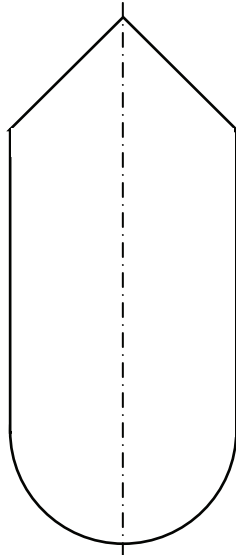
a)	6 points	
b)	4 points	
c)	4 points	
d)	3 points	
T.:	17 points	

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. The middle part of a water tank is a right circular cylinder of inner diameter 6 m and height 8 m. The lower part of the tank is a hemisphere, and the upper part is a right circular cone. The height of the cone is 3 m. The water tank is standing in a vertical position, a longitudinal section through its axis of rotation is shown below.

- a) The entire interior surface is to be repaired. Calculate the area in square metres that needs to be coated with waterproof material.
- b) The tank is filled with water up to 85% of its total height. Find the volume of the water in cubic metres. Ignore the thickness of the waterproof coating.

Round your answers to the nearest whole number.



a)	6 points	
b)	11 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 / Part I		
II. rész / Part II		

javító tanár / examiner

jegyző / registrar

dátum / date

dátum / date