

ÉRETTSÉGI VIZSGA • 2009. május 5.

**MATEMATIKA
ANGOL NYELVEN**

**KÖZÉPSZINTŰ
ÍRÁSBELI VIZSGA**

2009. május 5. 8:00

I.

Időtartam: 45 perc

Pótlapok száma	
Tisztázati	
Piszkozati	

**OKTATÁSI ÉS KULTURÁLIS
MINISZTERIUM**

Important information

1. The exam is 45 minutes long, after that you should stop working.
2. You may work on the problems in arbitrary order.
3. You may work with any calculator as long as it is not capable of storing and displaying textual information and you may also consult any type of four digit mathematical table. The use of any other kind of electronic device or written source is forbidden.
4. **The answer for a question should be entered into the corresponding frame**, the solution should be written down only if the question asks you to do so.
5. You are supposed to work in pen; diagrams, however, may also be drawn in pencil. Anything written in pencil outside the diagrams cannot be evaluated by the examiner. Any solution or some part of a solution that is crossed out will not be marked.
6. There is only one solution for every question that will be marked. If you attempt a question more than once then you should clearly indicate the one to be marked.
7. Please, leave the **rectangular shaded areas blank**.

1. Write down all subsets of the set $A = \{3; 6; 15; 28\}$ that contain even numbers only.

The subsets are	2 points	
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2. Express the fraction t below as an integral power of the positive real number a .

$$t = \frac{(a^3)^5}{a^{-2}}$$

$t =$	2 points	
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3. Decide if the following statement is true or false:
if a number is divisible by 36 then it is also divisible by 12.
 Write down the converse of this statement.

The logical value of the statement is	1 point	
The converse of the statement is	1 point	

4. How many handshakes take place in a group of five people if any two of them shake hands once?

The number of handshakes is	2 points	
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5. Bea deposits HUF 50 000 on compound interest in a bank for a period of three years. The annual interest rate is 7.4%. How much money will accumulate on her bank account after three years? The answer should be rounded to the nearest Forint. You should show your calculations.

	2 points	
Ft	1 point	

6. Student passwords are four digit integers in the computer lab. Kate has forgotten her password, she can remember only that its digits are 2; 2; 4; 4. Which numbers should she try to be able to access the system for sure?

The answer is	3 points	
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7. Determine the largest subset of the set of real numbers on which the expression $\sqrt{-x}$ is defined.

The domain is	2 points	
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8. Mark those numbers, by circling them in the list below that are solutions of the equation $\log_5(x + 2) = 0$.

-2; -1; 0; 1; 2; 3	2 points	
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9. The legs of a right triangle are 5 cm and 12 cm long, respectively. Justifying your answer, find the radius of the triangle's circumcircle.

	2 points	
The radius of the circumcircle is.....cm	1 pont	

10. The graph of the function $f: \mathbf{R} \rightarrow \mathbf{R}$; $f(x) = \sin x$ is translated by the vector $\mathbf{v} = \left(\frac{\pi}{2}; -3\right)$ in the Cartesian system yielding the graph of a function $g(x)$. What is the formula of this function.

$g(x) =$	3 points	
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11. The set H consists of the letters occurring in the word KATALINKA and the set G consists of the letters occurring in the word BICEBÓCA. Write down the elements of the set $H \cup G$.

$H \cup G =$ { }	3 points	
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- 12.** Find the equation of the straight line that is parallel to the line $x - 2y = 0$ and passing through the point $A(6; -1)$.

The equation of the straight line is	3 points	
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		maximum score	score attained
Paper I.	Problem 1.	2	
	Problem 2.	2	
	Problem 3.	2	
	Problem 4.	2	
	Problem 5.	3	
	Problem 6.	3	
	Problem 7.	2	
	Problem 8.	2	
	Problem 9.	3	
	Problem 10.	3	
	Problem 11.	3	
	Problem 12.	3	
TOTAL		30	

 date

 teacher

	score (pontszám)	score input for program (programba beírt pontszám)
Paper I (I. rész)		

 date (dátum)

 teacher
(javító tanár)

 registrar
(jegyző)

Note:

1. Leave this table blank, and do not sign here if the candidate has started working on Paper II.
2. If the examination was interrupted during the candidate working on Paper I, or it was not continued with Paper II, fill out this table and sign.

(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!

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ÍRÁSBELI VIZSGA**

2009. május 5. 8:00

II.

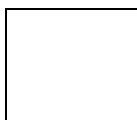
Időtartam: 135 perc

Pótlapok száma	
Tisztázati	
Piszkozati	

**OKTATÁSI ÉS KULTURÁLIS
MINISZTERIUM**

Important information

1. The exam is 135 minutes long, after that you should stop working.
2. You may attempt the questions in arbitrary order.
3. You are supposed to answer two out of the three questions in part **B**. **Please remember to enter the number of the question you have not attempted into the empty square below.** Should there *arise any ambiguity* for the examiner whether the question is to be marked or not, it is question no. 18 that will not going to be assessed.



4. You may work with any calculator as long as it is not capable of storing and displaying textual information and you may also consult any type of four digit mathematical table. The use of any other kind of electronic device or written source is forbidden.
5. **Remember to show your reasoning, because a major part of the score is given for this component of your work.**
6. **Remember to outline the substantial calculations.**
7. When you refer to a theorem that has been covered at school and has a common name (e.g. Pythagoras' theorem, sine rule, etc.) you are not expected to state it meticulously; it is usually sufficient to put the name of the theorem. *However, you should briefly explain, why and how it can be applied.*
8. Remember to answer each question (i.e. providing the result) also in textual form.
9. You are supposed to work in pen; diagrams, however, may also be drawn in pencil. Anything written in pencil outside the diagrams cannot be evaluated by the examiner. Any solution or some part of a solution that is crossed out will not be marked.
10. There is only one solution will be marked for every question. If you attempt a question more than once then you should **clearly indicate** the one to be marked.
11. Please, **do not write anything in the shaded rectangular areas.**

A**13.**

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

$$3^{x^2-3x-8} = 9$$

- b)**
- Find those integer numbers that satisfy both of the following inequalities.

$$3 - \frac{x}{2} > x \quad \text{and} \quad 3x + 4 \geq -3x - 8$$

a)	6 points	
b)	6 points	
T.:	12 points	

- 14.** The number of students of the RED school, rounded to the nearest ten, is equal to 650. There are exactly ten times more students of height below 180 cm than those who are at least 180 cm tall.

a) Find the exact number of students in this school.

The table below is showing the height distribution of the students from the neighbouring BLUE school.

below 180 cm	180 cm tall	taller than 180 cm
560 students	8 students	48 students

75% of the students of the BLUE school who are at least 180 cm tall are playing basketball: they comprise the 70% of the basketball players.

- b)** How many basketball players are attending the BLUE school?
c) On the occasion of the School Festival a sponsor of the BLUE school has organized a draw. The vouchers were distributed to the students: one for each. What is the probability that the winner of the first prize would be a student who is not taller than 180 cm?

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

- 15.** Ernie and Bernie wanted to determine the distance of two lonely oak trees but there was no way to measure their distance directly. Therefore, they performed the following field measurements.
- Getting started they marked out a point at which the angle subtended by the rays to the trees was a right angle.
 - Starting from this point P Ernie was walking 100 meters along the line connecting one of the trees and the point P , in the opposite direction with respect to the tree. He arrived at a point where the angle subtended by the rays to the trees was 40° .
 - As for Bernie, he was also walking 100 meters from P along the line connecting the other tree and the point P , in the opposite direction with respect to that tree. He arrived at a point where the angle subtended by the rays to the trees was 37° .

Sketch a map based on the above information, indicating also the data.

Calculate the distance of the two trees. (The answer should be rounded to the nearest meter.)

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.** The first, second and third terms of a geometric progression are equal to the first, fourth and sixteenth terms of an arithmetic progression, respectively. The common value of the first terms is equal to 5.
Calculate the fifth term of the arithmetic progression and also the sum of the first five terms of the geometric progression.

T.:	17 points	
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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.** There are 100 marbles of the same size in a box: 10 of them are white, 35 blue ones and 55 red ones.
- a) Represent, on a pie chart, the colour distribution of the marbles. Indicate both the angular and radian measure of the corresponding central angles of the respective sectors.

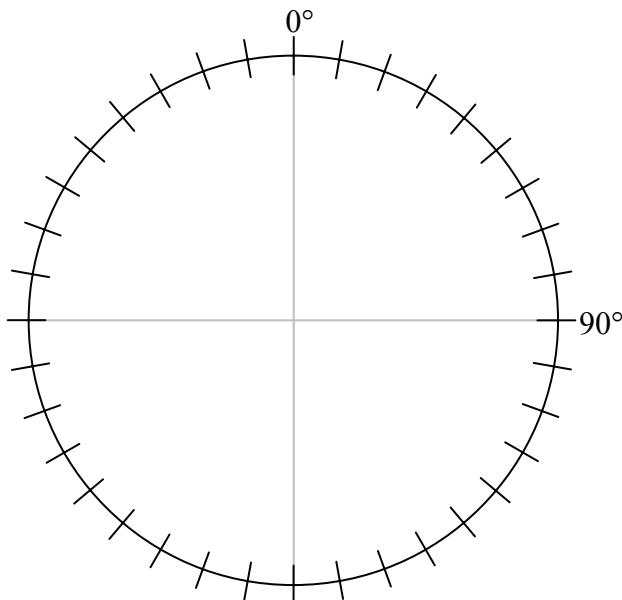
Some students are investigating the probability of drawing two marbles of the same colour.

- b) Steve drew a marble; it happened to be red. Steve put it away. Calculate the probability that the next marble drawn by Steve is also red.

In the course of another experiment ten white marbles, labelled by the numbers from 1 to 10, are put in the box. The students then draw four marbles in a row, with replacement.

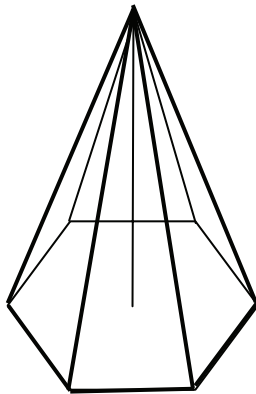
- c) What is the probability that the product of the labels of the marbles is equal to 24?

a)	4 points	
b)	3 points	
c)	10 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.** When erected, the shape of a circus tent is a six sided right pyramid with a regular hexagon base. The base edge is 12 meters long and the height of the pyramid is equal to 16 meters. There are 13 rods needed, altogether, when erecting the tent: six of them are running along the total lengths of the six slant edges, respectively. The remaining 7 rods are set up vertically. One of them is placed at the centre of the base to support the tent at its apex. The six shorter vertical rods, starting from the ground, are supporting the structure at the trisecting points, closer to the ground, of the six slant edges, respectively.
- Find, in square meters, the amount of sheet that is forming the tent. (i.e. the superficies of the pyramid.)
(The answer should be rounded to the nearest whole number.)
 - Find the total length of the 13 rods.
 - A rope is stretched along the top endpoints of the six smaller supporting rods. Find the length of this rope.



a)	7 points	
b)	6 points	
c)	4 points	
T.:	17 points	

	number of problem	score attained	total	maximum score
Part A	13.			12
	14.			12
	15.			12
Part B				17
				17
	← problem not selected			
TOTAL				70

	maximális pontszám	elért pontszám
I. rész	30	
II. rész	70	
Az írásbeli vizsgarész pontszáma	100	

_____ date

_____ teacher

	score attained (elért pontszám)	score input for program (programba beírt pontszám)
Paper I/(I. rész)		
Paper II/(II. rész)		

_____ date /(dátum)

_____ date /(dátum)

_____ teacher/(javító tanár)

_____ registrar/(jegyző)