

ÉRETTSÉGI VIZSGA • 2009. október 20.

**MATEMATIKA
ANGOL NYELVEN**

**KÖZÉPSZINTŰ
ÍRÁSBELI VIZSGA**

2009. október 20. 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. Calculate the arithmetic and the geometric means of 25 and 121, respectively.

The arithmetic mean is	1 point	
The geometric mean is	1 point	

2. The set A is formed by the positive prime numbers that are less than 10 and the set B is formed by those positive integers that are divisible by six and not exceeding thirty. List the elements of the sets A , B and $A \cup B$, respectively.

The elements of the set A are	1 point	
The elements of the set B are	1 point	
The elements of the set $A \cup B$ are	1 point	

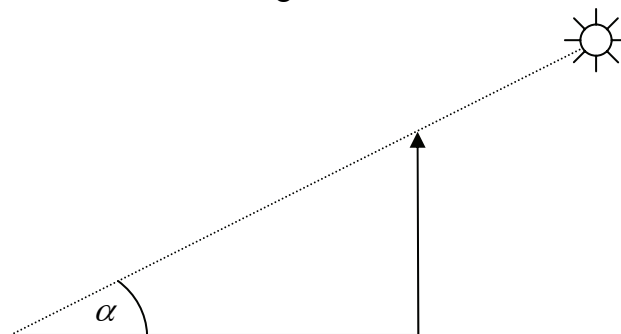
3. There are eight white marbles in a bag. How many additional black marbles should be put into the bag to make the probability that a marble chosen randomly from the bag is white equal to 0.4? It is assumed that the marbles are drawn with equal probability.

The number of black marbles is	2 points	
--------------------------------	----------	--

4. What is the value of $\left(\frac{1}{5}\right)^{2x}$ if $x = -1$?

The value of the expression is	2 points	
--------------------------------	----------	--

5. The shadow of a tower cast on horizontal ground is twice as long as the tower's height. Find the angle made at this moment by the sunbeam and the horizontal ground. State your answer in degrees rounded to the nearest integer.

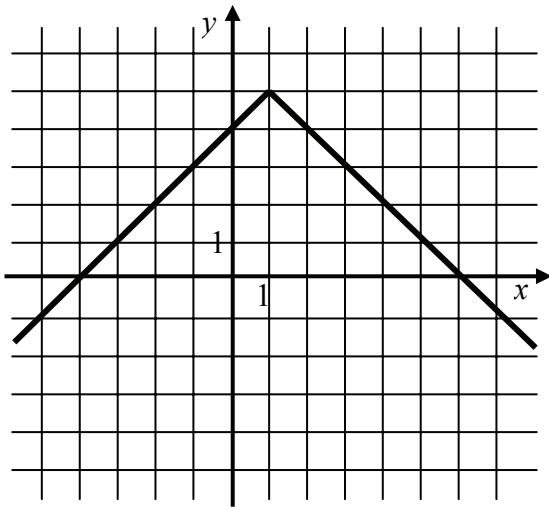


$\alpha =$	2 points	
------------	----------	--

6. The first term of a geometric progression is -5 and its common ratio is -2 . Justifying your answer calculate the eleventh term of this progression.

	1 point	
$a_{11} =$	1 point	

7. The graph of the function $x \mapsto |x|$ defined on the set of real numbers is transformed yielding the function f . The diagram shows a part of the graph of f . Find a formula defining the function f .



The formula is $x \mapsto$	3 points	
-------------------------------	----------	--

8. a, b and c are denoting arbitrary positive real numbers. It is given that $\lg x = 3 \cdot \lg a - \lg b + \frac{1}{2} \cdot \lg c$.

Which one of the following expressions yields the actual value of x ?

- A: $x = \frac{3a}{b} + \frac{1}{2}c$
- B: $x = a^3 - b + \sqrt{c}$
- C: $x = \frac{a^3}{b \cdot \sqrt{c}}$
- D: $x = \frac{a^3 \cdot c^{-1}}{b}$
- E: $x = a^3 - b \cdot \sqrt{c}$
- F: $x = \frac{a^3 \cdot \sqrt{c}}{b}$
- G: $x = \frac{a^3 \cdot \frac{1}{c}}{b}$

The code of the correct equality is	3 points	
-------------------------------------	----------	--

- 9.** Find the greatest one among the 12 numbers listed below which, when cancelled, yields 6 as the median of the remaining 11 numbers.
 6; 4; 5; 5; 1; 10; 7; 6; 11; 2; 6; 5

The cancelled number is	2 points	
-------------------------	----------	--

- 10.** Calculate the scalar product of the following vectors and find their angle.
a (5; 8) **b** (-40; 25)

The scalar product is	2 points	
The angle of the two vectors is	1 point	

- 11.** The surface area of a spherical iron ball is 1600 cm^2 . Would it fit into a cubical box whose edge is 20 cm long? Justify your answer.

	2 points	
The answer is	1 point	

12. Let f be a function defined on the set of real numbers for which

$$f(x) = 2 \sin\left(x - \frac{\pi}{2}\right).$$

Showing your calculations find the value of the function f if $x = \frac{\pi}{3}$?

$f\left(\frac{\pi}{3}\right) =$	3 points	
---------------------------------	----------	--

		maximum score	score attained
Part I.	Problem 1.	2	
	Problem 2.	3	
	Problem 3.	2	
	Problem 4.	2	
	Problem 5.	2	
	Problem 6.	2	
	Problem 7.	3	
	Problem 8.	3	
	Problem 9.	2	
	Problem 10.	3	
	Problem 11.	3	
	Problem 12.	3	
TOTAL		30	

date

teacher

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

date (datum)

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!

ÉRETTSÉGI VIZSGA • 2009. október 20.

**MATEMATIKA
ANGOL NYELVEN**

**KÖZÉPSZINTŰ
ÍRÁSBELI VIZSGA**

2009. október 20. 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.
 $(x + 2)^2 - 90 = 5 \cdot (0,5x - 17)$.

b) Solve the inequality $\frac{3-x}{7x} < 2$ on the set of real numbers.

a)	5 points	
b)	7 points	
T.:	12 points	

- 14.** Angela covered a part of their garden by ceramic tiles. There were 8 tiles laid in the first row and in each subsequent row there were two more tiles laid than in the previous row. There were 858 tiles laid altogether.

a) How many rows did Angela lay altogether?

These tiles are sold in packs of 225 each. 16 % of the tiles in each pack are claret coloured and the rest of them are grey. Angela purchased 4 of these packs. She used only claret coloured tiles in the first row and also in the last one. In addition to that the two bordering tiles in each further row are also claret coloured and all the remaining tiles laid are grey.

b) How many tiles were left of the respective colours after having finished the cover?

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

- 15.** Bill is rolling two fair dice at once, a black one and a white one. He records the two-digit number formed by the respective scores: the score on the black die is the first (decimal) digit and the score on the white die is the second (unary) digit.

What is the probability that the two-digit number hence obtained

- a) is a square number;
- b) has equal digits;
- c) has at most 9 as the sum of its digits?

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

16. Given is the circle of equation $x^2 + y^2 - 6x + 8y - 56 = 0$ and the straight line of equation $x - 8.4 = 0$.

- a) Calculate the coordinates of the common points of the circle and the straight line.
- b) Find the perpendicular distance of the centre of the circle from the straight line.

A straight line cuts a circle of radius 9 cm into two arcs. The perpendicular distance of the centre of the circle from the line is equal to 5.4 cm.

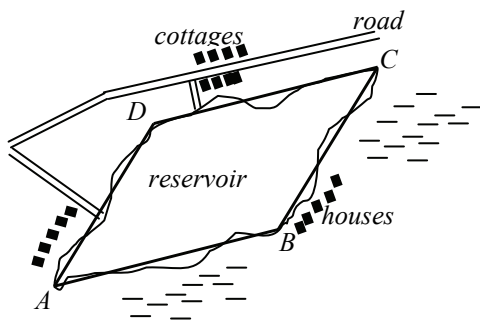
- c) Calculate the length of the major arc. (State your answer rounded to one decimal place.)

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

- 17.** The shape of the surface of a reservoir (storage lake) is approximated by the parallelogram $ABCD$ according to the diagram. Some distances in this parallelogram are measured on a map on the scale of $1 : 30\,000$ as $AB = 4.70$ cm, $AD = 3.80$ cm and $BD = 3.30$ cm.
- The local authority is planning a cycle path going all around the reservoir. According to the plans it will be approximately 25% longer than the circumference of the parallelogram. How many kilometers long will the cycle path be? State your answer rounded to one decimal place.
 - What is the longest distance that can be covered on the surface of the reservoir by a motor boat without changing direction? State your answer in kilometers rounded to one decimal place.
 - By how many m^3 will the amount of water increase in the reservoir approximately, if the water level is rising by 15 cm? State your answer rounded to the nearest thousand m^3 .



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

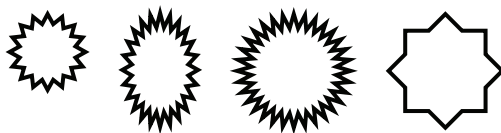
18. If a certain material is illuminated by a laser beam whose intensity is $I_0 \left(\frac{\text{watt}}{\text{m}^2} \right)$ then having penetrated x mm ($x \geq 0$) deep into the material, the intensity of the beam at this depth becomes $I(x) = I_0 \cdot 0,1^{\frac{x}{6}} \left(\frac{\text{watt}}{\text{m}^2} \right)$. Now this material is illuminated by a laser beam of intensity $I_0 = 800 \left(\frac{\text{watt}}{\text{m}^2} \right)$.

a) Complete the following table. (The results obtained for the respective values of the intensity should be rounded to the nearest integer.)

x (mm)	0	0,3	0,6	1,2	1,5	2,1	3
$I(x) \left(\frac{\text{watt}}{\text{m}^2} \right)$	800						

b) At what depth will the intensity of the penetrating beam be the 15% of its original magnitude (I_0)? (State your answer rounded to the nearest tenth of a millimeter.)

c) In a scene of the children’s theatre show some of the four stars as arranged in the diagram below are drawn by laser beam, green or blue. How many different illuminations can be planned if at least one star is going to be drawn anyway?



a)	3 points	
b)	6 points	
c)	8 points	
T.:	17 points	

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

	maximum score	score attained
Part I.	30	
Part II.	70	
Score of the written examination	100	

_____ date

_____ teacher

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

_____ date / (dátum)

_____ date / (dátum)

_____ teacher / (javító tanár)

_____ registrar / (jegyző)