

**ÉRETTSÉGI VIZSGA • 2010. október 19.**

**MATEMATIKA  
ANGOL NYELVEN**

**KÖZÉPSZINTŰ  
ÍRÁSBELI VIZSGA**

**2010. október 19. 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 textual 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 reasoning where 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. Please **do not write anything in the grey rectangles.**

1. The sets A and B are  $A = \{a; b; c; d\}$  and  $B = \{a; b; d; e; f\}$ .  
List the elements of the sets  $A \cap B$  and  $A \cup B$ .

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

2. Each member of a group of friends sent an SMS text message to each of the other members of the group. Given that everyone sent 11 SMS messages, find the number of messages they sent altogether.

SMS texts were sent altogether.	2 points	
---------------------------------	----------	--

3. The equations of three straight lines are as follows:

$e: y = -2x + 3$

$f: y = ax - 1$

$g: y = bx - 4$

( $a$  and  $b$  denote real numbers.)

What should be the value of  $a$  so that lines  $e$  and  $f$  are parallel?

What number does  $b$  denote if line  $g$  is perpendicular to line  $e$ ?

$a =$	1 point	
$b =$	2 points	

4. For what real numbers  $x$  is the expression  $\sqrt{\frac{1}{2x+7}}$  meaningful?

The expression is meaningful if	2 points	
---------------------------------	----------	--

5. What real numbers may  $a$  denote if the function  $x \mapsto a^x$  defined on the set of real numbers is strictly increasing?

	2 points	
--	----------	--

6. Select those elements of the set  $A$  that satisfy the equation  $\sqrt{x^2} = -x$ .  
 $A = \{-1; 0; 1; 2; 3\}$

The elements of set $A$ satisfying the equation:	2 points	
--	----------	--

7. Consider the right-angled triangle in which the length of the hypotenuse is 1, and the length of the leg adjacent to the acute angle  $\alpha$  is  $\sin\alpha$ .  
What is the measure of the angle  $\alpha$ ? Explain your answer.

	2 points	
$\alpha =$	1 point	

8. For each of the statements below, decide whether it is true or false.

- I. Every prime number is odd.
- II. There exists an odd prime number.
- III. Every whole number is a rational number.
- IV. There is an irrational number that can be expressed as the ratio of two whole numbers.

I.:	1 point	
II.:	1 point	
III.:	1 point	
IV.:	1 point	

9.  $b$ ,  $c$  and  $d$  denote positive numbers. Given that  $\lg b = \frac{\lg c - \lg d}{3}$ ,  
express  $b$  from the equality without using the logarithms of  $c$  and  $d$ .

$b =$	2 points	
-------	----------	--

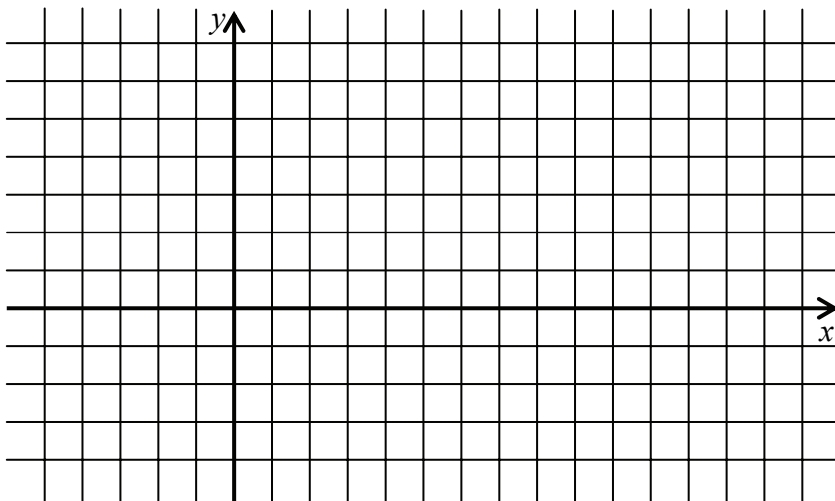
10. Write down a formula that defines the rule of assignment of a function on the set of real numbers, such that the function has an absolute maximum. State the point where the maximum of the function occurs.

$x \mapsto$	2 points	
Maximum occurs at	1 point	

- 11.** Kata, Mari, Réka and Bence are the four members of the newly elected leadership of the student union. Before their election, Kata knew three members of the group of four, Réka and Bence each knew two, and Mari only knew one. (Acquaintances are mutual.) Draw a graph representing the acquaintances of the group of the four student leaders before their election.

The graph of acquaintances:	2 points	
-----------------------------	----------	--

- 12.** A circle intersects the  $x$ -axis at the points  $(1; 0)$  and  $(7; 0)$ . Given that the centre of the circle lies on the line  $y = x$ , find the coordinates of the centre. Explain your answer.



The coordinates of the centre:	2 points	
	1 point	

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

---

 date

---

 examiner

	score attained, rounded to <b>integer</b> (pontszáma <b>egész számra</b> kerekítve)	<b>integer</b> score entered in program (programba beírt <b>egész</b> pontszám)
Part I (I. rész)		

---

 examiner  
(javító tanár)

---

 registrar  
(jegyző)

---

 date  
( dátum)

---

 date  
( dátum)

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.

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 • 2010. október 19.**

**MATEMATIKA  
ANGOL NYELVEN**

**KÖZÉPSZINTŰ  
ÍRÁSBELI VIZSGA**

**2010. október 19. 8:00**

**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 textual 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 can also be followed.**
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. Please **do not write anything in the grey rectangles.**

**A**

**13.** Solve the following inequalities on the set of real numbers.

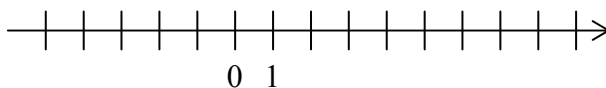
**a)**  $x - \frac{x-1}{2} > \frac{x-3}{4} - \frac{x-2}{3};$

**b)**  $-3x^2 - 1 \leq -4.$

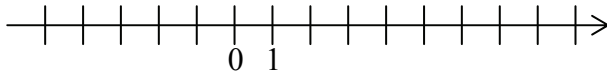
For each inequality, represent the set of solutions on the number line.

<b>a)</b>	5 points	
<b>b)</b>	7 points	
<b>T.:</b>	12 points	

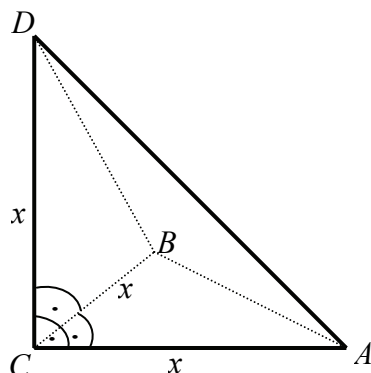
a)



b)



14. Milk is delivered to schools in waxed paper cartons shaped like a pyramid. (See the figure below, where  $CA = CB = CD$ .)



The box can hold 2.88 dl of milk.

- Calculate the lengths of the edges of the pyramid. Give your answers in centimetres, rounded to the nearest whole.
- Find the surface area of the paper box. Give your answer in  $\text{cm}^2$ , rounded to the nearest whole.

<b>a)</b>	8 points	
<b>b)</b>	4 points	
<b>T.:</b>	12 points	



**15.** In a game of dice, a **round** consists of **rolling a die twice** in a row. Each roll scores 1 point if it is a four or a five and no points otherwise. The score awarded for a **round** is the sum of the scores for the two rolls.

- a) What is the probability that 1 point is scored in a **round**, and it is awarded for the first roll?
- b) Which of the following is more probable:
- that a player scores some point in a **round**, or
  - that a player scores no points in a **round**?

<b>a)</b>	5 points	
<b>b)</b>	7 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.**

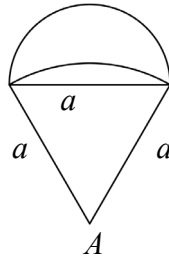
- a) The first term of an arithmetic progression is  $-7$  and the eighth term is  $14$ . What may be the values of  $n$  if the sum of the first  $n$  terms of the sequence is at most  $660$ ?
- b) The first term of a geometric progression is also  $-7$  and its fourth term is  $-189$ . What is  $n$  if the sum of the first  $n$  terms of the sequence is  $-68\ 887$ ?

a)	9 points	
b)	8 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.** The diagram shows the badge of a parachuting club. (One circular arc is centred at the vertex  $A$  of the regular triangle, and the other arc is centred at the midpoint of the side opposite to  $A$ .)  
Each region of this figure is given a colour.



- a)** Given that  $a = 2.5$  cm, calculate the area of each of the three regions. Use at least two decimal places during your calculations, and round your results to one decimal place.
- b)** In how many different ways is it possible to colour the badge if each region is coloured red, yellow, green or blue, and both of the following two conditions must hold:  
(1) regions next to each other are not allowed to have the same colour;  
(2) red and yellow regions are not allowed to be next to each other.  
(Regions next to each other have a boundary in common.)

<b>a)</b>	6 points	
<b>b)</b>	11 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.** 25 families were asked how much they had spent on fresh fruit last month. The results of the survey are listed in the table below.

3500	4500	5600	4000	6800
4000	3400	5600	6200	4500
500	5400	2500	2100	1500
9000	1200	3800	2800	4500
4000	3000	5000	3000	5000

(Assume that the numbers in the table are exact values.)

- a)** On average, how much did these families spend on fresh fruit last month?
- b)** Divide the values above into classes of range 1000 forints, starting with the classes 0 to 1000, 1001 to 2000, and so on. Represent in a bar chart the frequencies of the values in these classes.
- c)** The 500 forints and the 9000 forints are outlying values.  
What is the mean of the remaining data if these outlying values are omitted from the list?  
What is the percentage change in the mean, and in what direction?  
What is the range of the new list of data obtained in this way?
- (Round the mean to the nearest forint and the percentage to the nearest hundredth of a percent.)
- d)** The company carrying out the survey extended the original sample with the data of two additional families. Compared to the original mean, one of them spent 1000 forints less per month on fresh fruit, and the other spent 1000 forints more. Demonstrate by calculation that the mean was not changed by these data.

<b>a)</b>	3 points	
<b>b)</b>	5 points	
<b>c)</b>	6 points	
<b>d)</b>	3 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

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

\_\_\_\_\_ examiner (javító tanár)

\_\_\_\_\_ registrar (jegyző)

\_\_\_\_\_ date (dátum)

\_\_\_\_\_ date (dátum)