Név: ..... osztály:.....

ÉRETTSÉGI VIZSGA • 2008. május 6.

MATEMATIKA
ANGOL NYELVEN

KÖZÉPSZINTŰ
ÍRÁSBELI VIZSGA

2008. május 6. 8:00

I.

Időtartam: 45 perc

Pótlapok száma	
Tisztázati	
Piszkozati	

OKTATÁSI ÉS KULTURÁLIS MINISZTÉRIUM

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. The three digit number $\overline{2x3}$ is divisible by 3. Find the possible values of the digit x.

The possible values of the digit x is:	2 points	

2. The tangent of an obtuse angle is -1 .Find its angular measure.

The measure of the obtuse angle is °.	2 points	

3. Every student of a certain class has ordered some tickets to the theatre. They are planning to see two plays: 18 of them are going to the first play and 24 students are going to the second one. There were 16 students who ordered tickets to the second play only.

a) How many students did order tickets to both plays?
b) How many of them did go to the first play only?
c) How many students are there in this class?

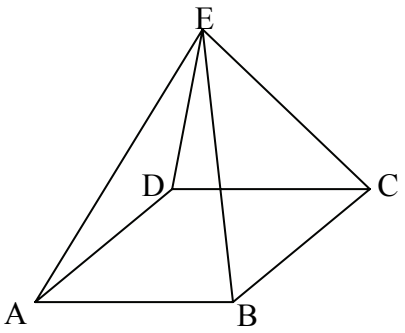
a)	1 point	
b)	1 point	
c)	1 point	

4. The domain of the function f is the set of real numbers and it is defined by the mapping $x \mapsto 3 \cdot |x+6|$. For which value of x does it attain its smallest value and what is the value of this minimum?

$x =$	1 point	
The smallest value of the function is:	1 point	

5. The diagram shows the right pyramid $ABCDE$ whose base forms a square. Which one of the following angles is equal to the angle between the lateral edge AE and the plane of the base?

a) $BCE\sphericalangle$
b) $CAE\sphericalangle$
c) $DCE\sphericalangle$



The letter of the correct answer is :	2 points	

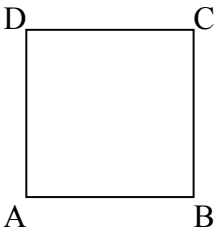
6. In a gymn-class 33 students are aligned in a row in descending order of height. The median of their respective heights is 168 cm. Is it possible that there are at least 20 students in this class that are taller than 170 cm? Justify your answer !

	2 points	
The answer is :	1 point	

7. Expand the following expression: $\left(\sqrt{a}-\sqrt{b}\right)^2$ where a and b are non-negative real numbers.

The expanded form is:	2 points	

8. Given is the square $ABCD$ denote its side vectors $\overrightarrow{AD}$ and $\overrightarrow{AB}$ by **a** and **b**, respectively. Let F be the midpoint of the side CD. Express the vector $\overrightarrow{AF}$ in terms of **a** and **b**!



$\overrightarrow{AF}=$	2 points	

9. The female contestants attained 115 points altogether on the adult swimming competition of the town, obtaining hence 46% of the total score. By how many points did the male contestants get more than that?
Justify your answer by appropriate calculations!

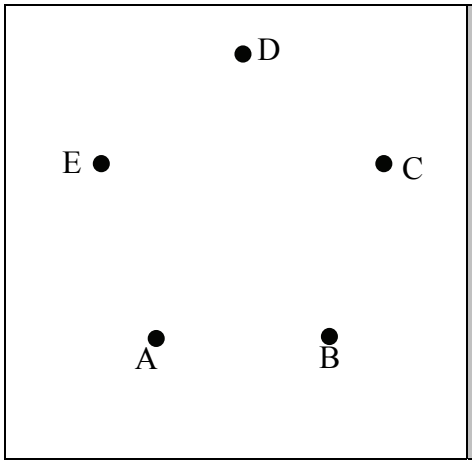
	2 points	
The total score of the male contestants was ..... points higher.	1 point	

10. Little Kitty is very good at both singing and drawing in the kindergarten.

Decide about each of the following statements if it is true or false!
A) Kitty is singing nicely but her drawings are clumsy.
B) Kitty is drawing very nicely.
C) Kitty is drawing well or she is singing nicely.
D) Kitty is drawing badly and she is singing off tune.

True statements: False statements:	4 points	

11. Five first year students, Andrew, Cecil, Bob, Dick and Edward are put into a five-bed dormitory. Andrew has already known the other four, but each of the others knew only three of their respective four new roommates. Dick did not know Edward. Draw a graph below, representing the acquaintances among the five students till then!



3 points	

12. A 20 meters long matting is 80 cm wide and 1.5 cm thick. To obtain doormats of size 50 by 80 cm each the matting is cut into 50 cm wide pieces along its longer side. The doormats hence obtained are stacked into a single rectangular heap.
What is the height of this heap? Justify your answer.

		1 point	
The answer is:	cm	1 point	

		maximal score	score
I. rész	problem 1.	2	
	problem 2.	2	
	problem 3.	3	
	problem 4.	2	
	problem 5.	2	
	problem 6.	3	
	problem 7.	2	
	problem 8.	2	
	problem 9.	3	
	problem 10.	4	
	problem 11.	3	
	problem 12.	2	
TOTAL:		**30**	

date examiner

	pontszáma/ score	programba beírt pontszám/score written in the program
I. rész/Part I		

Dátum/Date

javító tanár/examiner jegyző/registrar

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 started working on Part II., this table and the signature area should be left blank.
2. If the examination is stopped while the candidate is working on Part I. or it is not continued with Part II, this table and the signature area should be completed.

Név: ..... osztály:.....

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MATEMATIKA
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KÖZÉPSZINTŰ
ÍRÁSBELI VIZSGA

2008. május 6. 8:00

II.

Időtartam: 135 perc

Pótlapok száma	
Tisztázati	
Piszkozati	

OKTATÁSI ÉS KULTURÁLIS MINISZTÉRIUM

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 as for the question not be marked, 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. Pithagoras' theorem, sine rule, etc.) you are not expected be 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. communicating 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 company started to produce a new article. The output was 200 articles on the first week and after that there were 3 more of them produced on each week of the production, with respect to the previous week.

a) How many of these articles were made on the 15th week of the production?

b) How many of these articles can be expected to be produced altogether in a year (52 weeks) if the output is growing similarly during the whole year?

c) At least how many weeks have to pass until the company may announce about this product: The weekly production has doubled compared to the beginning?

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

14. A diagonal of a parallelogram is 16 cm long. This diagonal is dividing an angle of the parallelogram into two parts of 38° and 27°, respectively. Calculate, to the nearest whole number, the angles, the sides, the perimeter and the area of this parallelogram.

T.:	12 points	

15. 11 students of the class 12.a. are taking a trial examination in literature. They split into two groups, there are six students in the first group and five of them in the second one.

a) Peter claimed that there are a few hundred ways to select the 6 students into the first group. What is the actual number of the selections?

b) Each of the six students in the first group has drawn a question and they have just started the preparation. Is it true that there are more than one thousand possible orders of the six presentations?

Out of the 20 literature topics there are eight ones about modern Hungarian literature. The questions drawn on the course of the day are not going to be replaced.

c) What is the probability that the question drawn by the first student is not about modern Hungarian literature?

d) In fact, there was no one in the first group, whose question was about modern Hungarian literature, but the first student in the second group happened to draw such a question. What is the probability that the second student of the latter group is also drawing a question in modern Hungarian literature?

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

B

You are supposed to answer any two out of the questions no. 16-18. The number of the question not attempted should be entered into the empty square on sheet no. 3.

16. The equation of the circle k is: $x^2 + y^2 - 4x + 10y - 23 = 0$.

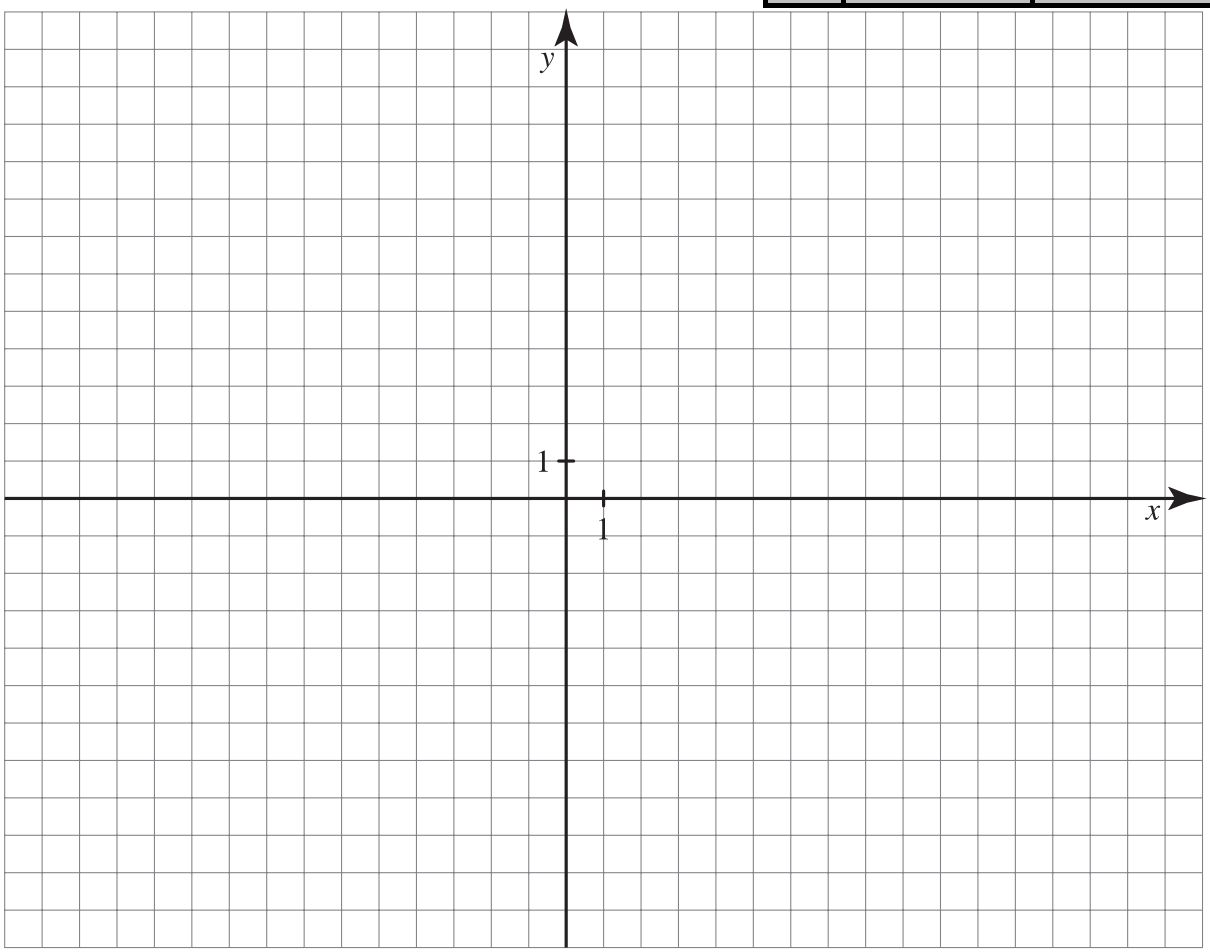
a) Calculate the coordinates of the common points of the the circle k and the line f whose equation is $y = 1.5x + 5$.

The centre of the circle k' is $C(2,-5)$, and this circle is touching the straight line e whose equation is $3x - 2y - 3 = 0$.

b) Calculate the coordinates of the point of tangency and write down the equation of the circle.

c) Prove that the circle k is the image of the circle k' under an enlargment from its centre by a scale factor of 2.

a)	5 points	
b)	7 points	
c)	5 points	
T.:	17 points	



You are supposed to answer any two out of the questions no. 16-18. The number of the question not attempted should be entered into the empty square on sheet no. 3.

17. The following table represents seven Hungarian country towns whose population is exceeding 100 000 and it shows the changes of the population in the last two decades of the 20th century. The figures are correct to the nearest hundred.

	1980	**2000**
Debrecen	198 200	203 600
Győr	124 100	127 100
Miskolc	208 100	172 400
Nyíregyháza	108 200	112 400
Pécs	169 100	157 300
Szeged	164 400	158 200
Székesfehérvár	103 600	105 100

a) A certain newspaper presented similar data as follows:

	1980	**2000**
Debrecen	198 198	203 617
Győr	124 170	127 149
Pécs	169 173	157 243

Assuming that the information in the first table is correct, which one of the newspaper's figures might be accurate and which one of them might be false?

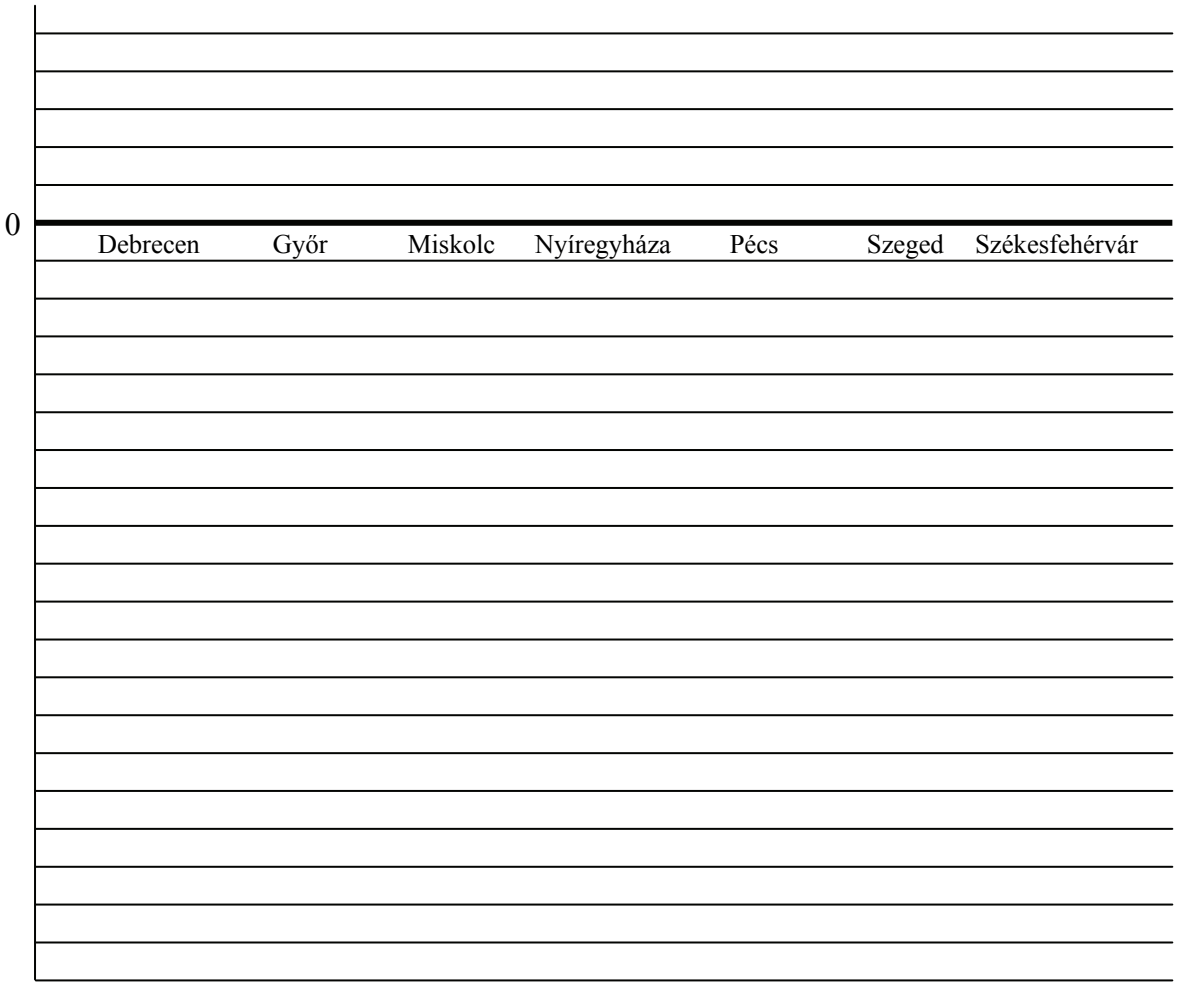
b) Based on the figures in the first table what is the change in percentage of the mean population in the given period of 20 years? (Your answer should be correct to one decimal digit.)

c) Fill the missing data in the table below and answer the following questions based on your results:
On the basis of its increment of population which town has developed to the highest extent?
In which town did the population change to the highest extent?

	Proportional change	Change in percentages
Debrecen	1,027	
Győr		
Miskolc		
Nyíregyháza		
Pécs		
Szeged		decrement by 3,8 %
Székesfehérvár		

d) Represent, on a bar chart, the percentage change of the population in the 7 towns.

a)	3 points	
b)	5 points	
c)	6 points	
d)	3 points	
T.:	17 points	



You are supposed to answer any two out of the questions no. 16-18. The number of the question not attempted should be entered into the empty square on sheet no. 3.

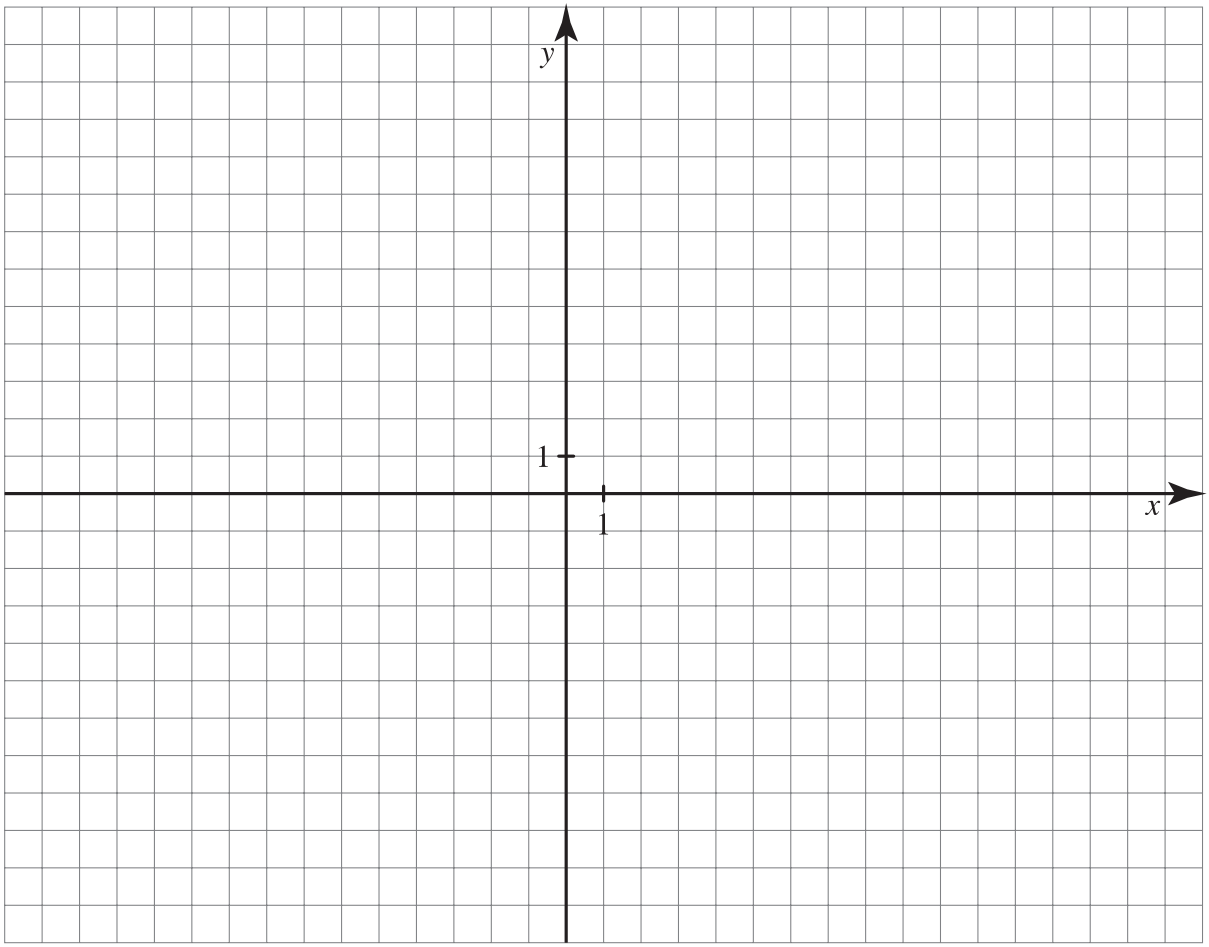
18. A biology research team was studying a cell population. They found that the mass of the population in milligrams is sufficently estimated by the function $m(t) = 0{,}8 \cdot 10^{0{,}02t}$, where t denotes the time in hours, elapsed from the beginning of the experiment.

a) Write down, in milligrams, the mass of the population at the beginning of the experiment.

b) Calculate the change of the mass of the population during the second 24 hours of the experiment.
(Your answer should be given to one decimal digit.)

c) When the mass of the population has reached the amount of 12.68 mg, the experiment had to be suspended for technical reasons. On which day of the experiment did this happen?

a)	3 points	
b)	7 points	
c)	7 points	
T.:	17 points	


y
1
1
x

	No. of the question	Score	total	maximal score
part II./A	13.			12
	14.			12
	15.			12
part II./B				17
				17
		← problem not chosen		
	TOTAL			**70**

	Score	maximal score
Part I.		30
Part II.		70
TOTAL		**100**

date examiner

	elért pontszám/score	programba beírt pontszám/score entered in the program
I.rész/Part I.		
II. rész /Part II.		

Dátum/date

javító tanár/examiner jegyző/registrar