

**MATEMATIKA  
ANGOL NYELVEN**

**KÖZÉPSZINTŰ  
ÍRÁSBELI VIZSGA**

**2008. október 21. 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 the set of the one-digit positive divisors of 24.

The set is: { ..... }	2 points	
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2. In what proportion is the area of a circle of radius 2 increasing if the radius is magnified by a scale factor of 3?

The area becomes ..... times larger.	2 points	
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3. List all the two-element subsets of the set  $A = \{1; 10; 100\}$ .

The given subsets are	2 points	
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4. Translating the point  $A(-7; 12)$  by some vector  $\mathbf{r}$  one gets the point  $B(5; 8)$ . What are the coordinates of the vector  $\mathbf{r}$ ?

$\mathbf{r} ( \quad ; \quad )$	2 points	
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5. The leg of a right triangle is 5 cm long and its hypotenuse is 13 cm long. Find the respective magnitudes of the acute angles of this triangle. (You should round the results to the nearest degree.)

The acute angles are	2 points	
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6. Rosie got the following marks in literature in the course of the year: 2; 4; 3; 5; 2; 4; 5; 3; 5.  
Had she received the median of her marks as her end-of-year grade what would it be?

The end-of-year grade would be	2 points	
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7. Decide the logical value of each of the following statements. The correct answer should be encircled in each case in the table below.

Statement *A* : Any rhomb has exactly two axes of symmetry.

Statement *B*: There exist two axes of symmetry in any rhomb.

Statement *C*: There exists some rhomb that has exactly two axes of symmetry.

Statement *D*: There is no rhomb that has four axes of symmetry.

Statement <i>A</i> : true	false	1 point	
Statement <i>B</i> : true	false	1 point	
Statement <i>C</i> : true	false	1 point	
Statement <i>D</i> : true	false	1 point	

8. Find the angular measure of those angles of revolution for which the expression

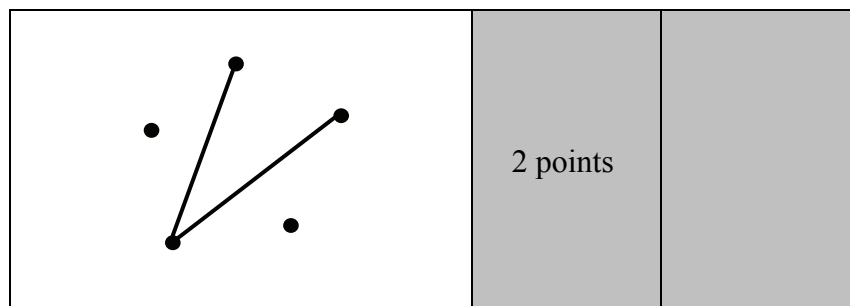
$k(x) = \frac{5}{\cos x}$  is undefined. Justify your answer.

The expression is undefined if $x =$	3 points	
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9. The average height of 16 students who are participating in the handball activity is 172 cm. What is the sum of the respective heights of these students?

The sum of the heights is	2 points	
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10. The diagram shows the position of five villages. There are four roads to be made, each connecting exactly two villages. Two of these roads have already been finished. Draw a possible arrangement of the remaining two roads in such a way that the completed road system provide a connection between any two of the given villages.

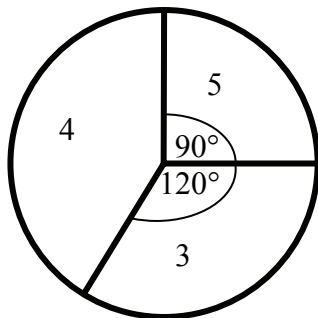


11. Mark by X in the corresponding column of the table below those pairs of coordinates that determine a unit vector of direction angle  $300^\circ$  and also those that do not.

	YES	NO
$\underline{e}\left(\frac{1}{2}; \frac{\sqrt{3}}{2}\right)$		
$\underline{e}\left(-\frac{\sqrt{3}}{2}; \frac{1}{2}\right)$		
$\underline{e}\left(\frac{1}{2}; -\frac{\sqrt{3}}{2}\right)$		
$\underline{e}(\sin 30^\circ; -\cos 30^\circ)$		

4 points	
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12. There were 120 students in a school sitting the math final examination. No one has failed the exam and there were no sufficient (2) grades either. The pie-chart below shows the distribution of the actual grades.



How many students did get grades 5,4 and 3, respectively ?

The number of grades 5 is	1 point	
The number of grades 4 is	1 point	
The number of grades 3 is	1 point	

		maximal score	score
Part I.	problem 1.	2	
	problem 2.	2	
	problem 3.	2	
	problem 4.	2	
	problem 5.	2	
	problem 6.	2	
	problem 7.	4	
	problem 8.	3	
	problem 9.	2	
	problem 10.	2	
	problem 11.	4	
	problem 12.	3	
<b>TOTAL</b>			

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 date

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 examiner

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

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 Dátum/Date

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 Dátum/Date

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 javító tanár/examiner

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 jegyző/registrar

## Megjegyzések:

- Ha a vizsgázó a II. írásbeli összetevő megoldását elkezdte, akkor ez a táblázat és az aláírási rész üresen marad!
- 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:

- If the candidate started working on Part II., this table and the signature area should be left blank.
- 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.



**MATEMATIKA  
ANGOL NYELVEN**

**KÖZÉPSZINTŰ  
ÍRÁSBELI VIZSGA**

**2008. október 21. 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 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.** Solve the following equation on the set of the real numbers.

$$x \cdot y = 600$$

$$(x-10) \cdot (y+5) = 600$$

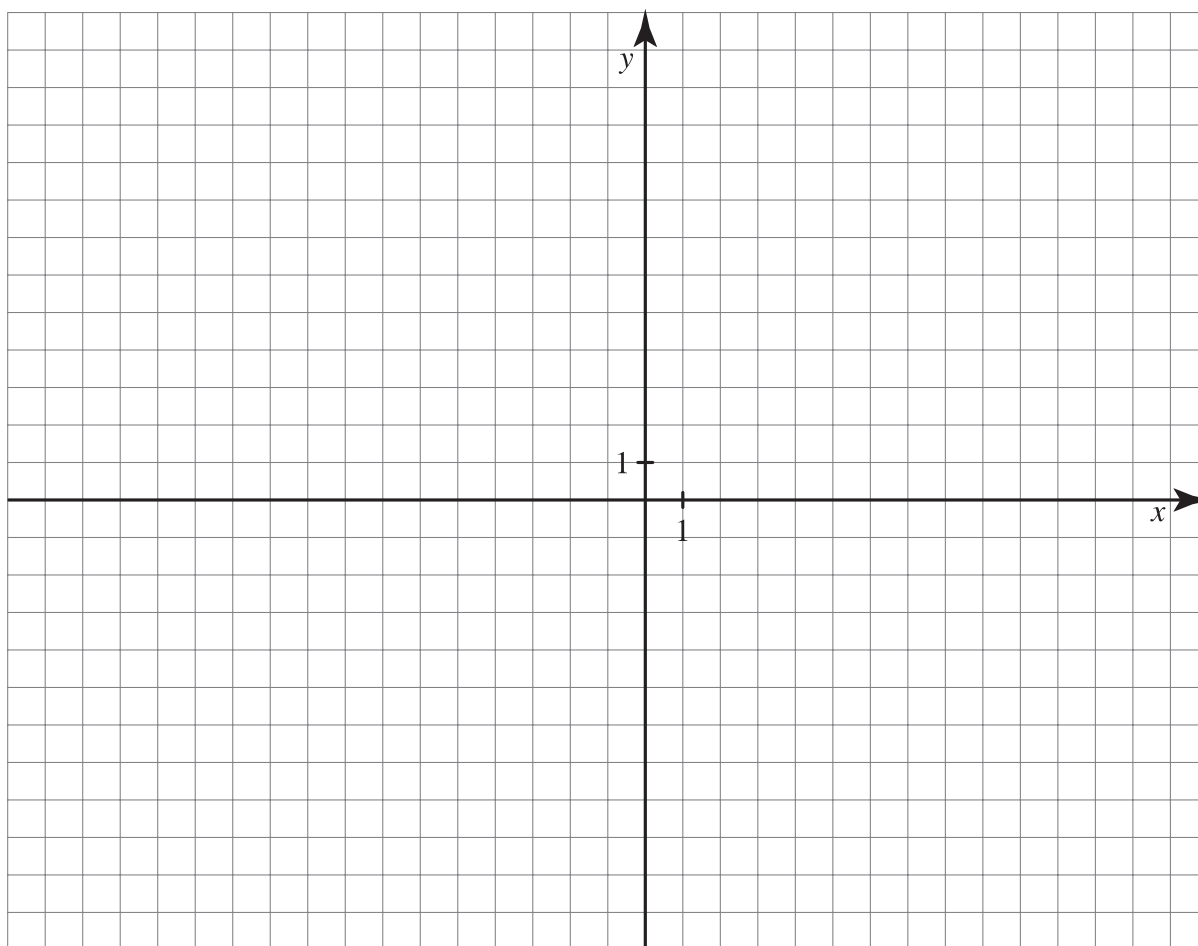
<b>T.:</b>	12 points	
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**14.**

- a)** Describe the sequence of transformations which when applied to the graph of the function  $f_0 : \mathbf{R} \rightarrow \mathbf{R}, f_0(x) = |x|$ , yield the graph of the function  $f : \mathbf{R} \rightarrow \mathbf{R}, f(x) = |x + 2| - 1$ . Sketch the graph of the function  $f$  on the interval  $[-6 ; 6]$ .
- b)** Write down the equation of the straight line through the points  $A(-4 ; 1)$  and  $B(5 ; 4)$ . At which points does the line  $AB$  intersect the graph of the function  $f$ ? (You should justify your answer by calculations.)

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





- 15.** On the happy occasion of the birth of the twins Anna and Albert their grandparents had opened savings books for them, respectively. There was no money withdrawn from the bank accounts until the twins have completed the age 18.

There were 500 000 forints (Hungarian currency) deposited on Anna's bank account on 8% annual compound interest.

- a)** At most how much money can she withdraw on her 18th birthday altogether if the interest rate has been 8% per annum all the time. (The amount is rounded to the nearest forint by the bank.)

On Albert's bank account there were 400 000 forints deposited at his birth, however, on a constant six-month interest rate in his case.

- b)** What is this half-year rate of interest if it is given that Albert can withdraw a total of 2 million forints from his bank account on his 18th birthday? (The interest rate has been the same all the time.) The interest rate should be calculated correct to two significant digits.

<b>a)</b>	5 points	
<b>b)</b>	7 points	
<b>T.:</b>	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.** A set of wooden construction toy consists of four types of bricks and there are ten pieces of each type. The dimensions of one type, let's call it basic block, are 8 cm, 4 cm and 2 cm. The other types can be obtained from this basic block by doubling 4 of its parallel edges and leaving the lengths of the remaining edges unchanged.
- Find the surface areas of each of the 4 types of bricks, respectively.
  - Draw a copy of the planar net of the basic piece reduced into the proportion 1:2.
  - Would the whole set fit into a cubic box whose internal edge is 16 cm long?
  - Five blocks are taken randomly from the complete set. ( Any block is chosen with the same probability.) What is the probability that each selected block is a square based cuboid? (The given probability should be calculated correct to three decimal places.)

<b>a)</b>	4 points	
<b>b)</b>	4 points	
<b>c)</b>	4 points	
<b>d)</b>	5 points	
<b>T.:</b>	17 points	



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**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.** Solve the following equations on the set of real numbers.

**a)**  $(\log_2 x - 3) \cdot (\log_2 x^2 + 6) = 0$

**b)**  $\sin^2\left(x - \frac{\pi}{6}\right) = \frac{1}{4}$

<b>a)</b>	7 points	
<b>b)</b>	10 points	
<b>T.:</b>	17 points	



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**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.** There are designated parking-places numbered from 1 to 25 in front of the car dealer's office. Each arriving car is given a parking ticket assigned randomly to one of these places.
- a) The lucky number of the driver arriving first to the empty parking area happens to be 7. What is the probability that the number of his parking place has a digit 7 or it is a multiple of 7?

There are 25 cars arriving to the empty parking area in the morning of the 10th of May: 12 of them are five-door, silver-metal models, 4 of them are red, four-door models, finally, there are 2 red three-door models and 7 green three-door models.

- b) How many ways are left for the three-door cars to occupy the remaining parking places once the four- and the five-door cars have all parked in the empty parking area? (Cars of the same colour are not distinguished.)

Almost all of the 25 customers booked on the 10th of May have put forward certain demands about the colour of their would-be cars. Four of them would prefer green models; three of them would be happy with any colour as long as it is not red; five of them have asked for red or silver-metal; ten customers insist on green or red, finally, there are three customers with no specific requests about the colour of their cars.

- c) Speaking of colours only, is it possible to meet the demand of every single customer booked on the 10th of May with the lot of cars having arrived in the morning?

<b>a)</b>	4 points	
<b>b)</b>	5 points	
<b>c)</b>	8 points	
<b>T.:</b>	17 points	

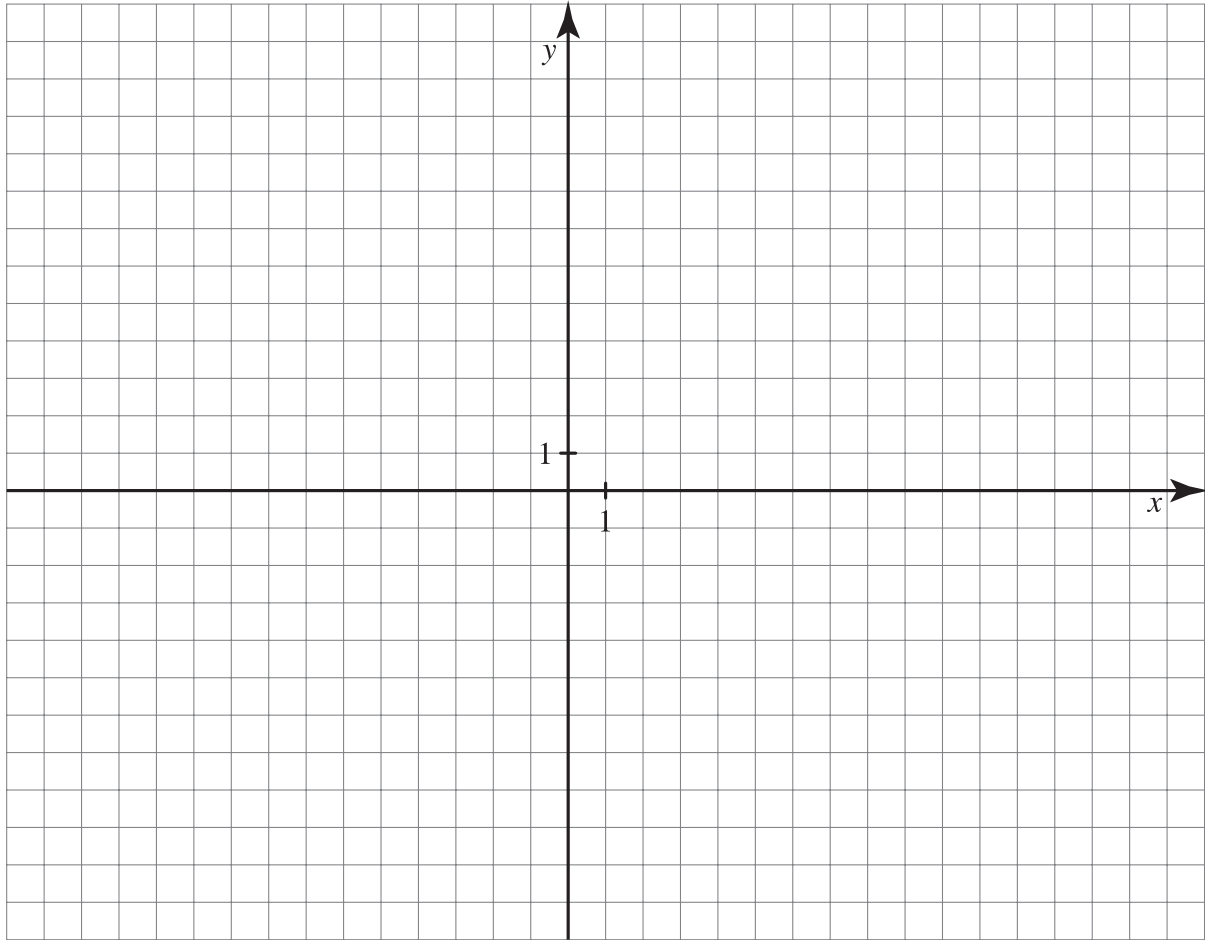












	No. of the question	Score	total	maximal score
part II./A	13.			12
	14.			12
	15.			12
part II./B				17
				17
	← problem not chosen			
<b>TOTAL</b>				<b>70</b>

	Score	maximal score
Part I.		30
Part II.		70
<b>TOTAL</b>		<b>100</b>

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date

\_\_\_\_\_

examiner

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

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Dátum/date

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Dátum/date

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javító tanár/examiner

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jegyző/registrar