

ÉRETTSÉGI VIZSGA • 2007. május 8.

**MATEMATIKA
ANGOL NYELVEN
MATHEMATICS**

2007. május 8. 8:00

**KÖZÉPSZINTŰ ÍRÁSBELI VIZSGA
STANDARD LEVEL
WRITTEN EXAMINATION**

I.

Időtartam: 45 perc
Time allowed: 45 minutes

Pótlapok száma /Number of extra sheets	
Tisztázati / Final version	
Piszkozati / Draft	

**OKTATÁSI ÉS KULTURÁLIS
MINISZTERIUM
MINISTRY OF EDUCATION
AND CULTURE**

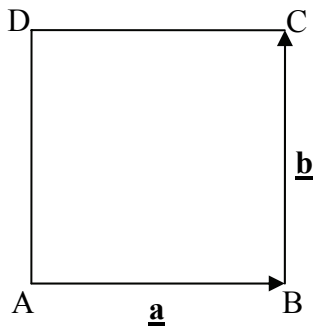
Important information

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. We deposited 210 000 Ft in a bank for a year. One year later its value incremented by the interest was 223 650 Ft. What was the annual interest rate?

The annual interest rate was	%.	2 points	
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2. Two of the side vectors of a square $ABCD$ are $\underline{\mathbf{a}} = \overrightarrow{AB}$ and $\underline{\mathbf{b}} = \overrightarrow{BC}$. Express the vectors \overrightarrow{AC} and \overrightarrow{BD} in terms of the vectors $\underline{\mathbf{a}}$ and $\underline{\mathbf{b}}$.



$\overrightarrow{AC} =$	1 point	
$\overrightarrow{BD} =$	1 point	

3. Solve the equation $2x + 35 = x^2$ on the set of real numbers, and check your answers.

$x_1 =$; $x_2 =$	2 points	
	1 point	

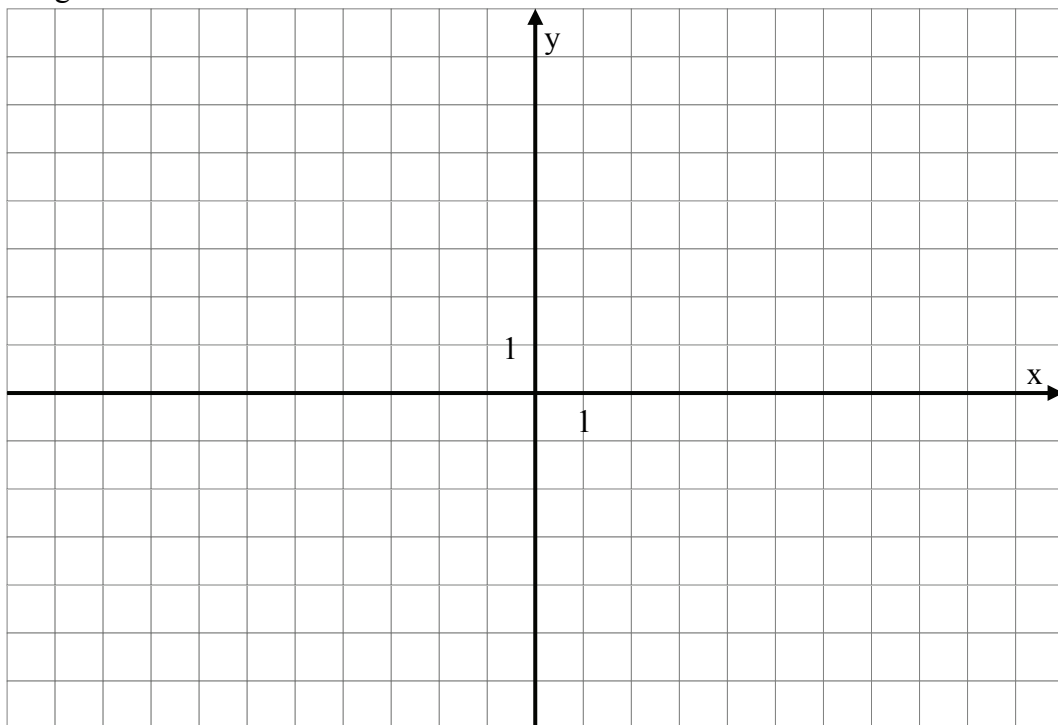
4. Find in degrees the angle enclosed between the short hand and the long hand (minute hand) of a clock at 5 o'clock.

The angle is	2 points	
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5. The following statement is accepted as true: “Not all dogs bite.” Use this to decide whether each of the statements below is “true”, “false” or “cannot be known”. Write the answers next to the appropriate letters.
- a) There is a dog that does not bite.
- b) Dogs that bark a lot do bite.

a)	1 point	
b)	1 point	

6. Graph the function $f(x) = \sqrt{x} - 1$, $x \in [0; 9]$. To what value of x does the function assign zero?



	2 points	
$x =$	1 point	

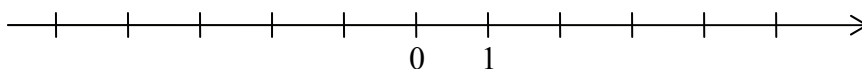
7. Find all angles between 0° and 360° the tangent of which is $\sqrt{3}$.

The angles are	2 points	
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8. Joseph had 3 children: Andrew, Matthias and David. Matthias had 3 sons, David had 1 and Andrew had no sons. Illustrate the father-son relationships by means of a graph. How many vertices and how many edges does the graph have?

	1 point	
The number of vertices:	1 point	
The number of edges:	1 point	

9. Find the exact value of z , given that $\log_4 z = -\frac{1}{2}$. Mark the position of z on the number line.



$z =$	2 points	
	1 point	

- 10.** What is the probability that a number divisible by three is obtained by rolling a die once? (Explain your answer.)

The probability is	3 points	
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- 11.** The daily mean temperatures in Celsius of a certain period were as follows: 24°, 22°, 22°, 21°, 23°, 23°, 24°, 25°, 24°. What is the mode and what is the median of these data?

Mode:	1 point	
Median:	1 point	

- 12.** The inner diameter of the cylindrical top hat of a magician is 22 cm, and its height is 25 cm. How many litres of water could be conjured into it? Write down the details of your calculation.
(Round your answer to one decimal place.)

Answer:	3 points	
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		maximum score	score attained
Paper I.	Problem 1.	2	
	Problem 2.	2	
	Problem 3.	3	
	Problem 4.	2	
	Problem 5.	2	
	Problem 6.	3	
	Problem 7.	2	
	Problem 8.	3	
	Problem 9.	3	
	Problem 10.	3	
	Problem 11.	2	
	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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**KÖZÉPSZINTŰ ÍRÁSBELI VIZSGA
STANDARD LEVEL
WRITTEN EXAMINATION**

II.

Időtartama: 135 perc
Time allowed: 135 minutes

Pótlapok száma /Number of extra sheets	
Tisztázati / Final version	
Piszkozati / Draft	

**OKTATÁSI ÉS KULTURÁLIS
MINISZTERIUM
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AND CULTURE**

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. For which integer values of x will the value of the expression $\frac{7}{2-x}$ be

- a) -3.5 ;
- b) a positive number;
- c) an integer?

a)	3 points	
b)	3 points	
c)	6 points	
Total:	12 points	

- 14.** The difference of the radii of two concentric circles is 8 cm. A chord of the larger circle touches the inner circle, and its length equals the diameter of the inner circle.
- a)** Draw a diagram.
 - b)** Determine the radii of the circles.

a)	2 points	
b)	10 points	
Total:	12 points	

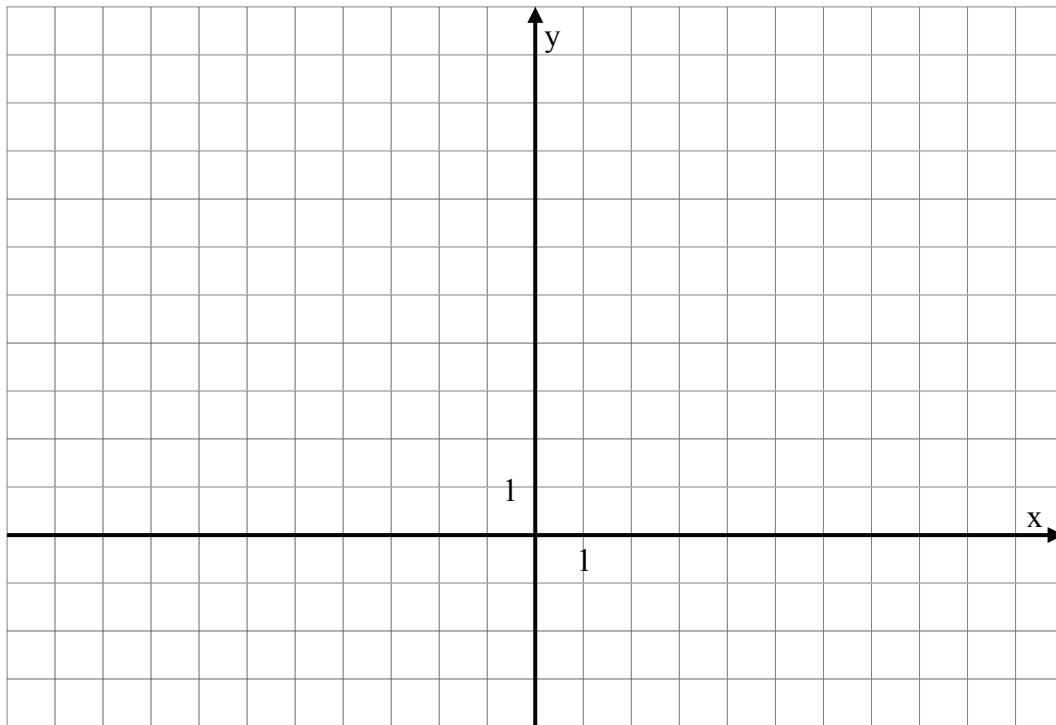
- 15.** A trainer at an athletics club is in charge of 29 runners altogether. There are 100-metre runners, 200-metre runners and relay runners among them. Each runner is training for at least one of the three races. 15 of them are 100-metre runners. Seven runners are training for the 100-metre race only, four for the 200-metre race only, and seven for the relay race only.
- a)** Draw a set diagram representing the information in the problem.
- b)** Given that there are the same number of runners training for every pair of two different races, find that number.

a)	2 points	
b)	10 points	
Total:	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 2.

- 16.** The slope of the line e is $\frac{1}{2}$, and it intersects the y -axis at 4.
- a) Graph the line e on the coordinate plane and find its equation.
 - b) Show that the point $P(2; 5)$ lies on the line e . Draw a line perpendicular to e at this point. Find the equation of the perpendicular line.
 - c) These two lines are intersected with the line $4x - 3y = -17$. The points of intersection are A and B . Determine the coordinates of the points A and B .
 - d) Calculate the area of the triangle PAB .
 - e) Find the coordinates of the centre of the circumscribed circle of the triangle PAB .



a)	2 points	
b)	4 points	
c)	4 points	
d)	4 points	
e)	3 points	
Total:	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 2.

- 17.** A vertical radio transmission aerial is fixed to the ground by means of four cables 14.5 m long each, attached to the aerial at $\frac{2}{3}$ of its height. The points where the cables are fixed to the ground form a square of 10-m sides.
- a) Draw a diagram showing the given data.
- b) For advertising purposes, sheets of canvas are stretched between the cables so that the structure resembles a tent. What is the total area of the canvas sheets? Round your answer to the nearest square metre.
- c) Determine the height of the aerial to the nearest decimetre.

a)	3 points	
b)	4 points	
c)	10 points	
Total:	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 2.

- 18.** I improved my language proficiency by learning new words. On the first day, a Monday, I learnt eight new words. Then every day of the week up to Friday I learnt three words more than on the previous day. Saturday and Sunday were the days of self assessment, that is when I realised that, unfortunately, I had forgotten one fifth of the words learnt during the week.

- a)** How many new words did I know at the end of the week?

The next Monday I started with nine new words, the following Monday I started with ten, and so on. Within each week I increased the number of words to be learnt by three every day for five days. Then, again, by the end of every week I forgot one fifth of the words learnt during the week. I continued the procedure for a quarter of a year. (Assume that a quarter of a year is 13 weeks.)

- b)** Every week, I wrote down the number of words learnt (and not forgotten). What sequence is formed by the 13 numbers obtained in this way?
- c)** How many new words did I learn (and remember) on the 13th week?
- d)** How many new words did I learn (and remember) during the quarter year?
- e)** Suppose I make a probability test on the words learnt during the first week. I select two of the words at random. What is the probability that I remember both of them?

a)	2 points	
b)	3 points	
c)	3 points	
d)	3 points	
e)	6 points	
Total:	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

	score attained	maximum score
Paper I		30
Paper II		70
GRAND TOTAL		100

_____ date

_____ teacher

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

_____ date
(dátum)

_____ teacher
(javító tanár)

_____ registrar
(jegyző)