

ÉRETTSÉGI VIZSGA • 2005. május 28.

**MATEMATIKA
ANGOL NYELVEN
MATHEMATICS**

**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 MINISZTERIUM
MINISTRY OF EDUCATION**

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Instructions to candidates

- The time allowed for this examination paper is 45 minutes. When that time is over, you will have to stop working.
- You may solve the problems in any order.
- In solving the problems, you are allowed to use a calculator that cannot store and display verbal information. You are also allowed to use four-digit data tables. The use of any other electronic devices or printed material is forbidden!
- **Write the final answers in the appropriate frames.** You are not required to write down details of the solutions, except where you are instructed by the problem to do so.
- Write in pen. 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.
- Only one solution to each problem will be assessed.
- Please do not write anything in the grey rectangles!

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1. Find all real numbers x for which $|x| = 7$.

The solutions of the equation:

2 points

2. A winter coat that cost 40 000 Ft is sold for 10% less in the great spring sales. What is the reduced price of the winter coat?

The reduced price of the coat:

2 points

3. The lengths of the edges of a cuboid are 15 cm, 12 cm and 8 cm. Calculate the surface area of the cuboid. Show your calculations in detail.

The surface area of the cuboid:

2 points

1 point

4. The radius of a circle is 6 cm. Find the area of the sector of this circle that belongs to a central angle of 120° .

The area of the sector:

cm^2 .

2 points

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5. Decide which of the sentences listed below is the negation of the following statement:

Every final exam problem is simple.

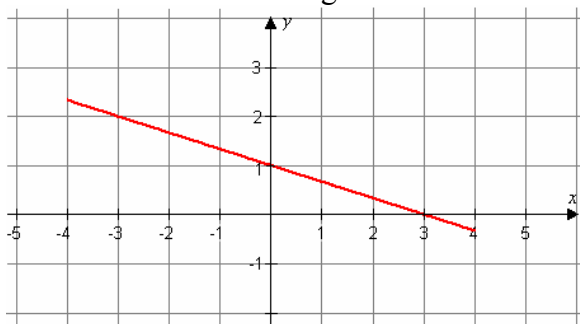
- A:** Every final exam problem is complicated.
- B:** There is a final exam problem that is not simple.
- C:** Many of the final exam problems are complicated.
- D:** There is a final exam problem that is simple.

The letter of the sentence chosen:	2 points	
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6. A tangent is drawn to a circle of radius 5 cm from a point that is 13 cm from its centre. Find the length of the tangent. Show your calculations in detail.

	2 points	
The length of the tangent is cm.	1 point	

7. The diagram shows the graph of a function defined on the interval $[-4; 4]$. Select the correct rule of assignment of this function from the formulae listed below.



A: $x \mapsto \frac{1}{3}x + 1.$

B: $x \mapsto -\frac{1}{3}x + 1.$

C: $x \mapsto -3x + 1.$

D: $x \mapsto -\frac{1}{3}x + 3.$

The letter of the correct answer:	2 points	
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- 8.** There are 80 tea towels on a shelf in a shop, 20 of which have chequered patterns on them. What is the probability that a tea towel picked at random will be chequered?

The probability in question:	2 points	
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- 9.** Find the angles α between 0° and 360° that satisfy the following equality.

$$\sin \alpha = \frac{\sqrt{2}}{2}.$$

Solution:	2 points	
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- 10.** Draw a graph on five vertices that has 4 edges.

2 points	
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- 11.** The inner diameter of the base of a cylindrical cooking pot is 20 cm, and its height is 14 cm. Is it possible to cook 5 litres of soup in the pot (all of it at the same time)? Explain your answer.

	3 points	
Large enough for 5 litres of soup?	1 point	

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- 12.** Consider the vectors \underline{a} (4; 3) and \underline{b} (-2; 1).
- Determine the length of \underline{a} .
 - Calculate the coordinates of $\underline{a} + \underline{b}$.

a) The length of \underline{a} :	2 points	
b) The coordinates of $\underline{a} + \underline{b}$:	2 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.	2	
	Problem 9.	2	
	Problem 10.	2	
	Problem 11.	4	
	Problem 12.	4	
TOTAL		30	

teacher

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

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!

**MATEMATIKA
ANGOL NYELVEN
MATHEMATICS****KÖZÉPSZINTŰ
ÍRÁSBELI VIZSGA
STANDARD LEVEL
WRITTEN EXAMINATION****II.**

Időtartam: 135 perc
Time allowed: 135 minutes

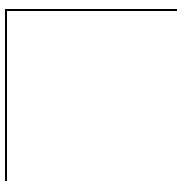
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**OKTATÁSI MINISZTERIUM
MINISTRY OF EDUCATION**

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Instructions to candidates

- The time allowed for this examination paper is 135 minutes. When that time is over, you will have to stop working.
- You may solve the problems in any order.
- 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 teacher marking the paper which problem you do not want to be assessed, then problem 18 will not be assessed.



- In solving the problems, you are allowed to use a calculator that cannot store and display verbal information. You are also allowed to use four-digit data tables. The use of any other electronic devices or printed material is forbidden!
- Always write down the reasoning used in obtaining the answers, since a large part of the attainable points will be awarded for that.
- Make sure that the calculations of intermediate results are also possible to follow.
- 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.*
- Always state the final result (the answer to the question of the problem) in words, too!
- Write in pen. 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.
- Only one solution to each problem will be assessed.
- Please do not write anything in the grey rectangles.

A

13. Solve the following equations on the set of real numbers:

a) $\frac{x-1}{2} + \frac{2x}{5} = 4;$

b) $\lg(x-1) + \lg 4 = 2.$

a)	5 points	
b)	7 points	

14. a) Insert two numbers between 6 and 1623, such that the four numbers are consecutive terms of an arithmetic progression.

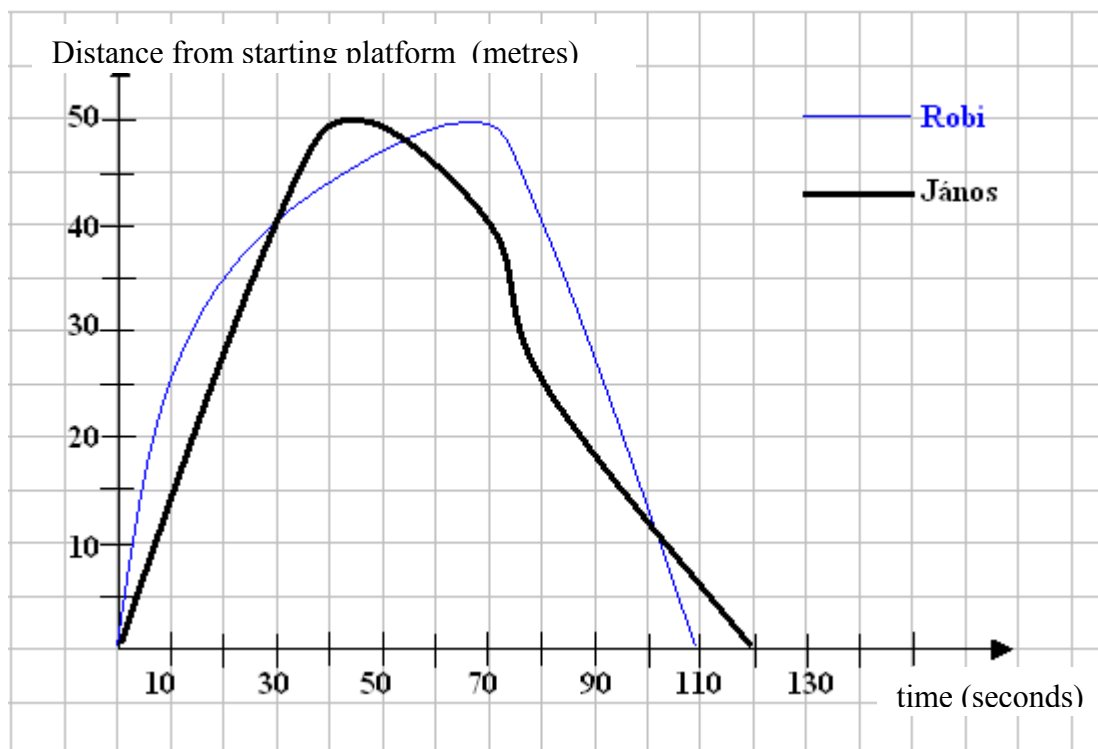
b) Calculate the sum of the numbers divisible by four between 6 and 1623.

a)	5 points	
b)	7 points	

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- 15.** When the training was over, two swimmers swam a race in the 50-metre-long pool. Watching the race, the trainer drew the following graphs of the swimming of his trainees Robi and János:



Read the following information from the graph:

- a) What was the largest distance between the two boys during the race?
- b) When did János overtake Robi?
- c) Which of them was faster in the 35th second?

Four swimming teams qualified for the finals of the 4×100-metre free-style relay race: the Dolphins, the Fish, the Otters and the Sharks.

- d) How many different orders of the four teams are possible, if we are certain that the Dolphins are not going to be the fourth?
- e) At the end of the relay race, it turned out that two teams tied for first place and, as expected, the Dolphins did not finish last. Provided that one is only given these two pieces of information, how many different orders can one set up?

a)	1 point	
b)	2 points	
c)	2 points	
d)	3 points	
e)	4 points	

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II / 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.** Consider the circle $x^2 + y^2 + 2x - 2y - 47 = 0$ on the coordinate plane.
- a) Determine whether the point $A (7; 7)$ lies on the circle.
 - b) Find the radius of the circle and the coordinates of its centre.
 - c) Let $A (7; 7)$ and $B (0; 0)$ be the endpoints of the base of an isosceles triangle. Vertex C of the triangle lies on the circle $x^2 + y^2 + 2x - 2y - 47 = 0$. Calculate the coordinates of the vertex C .

a)	2 points	
b)	5 points	
c)	10 points	

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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.

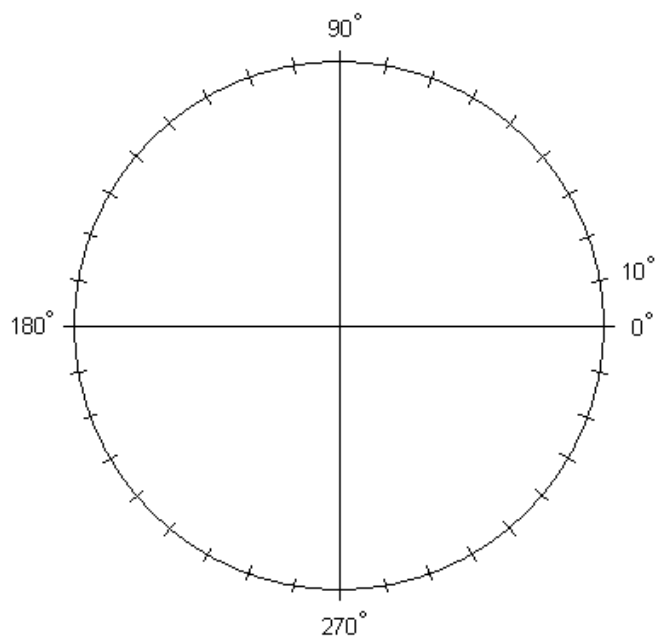
17. A lorry delivered apples to grocery shops. It took four kinds of apples to a certain shop: 60 kg of Jonatan apples, 135 kg of Starking, 150 kg of Idared and 195 kg of Golden apples. The greengrocer sold Jonatan and Idared apples for 120 forints a kilo, and he sold Starking and Golden for 85 forints a kilo.

- a) Relative to the price of Golden apples, by what percentage was a kilo of Jonatan apples more expensive?
- b) What was the greengrocer's total revenue if he sold all the apples?
- c) Calculate the average price of a kilo of apple in this grocery shop.
- d) Represent the distribution of the four kinds of apples in a pie chart.

A Jonatan apple is smaller than an Idared apple, therefore a crate of Jonatan contains 25% more pieces on average than a crate of Idared. The deliveryman accidentally overturned one crate of each of the two kinds, the apples fell out and got mixed together.

- e) What is the probability that an apple picked at random out of the ones that fell out will be a Jonatan apple?

a)	2 points	
b)	2 points	
c)	3 points	
d)	6 points	
e)	4 points	

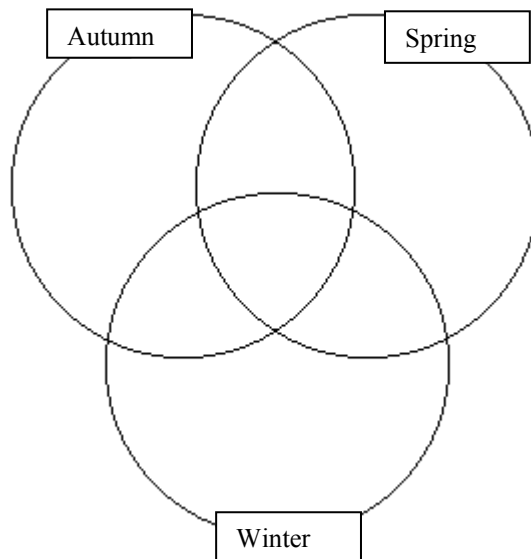


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You are required to solve any two out of the problems 16 to 18. Write the number of the problem NOT selected in the blank square on page 2.

- 18.** Every student of a music school played in some of the three concerts organized during the academic year. There was a concert in the autumn, one in the winter and one in the spring. 20 students played in both the autumn concert and the winter concert, there were 23 who played both in the winter and in the spring, and 18 students took part in both the autumn concert and the spring concert. There were 10 students who played in all the three concerts.

- a) Write the information given above in the appropriate places in the set diagram.



The music school has 188 students. Out of those who only played in one of the concerts, twice as many played in the spring as in the winter, and only one quarter as many played in the autumn as in the spring.

- b) Find the number of students who only played in the winter.
- c) There are 32 students in the class A and 28 students in the class B. A group of 10 students are selected at random from the two classes to represent the school at an event. What is the probability that exactly 5 students are selected from each class?

a)	4 points	
b)	8 points	
c)	5 points	

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	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
Grade (percentage)		

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

teacher
(javító tanár)

registrar
(jegyző)