ÉRETTSÉGI VIZSGA • 2016. október 18.

MATEMATIKA ANGOL NYELVEN

KÖZÉPSZINTŰ ÍRÁSBELI VIZSGA

2016. október 18. 8:00

I.

Időtartam: 45 perc

Pótlapok száma	
Tisztázati	
Piszkozati	

EMBERI ERŐFORRÁSOK MINISZTÉRIUMA

Instructions to candidates

1. The time allowed for this examination paper is 45 minutes. When that time is up, you will have to stop working.

2. You may solve the problems in any order.

3. On solving the problems, you may use a calculator that cannot store and display textual information. You may also use any edition of the four-digit data tables. The use of any other electronic device or printed or written material is forbidden!

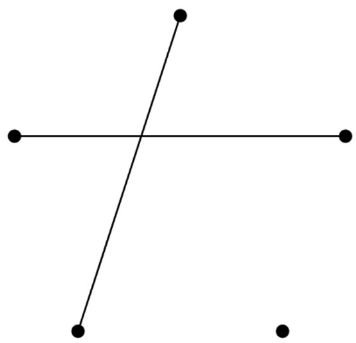
4. **Enter the final answers in the appropriate frames.** You are only required to detail your solutions where you are instructed by the problem to do so.

5. Write in pen. Diagrams may be drawn in pencil. The examiner is instructed not to mark anything written in pencil, other than diagrams. 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 case of more than one attempt to solve a problem, indicate clearly which attempt you wish to be marked.

7. Please **do not write in the grey rectangles**.

1. Draw further edges into the diagram of the 5-point graph shown below, until the degree of each vertex is 2.



2 points	

2. What number does the function $x \mapsto \sqrt[3]{4x-1}$ ($x \in \mathbf{R}$) assign to 7?

	2 points	

3. Write 38 as a sum of two different primes.

38 =	2 points	

4. How many 4-digit positive integers exist in the decimal system that have four different odd digits?

	2 points	

5. Determine the truth value of the following statements (true or false).

A: Point (1; –1) is on the line whose equation is $5x - 3y = 2$.

B: Given $A(-2; 5)$ and $B(2; -3)$, the midpoint of segment AB is the point (0; 2).

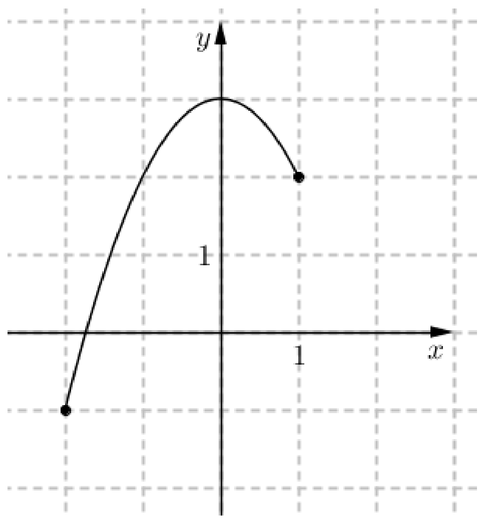
C: The lines $x + 2y = 7$ and $2x + 4y = 7$ are parallel.

A: B: C:	2 points	

6. Students use two different measuring cylinders at a Chemistry class. Both the height and the diameter of the base circle of one of these cylinders are exactly half as much as that of the other one. How many times larger is the volume of the larger cylinder than the volume of the smaller one?
Explain your answer.

	3 points	
	1 point	

7. The function $x \mapsto -x^2 + 3$ shown in the diagram is defined over the interval [–2; 1]. Determine the range of this function.



The range of the function:	2 points	

8. Give all positive, real solutions of the equation $\sin x = \frac{1}{2}$ that are smaller than π.

	2 points	

9. A group of people went on an 8-km trip. They have already covered 40% of the 8 km and 1200 metres more. What percentage of the full distance do they still have to walk? Show your work!

	3 points	
They still have to walk % of the 8 km.	1 point	

10. Give the value of the following sum: $\log_6 2 + \log_6 3$.

The value of the sum:	2 points	

11. The function $f(x)=|x-1|-3$ is defined over the set of real numbers.
Determine the zeros of the function.
Explain your answer.

	2 points	
The zeros:	2 points	

12. A fair dice is rolled four times in a row. The numbers obtained are recorded, one after the other. Consider the sequences of rolls below.

a) 5, 1, 2, 5; *b)* 1, 2, 3, 4; *c)* 6, 6, 6, 6.

Which of the following statements is true?

A) The probability of sequence *a)* is the greatest of the above three sequences.
B) The probability of sequence *b)* is the greatest of the above three sequences.
C) The probability of sequence *c)* is the greatest of the above three sequences.
D) The probabilities of all three sequences are equal.

The letter of the true statement:	2 points	

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

date examiner

	elért pontszám **egész számra** kerekítve	programba beírt **egész** pontszám
I. rész		

dátum dátum

javító tanár jegyző

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!

Név: .... osztály:......

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MATEMATIKA ANGOL NYELVEN

KÖZÉPSZINTŰ ÍRÁSBELI VIZSGA

2016. október 18. 8:00

II.

Időtartam: 135 perc

Pótlapok száma	
Tisztázati	
Piszkozati	

EMBERI ERŐFORRÁSOK MINISZTÉRIUMA

Instructions to candidates

1. The time allowed for this examination paper is 135 minutes. When that time is up, 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 of the three problems. **When you have finished the examination, enter the number of the problem not selected in the square below**. *If it is not clear* for the examiner which problem you do not want to be assessed, the last problem in this examination paper will not be assessed.

4. On solving the problems, you may use a calculator that cannot store and display textual information. You may also use any edition of the four-digit data tables. The use of any other electronic device or printed or written material is forbidden!

5. **Always write down the reasoning used to obtain the answers. A major part of the score will be awarded for this.**

6. **Make sure that calculations of intermediate results are also possible to follow.**

7. On solving the problems, theorems studied and given a name in class (e.g. the Pythagorean Theorem or the height theorem) do not need to be stated precisely. It is enough to refer to them by 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. Diagrams may be drawn in pencil. The examiner is instructed not to mark anything in pencil, other than diagrams. 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 case of more than one attempt to solve a problem, **indicate clearly** which attempt you wish to be marked.

11. Please **do not write in the grey rectangles**.

A

13. Solve the following equations in the set of real numbers.

a) $\dfrac{2}{x-2} = x - 3$

b) $9^{x+1} - 7 \cdot 9^{x} = 54$

a)	6 points	
b)	6 points	
T.:	12 points	

14. Andrea and Gabi are training for a running competition. They train together, but use different techniques. They both ran 15 km-s in the first week of training and 60 km-s in the eleventh (11) week.

Andrea increases the distance run by the same number of km-s each week.

a) By how many km-s does Andrea increase the distance each week?

b) What is the total number of km-s run by Andrea during the 11 weeks?

Gabi increases the distance run by the same percentage each week.

c) By what percentage does Gabi increase the distance each week?

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

15. The length of diagonal *AC* of the rhombus *ABCD* is 12 cm, the length of diagonal *BD* is 5 cm.

a) Calculate the measure of each interior angle of the rhombus.

The rhombus is then rotated around the line of diagonal *AC*.

b) Calculate the total surface area of the solid obtained this way.

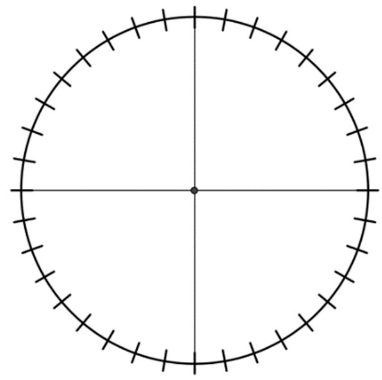
a)	5 points	
b)	7 points	
T.:	12 points	

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. During the 2016 Summer Olympic Games, Hungarian sportspeople won 8 gold medals, 3 silver and 4 bronze.

a) Create a pie chart that shows the distribution of medals.



In the summer of 2016, in a class of 32 students, there were twice as many students watching the TV broadcast of the women's kayak K-4 Olympic finals as there were students watching the finals of the European Soccer Championship. There were 10 students watching both events.

b) How many students in this class were watching the women's kayak finals only, given that everybody watched at least one of the two events?

In a school contest, the form shown below is used to give the order of the first six nations finishing at the 2016 women's kayak Olympic finals. Péter knows there were no ties and that Hungary won the race, however, he does not remember the order of the other five nations at all.

Betting Slip						
	Denmark	**Belarus**	**Hungary**	**Germany**	**New Zealand**	**Ukraine**
Placement			1.			

Péter fills the blanks: he writes in the numbers 2, 3, 4, 5, 6 in some order.

c) Calculate the probability of the event that Péter guesses the placement of at least three more nations – other than Hungary – correctly.

a)	4 points	
b)	5 points	
c)	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. Given is the line *e*: $x + 2y = 13$ and also the circle *k*: $x^2 + (y+1)^2 - 45 = 0$.

a) Give the gradient of line *e* and also the point where line *e* intersects the *y*-axis.

b) Give the centre and the length of the radius of circle *k*.

c) Prove by calculations that the line *e* and the circle *k* have one common point only.

a)	4 points	
b)	4 points	
c)	9 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.

18. Mr. Szabó is teaching Mathematics. This year he has 11 standard level mathematics final exam papers to grade. The scores of the nine papers he graded first are: 35, 40, 51, 55, 62, 67, 72, 84, 92 points.

a) Calculate the mean and the standard deviation of the scores of these nine papers.

After grading these nine papers, Mr. Szabó randomly selects three of them.

b) Calculate the probability that the score of at least two out of the three selected papers is at least 60 points.

After grading the remaining two papers Mr. Szabó finds that the median of the scores of all 11 papers is 64 and their mean is 65.

c) Determine the scores for each of the two papers Mr. Szabó graded last.

a)	4 points	
b)	8 points	
c)	5 points	
T.:	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		
	TOTAL	**70**		

	maximum score	points awarded
Part I	30	
Part II	70	
Total score on written examination	**100**	

date examiner

	elért pontszám **egész számra** kerekítve	programba beírt **egész** pontszám
I. rész		
II. rész		

dátum dátum

javító tanár jegyző