ÉRETTSÉGI VIZSGA • 2022. október 18.

MATEMATIKA ANGOL NYELVEN

KÖZÉPSZINTŰ ÍRÁSBELI VIZSGA

minden vizsgázó számára

2022. október 18. 8:00

I.

Időtartam: 57 perc

Pótlapok száma	
Tisztázati	
Piszkozati	

OKTATÁSI HIVATAL

Instructions to candidates

1. The time allowed for this examination paper is 57 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. Two subsets of the set of the positive integers are given:
A = {primes that are less than 12},
B = {one-digit numbers that are not divisible by 3}.
Give the sets A, B, A∩B and B \ A by listing their elements.

A =	1 point	
B =	1 point	
A∩B =	1 point	
B\A =	1 point	

2. Every digit of a three-digit, positive integer is greater than 5.
How many such integers are there?

	2 points	

3. Give the value of *n* that makes the following equation true.

$$\frac{2^7 \cdot 2^6}{2^3} = 2^n$$

n =	2 points	

4. A chocolate bar weighs 35 grams. The nutrition information on the package says: "520 kcal energy per 100 grams". How many kcal of energy does this chocolate bar contain?

	2 points	

5. The function $x \mapsto -(x+1)^2 + 5$ is defined over the closed interval [–3; 2]. The graph of the function is shown below. Give the range of the function as well as the value of x where it assumes its maximum.
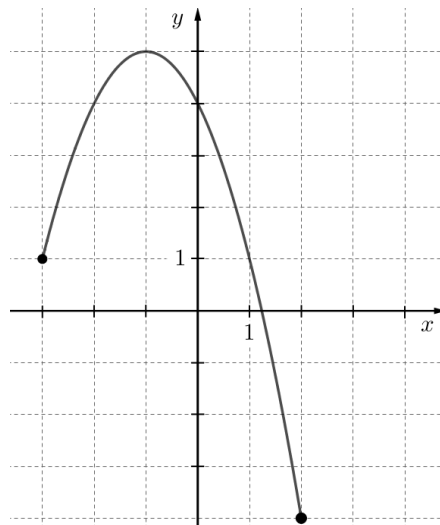
The range:	2 points	
Maximum is assumed at:	1 point	

6. Give the number of diagonals in a convex octagon (8 sides).
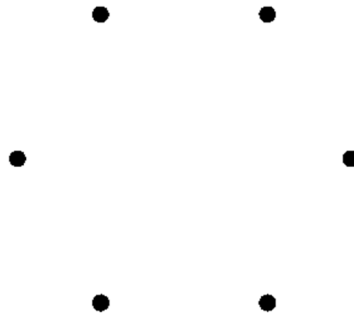
	2 points	

7. Give the value of x, rounded to three decimal places, where $10^x = 30$.

	2 points	

8. The function $x \mapsto 5x - 3$ is defined over the set of real numbers and intersects the x axis in point P. Give the first coordinate of point P.
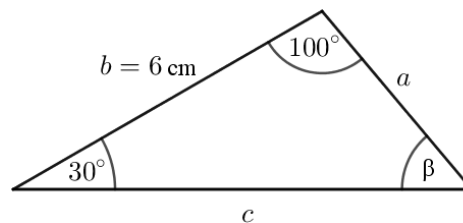
	2 points	

9. Draw a six-point graph in which two vertices have the same degrees, but the other four vertices have degrees different from these, as well as from one another.

2 points	

10. Calculate the length of the side in the triangle below that is opposite the 30° angle. Show your work.

2 points	
1 point	

11. Quality Control is checking the number of matchsticks in six different matchboxes. The results obtained are shown in the table below. Calculate the mean and the standard deviation of the data.

box	first	second	third	fourth	fifth	sixth
no. of matchsticks	43	40	42	39	40	36

The mean:	1 point	
The standard deviation:	2 points	

12. A fair gambling die is thrown twice. What is the probability that the product of the two numbers thrown is 6? Show your work.

	2 points	
The probability:	1 point	

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

_____   _____
date   examiner

	pontszáma **egész számra** kerekítve	
	elért	programba beírt
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!

MATEMATIKA ANGOL NYELVEN

KÖZÉPSZINTŰ ÍRÁSBELI VIZSGA

minden vizsgázó számára

2022. október 18. 8:00

II.

Időtartam: 169 perc

Pótlapok száma	
Tisztázati	
Piszkozati	

OKTATÁSI HIVATAL

Instructions to candidates

1. The time allowed for this examination paper is 169 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.
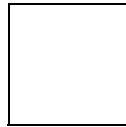
4. On solving the problems, you may use a calculator that cannot store and display textual information. You may also use any edition of the four-digit data tables. The use of any other electronic device or printed or written material is forbidden!

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. **The use of calculators** in the reasoning behind a particular solution **may be accepted without further mathematical explanation in case of the following operations**: addition, subtraction, multiplication, division, calculating powers and roots, $n!$, $\binom{n}{k}$, replacing the tables found in the 4-digit Data Booklet (sin, cos, tan, log, and their inverse functions), approximate values of the numbers π and e, finding the solutions of the standard quadratic equation. No further explanation is needed when the calculator is used to find the mean and the standard deviation, as long as the text of the question does not explicitly require the candidate to show detailed work. **In any other cases, results obtained through the use of a calculator are considered as unexplained and points for such results will not be awarded.**

8. 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*.

9. Always state the final result (the answer to the question of the problem) in words, too!

10. 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.

11. 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.

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

A

13.   **a)** Solve the following equation over the set of real numbers.

$$\frac{x}{2} + \frac{x-1}{3} = 8$$

   b) The sum of the squares of two consecutive integers is 10 513.
   Which two integers are these?

a)	4 points	
b)	8 points	
T.:	12 points	

14. The diagram shows the side view of some steps of a staircase complete with rails. The rails form a parallelogram. The vertical sides are 80 cm long, the distance between them is 115 cm. The other two side are 125 cm each. (See the diagram on the right.)
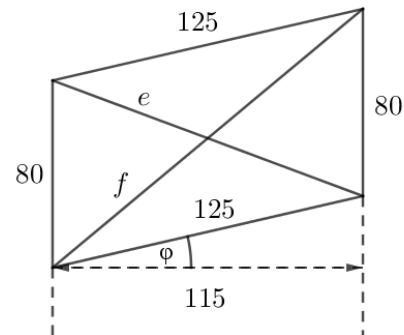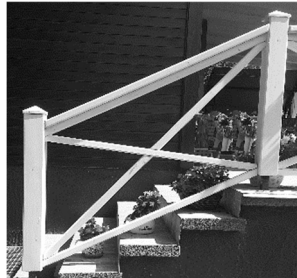
a) The angle φ is the angle between the horizontal and the bottom side of the parallelogram. Prove by calculations that φ = 23° (rounded to the nearest integer degree).

b) Calculate the length of diagonal *e* of the parallelogram.

c) The rails will be covered with a woven reed screen.
What is the area of the reed screen that would cover the parallelogram? Is it true that such area is less than 1 m²?

a)	3 points	
b)	4 points	
c)	3 points	
T.:	10 points	

15. András is making a financial plan for his new business. He plans to make a 300 000 Ft monthly revenue in sales for each month in the first half year. He is then expecting a 5% increase in his monthly revenues (compared to the previous month) for each month from the 7th to the end of the second year.

   a) According to this plan, what will András' revenue be in the 24th month and how much will he earn altogether, over the course of these two years? Round your answers to the nearest ten thousand forints.

András and four of his friends: Balázs, Cili, Dóra and Endre are travelling to Lake Balaton in a car that seats 5 passengers (two can sit up front and another three on the rear bench). Only András and Dóra have drivers' licenses, so one of them must drive.

   b) How many seating arrangements are possible for the five friends, given that András must sit next to Cili?
   (The two people up front sits next to one another. Two arrangements are considered different if there is at least one person sitting in a different position.)

| a)	9 points	
b)	5 points	
T.:	14 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 table below shows the results of this year's Mathematics mock exam, taken by the advanced level math group of a senior class. The maximum score was 115. The grade is excellent (5) from 60%, good (4) from 47%, satisfactory (3) from 33%, pass (2) from 25%. The scores have already been entered in the table but some of the grades are still missing.

	Anna	Béla	Cili	Dezső	Egon	Fruzsi	Géza	Huba	Imre
score (points)	103	61	68	72	97	55	37	39	75
grade	5		4	5	5				5

a) Use the data to complete the table and create a pie chart showing the grade-distribution for this group.
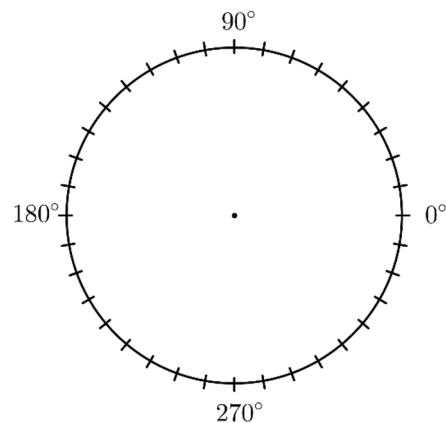
The 33 students in this class participated in three class events this year: a theatre act, a movie and a class trip. Every student participated in at least one of the events. 13 students went to the theatre as well as to the movie, 12 students went to the theatre as well as to the trip, and 10 students went to the movie as well as to the trip. 4 students participated in only one of the three events.

b) How many students participated in all three events?

There are 15 rows of seats in the theatre hall. Starting with the second row, each row has the same number of seats more than the previous one. There are 26 seats in the sixth row and 34 seats in the tenth row.

c) How many seats are there altogether in the theatre hall?

a)	5 points	
b)	7 points	
c)	5 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 2.

17. One step of the manufacturing process of pencils is the making of cores. The core consists of a mix of graphite, clay and soot which is first pressed into the form of cylindrical cakes, 20 cm in diameter and 25 cm in height. These cakes are then reshaped into long, cylindrical rods, 2 mm in diameter, without waste.

   a) What is the total length, in metres, of such a rod that has been made out of one cake?

Among the workers of one pencil manufacturing company the ratio of women to men is now 3 : 2, but it would change to 4 : 3 if 5 more women and 6 more men were hired.

   b) How many women and how many men are working currently at this company?

When a pencil falls off the table, the tip will break at a probability of 0.2. Ervin's cat knocks a set of pencils off the table and they fall to the ground, one after the other.

   c) Calculate the probability, that out of the 12 falling pencils no more than one will break its tip.

a)	6 points	
b)	6 points	
c)	5 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 2.

18. There are a total 36 coloured paper polygons on the table, some are triangles the rest are quadrilaterals. They are all either red or blue. There are 24 red polygons and 27 triangles altogether. Also, there are 5 blue quadrilaterals.

   a) How many red triangles are there on the table?

   Select two polygons out of the 36 at random (without replacement).

   b) What is the probability that both polygons will be triangles?

   The three vertices of a triangle in the coordinate plane are $A(1; 2)$, $B(5; 0)$ and $C(6; 7)$.

   c) Prove that triangle ABC is isosceles.

   d) Determine the area of triangle ABC.

a)	4 points	
b)	4 points	
c)	3 points	
d)	6 points	
T.:	17 points	

	number of question	score		
		maximum	awarded	total
Part II A	13	12		
	14	10		
	15	14		
Part II B		17		
		17		
	← question not selected			
	TOTAL	**70**		

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

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date

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examiner

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

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dátum

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dátum

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javító tanár

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jegyző