Név: ..... osztály:.....

ÉRETTSÉGI VIZSGA • 2023. október 17.

MATEMATIKA
ANGOL NYELVEN

KÖZÉPSZINTŰ
ÍRÁSBELI VIZSGA

minden vizsgázó számára

2023. október 17. 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. Give the prime-factorisation of the number 1848.

1848 =	2 points	

2. Sand is delivered to a construction site by trucks. Five identical trucks should take eight turns each to deliver all the sand. Assume that we only have four of these same trucks. How many turns would each of them have to take to deliver the same amount of sand?

	2 points	

3. The two legs of a right triangle are 10 and 24 cm long. Calculate the length of the hypotenuse, as well as the measure of the angle opposite the 10 cm leg. Explain your answer.

	2 points	
The length of the hypotenuse: cm	1 points	
The measure of the angle opposite the 10 cm side: degrees	1 points	

4. The following functions are all defined over the set of real numbers. Select the one that never assumes a negative value.

A) $x \mapsto x+3$

B) $x \mapsto x^2-3$

C) $x \mapsto |x-3|$

	2 points	

5. The webpage of a car rental company gives the rental fee of a certain car as 7500 Ft/day, assuming the rent is for 5 days or less. For 6 days or more, the rent is only 6300 Ft/day for the same car.
How much more would we have to pay altogether if the car is rented for 6 days, instead of 5?

The total fee for 6 days is Ft more than it would be for 5 days.	2 points	

6. A weather station recorded the following daily maximum temperatures over the days of the first week of November (in °C): 9, 5, 6, 9, 6, 6, 8. Give the mean, the range and the median of the data.

The mean: °C	1 point	
The range: °C	1 point	
The median: °C	1 point	

7. There are 10 red and a few green marbles in a box. The probability of a randomly selected marble being red is known to be $\frac{2}{3}$. How many green marbles are there in the box?

There are green marbles in the box.	2 points	

8. Expand the brackets and combine the like terms in the expression below, wherever possible. Show your work.

$(a+1)(a-1)+(a+4)^2$

	2 points	
The final form of the expression:	1 point	

9. An empty rail tank car weighs 23.8 tons. The tank car may carry a maximum of 60 000 litres of fuel. One litre of fuel weighs 0.85 kg. How many tons does the car weigh when it is fully loaded with fuel? Show your work.

	2 points	
The weight of the fully loaded car is tons.	1 point	

10. The equation of a circle is: $(x-2)^2+(y-4)^2=25$.
Give the coordinates of the centre of the circle and also its radius.

The centre:	1 point	
The radius:	1 point	

11. The function $x \mapsto \sqrt{x} - 3$ is defined over the set of non-negative real numbers. Give the zero of this function.

The zero:	2 points	

12. A fair coin is flipped three times. Determine the probability that, out of the three trials, exactly one will be Heads. Explain your answer.

	2 points	
The probability:	1 point	

Név: ..... osztály:.....

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

date examiner

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	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!

Név: ..... osztály:.....

ÉRETTSÉGI VIZSGA • 2023. október 17.

MATEMATIKA
ANGOL NYELVEN

KÖZÉPSZINTŰ
ÍRÁSBELI VIZSGA

minden vizsgázó számára

2023. október 17. 8:00

II.

Időtartam: 169 perc

Pótlapok száma	
Tisztázati	
Piszkozati	

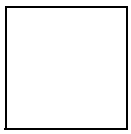
OKTATÁSI HIVATAL

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. The function $f(x) = (x-3)^2 + 2$ is defined over the set of real numbers.

a) What value does the function *f* assign to $x = 3.5$?

b) To what value(s) of *x* does the function *f* assign 6?

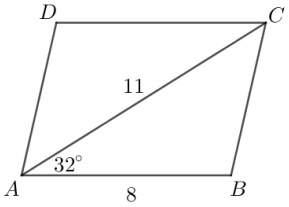
c) Select the range of the function *f* from the following:

A: $[-3; \infty[$ B: $[2; \infty[$ C: $[3; \infty[$ D: $[2; 3]$ E: **R**

d) Solve the inequality $x^2 - 6x + 11 \leq 3$ over the set of **integers**.

a)	2 points	
b)	4 points	
c)	2 points	
d)	4 points	
T.:	12 points	

14. Side *AB* of parallelogram *ABCD* is 8 cm long, diagonal *AC* is 11 cm. The angle between side *AB* and diagonal *AC* is 32°.



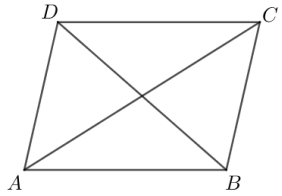
a) Calculate the length of side *BC*.

b) Calculate the area of the parallelogram.

Draw a line perpendicular to *AB* through the midpoint of diagonal *AC*. This line will intersect side *AB* in point *T*.

c) Point *T* divides side *AB* into two segments. Calculate the length of these segments.

The diagonals of parallelogram *ABCD* divide it into four regions. These regions are coloured in either red, yellow or blue, such that each colour is used for at least one region and adjacent regions, sharing a common side, must not be of the same colour. (Each region is coloured in a single colour.)

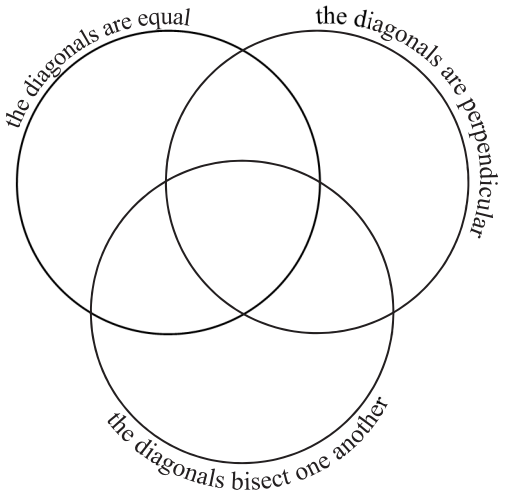


d) How many different ways are there to colour the parallelogram following the above rules? (Two colourings are considered different as long as there is at least one region that is coloured differently in each of them.)

a)	3 points	
b)	3 points	
c)	3 points	
d)	4 points	
T.:	13 points	

15. **a)** Let H be the set of quadrilaterals. The Venn-diagram shown below demonstrates three subsets of H. Write the letters for each quadrilateral below into the appropriate region of the diagram.

N: A square.
T: A rectangle with sides 3 cm and 5 cm.
R: A rhombus with a 60° angle.
P: A parallelogram with sides 3 cm and 5 cm and a 60° angle.



b) Determine the truth value of the following statements (true or false). Explain your answer.

I. If both sets A and B have two elements then the set $A \cup B$ has four elements.
II. The set of two-digit square numbers has six elements.

a)	7 points	
b)	4 points	
T.:	11 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. Janka's first three History grades in the previous school year were 3, 3, 4. Through the rest of the year, she only got 5-s.

a) How many 5-s did Janka get throughout the year if her final History grade average was exactly 4.5?

Each month, Janka receives as many times 1000 Ft pocket money from her parents as is her current grade. (Janka stays for 12 months in each of the grades 1-12.)

b) How much pocket money does Janka receive from her parents in 12 years altogether, while completing her primary and secondary education?

The common ratio (quotient) of a geometric sequence is 3, the sum of the first nine terms of this sequence is 59 046.

c) Determine the first and the ninth terms of this sequence.

A 50 000 Ft deposit had been placed in a bank account at an annual compound interest rate of p percent. Three years later, the value of this investment is 59 046 Ft (including interest).

d) Calculate the value of p.

a)	4 points	
b)	4 points	
c)	4 points	
d)	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. A passenger train consists of five second-class cars, a car to transport bicycles and a buffet car (not including the train engine).

a) How many different ways are there to arrange these seven cars, assuming all second-class cars are identical?

A 5% discount can be obtained on ticket prices if train tickets are bought from a vending machine.

b) How many Ft-s is the full, undiscounted cost of the train ticket that (when bought from the vending machine) costs 3040 Ft?

In January 2022, a students' monthly ticket, valid for a 30-km distance, cost 2140 Ft (and no further discounts were available). A students' single ticket for the same distance cost 280 Ft, and a 5% discount was available when bought from a vending machine.
Ábel, a student, travelled this 30-km distance several times this month, so a monthly ticket was the better option. However, if he had travelled one less time, the better option would have been to purchase separate single tickets from a vending machine.

c) How many times did Ábel travel on this 30-km stretch this month?

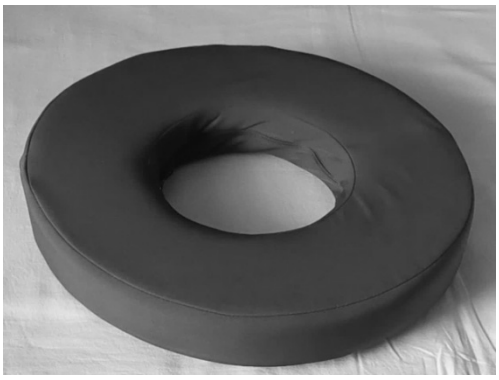
There are four members in the Kiss family and five in the Nagy family. The two families have decided to go on a holiday trip together. The Kiss family has bought two full-price tickets, a 20% discounted ticket, a 50% discounted ticket and four complementary intercity tickets in the ticket office for a total 7960 Ft. The Nagy family has bought five 90% discounted tickets, as well as five complementary intercity tickets for a total of 1975 Ft. (Complementary intercity tickets have a fixed price. 20%, 50% and 90% discounted tickets are available for 20, 50 or 90% less than the full price of the ticket.)

d) What is the full price of a train ticket and how much does a complementary intercity ticket cost?

a)	3 points	
b)	2 points	
c)	4 points	
d)	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 2.

18. A company is manufacturing cushions. The one shown in the picture is made of sponge, covered in cloth. A cylinder of diameter 42 cm and height 7 cm is cut out of sponge first. Then a smaller cylinder of diameter 18 cm is cut out from the middle. (The base circles of the two cylinders are concentric.)



a) Calculate the volume of the sponge in this cushion.

b) How much cloth is needed to cover 30 cushions? Give your answer in square metres, rounded to the nearest integer. (Ignore possible losses.)

The probability that a cushion is defected is 0.03.

c) Calculate the probability that, out of 30 cushions, no more than one will be defected.

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

	number of question	score		
		maximum	awarded	total
Part II A	13.	12		
	14.	13		
	15.	11		
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**	

date examiner

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

dátum dátum

javító tanár jegyző