Név: .... osztály:......

ÉRETTSÉGI VIZSGA • 2014. október 14.

MATEMATIKA
ANGOL NYELVEN

KÖZÉPSZINTŰ
ÍRÁSBELI VIZSGA

2014. október 14. 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 to do so by the problem.

5. 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.

6. Only one solution to each problem will be assessed. In the 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 equation of the line that passes through the point (1; –3) and one of its normal vectors is (8; 1).

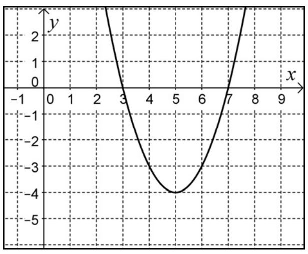
The equation of the line:	2 points	

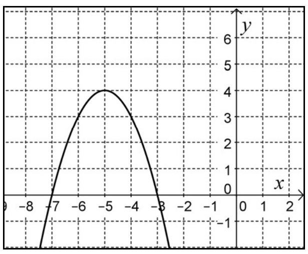
2. Simplify the following expression and combine the like terms.
Detail your solution.

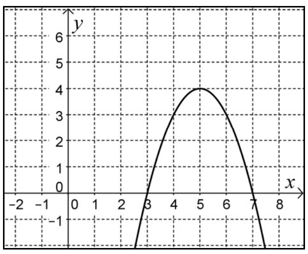
$$(x-3)^2+(x-4)\cdot(x+4)-2x^2+7x$$

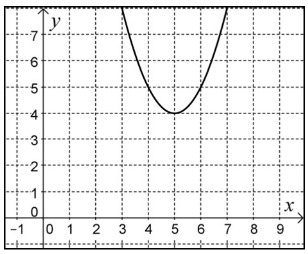
	2 points	
The simplified form:	1 point	

3. The function $x \mapsto -(x-5)^2+4$ is defined in the set of real numbers.
Which of the following diagrams shows part of the graph of this function?


A


B


C


D

The letter corresponding to the graph of the given function:	2 points	

4. Find the real solutions of the following equation.

$$\left|x^2 - 8\right| = 8$$

The solutions of the equation:	3 points	

5. **a)** For which real numbers is the expression $\log_2(3-x)$ defined?

b) Solve the following equation in the set of real numbers.

$$\log_2(3-x) = 0$$

a) The domain of the expression:	1 point	
b) $x =$	2 points	

6. One of the first 100 positive integers is randomly selected.
Give the probability that the selected number is divisible by 5.

The probability:	2 points	

7. Find the exact value of the solution of the equation below that is within the interval $[0; 2\pi]$.

$$\sin x = -1$$

$x =$	2 points	

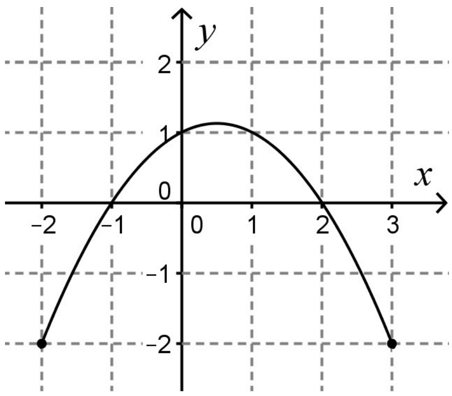
8. The function $x \mapsto 1 + \cos x$ is defined in the set of real numbers.
Give the range of this function.

The range of the function:	2 points	

9. The y-axis is tangent to a circle. The centre of the circle is the point $K(–2; 3)$.
Calculate the radius and give the equation of the circle.

The radius of the circle:	1 point	
The equation of the circle:	2 points	

10. The domain of the function shown below is the interval [–2; 3], the zeros are –1 and 2.
Over which interval of the domain will the function be positive?



The interval:	2 points	

11. Solve the following equation system in the set of real pairs of numbers.

$$\left.\begin{aligned}5x + y &= 3\\ x + y &= 7\end{aligned}\right\}$$

Detail your answer.

	2 points	
$x =$ $y =$	2 points	

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

A: The absolute value of all real numbers is positive.

B: $16^{-\frac{1}{4}} = 2$

C: If a number is divisible by both 6 and 9 then it is necessarily divisible by 54, too.

A: B: C:	2 points	

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

date examiner

	elért pontszám **egész számra** kerekítve/score rounded to the nearest **integer**	programba beírt **egész** pontszám/**inte ger** score en- tered into the program
I. rész/Part I		

javító tanár/examiner jegyző/registrar

dátum/date dátum/date

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!

Remarks

1. If the candidate has started working on Part II of the written examination paper then this table and the signature section remain blank.
2. Fill in the table and signature section if the examination is interrupted during Part I or it does not continue with Part II.

Név: .... osztály:......

ÉRETTSÉGI VIZSGA • 2014. október 14.

MATEMATIKA ANGOL NYELVEN

KÖZÉPSZINTŰ ÍRÁSBELI VIZSGA

2014. október 14. 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 45 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 paper, 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, problem 18 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 in obtaining the answers. A major part of the points will be awarded for that.**

6. **Make sure that the 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 altitude 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 the 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. An institute for public opinion research has been asked to conduct two surveys, half a year apart, about the ratings of three television series. The questionnaire shown offered options to mark either series **A, B** or **C** (one or more of them), or to mark neither.

Mark the appropriate answer with an X:
- I watch series **A**. ☐
- I watch series **B**. ☐
- I watch series **C**. ☐
- I do not watch any of these series. ☐

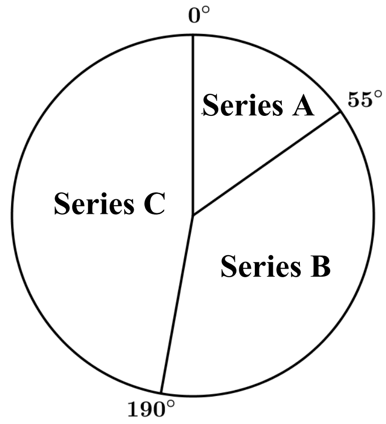
If you mark the last option, please leave all other options blank.

On the first survey, 600 questionnaires were returned. Series **A** was marked on 90 of them, series **B** on 290, and series **C** on 230. As it turned out, nobody marked exactly two of the series, but on 55 questionnaires all three were marked.

a) What percentage of the participants watched series **A**?

b) How many participants watched neither of the three series?

On evaluating the results of the second survey, only those questionnaires were assessed that marked at least one of the series. On these questionnaires there were a total 576 marks. The results were then converted into the pie chart shown.



c) Calculate the number of marks for each of the three television series.

a)	2 points	
b)	5 points	
c)	5 points	
T.:	12 points	

14. A family travelled from Budapest to Keszthely by car. They drove through residential areas, on highways, and on motorways, too. The table below summarises some of the data about the journey and the car.

	distance travelled (km)	average speed (km/h)	average gas consumption on 100 km (litres)
within residential areas	45	40	8.3
on highways	35	70	5.1
on motorways	105	120	5.9

a) How long did the journey take?

b) What was the average gas consumption of the car on 100 km for the whole journey? Round your answer to one decimal place.

Partway through the journey the car ran out of gas. At the nearest gas station there were two different-size cans sold. The larger one was marked as holding 20 litres but there was nothing written on the smaller one. The two cans were similar (in the mathematical sense), and the height of the larger one was exactly the double of the height of the smaller can.

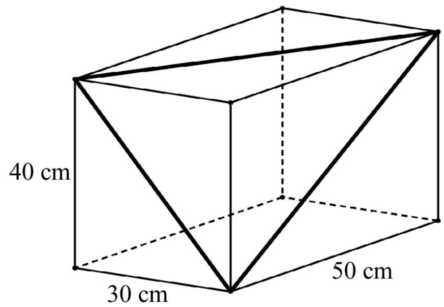
c) How many litres did the smaller can hold?

a)	4 points	
b)	5 points	
c)	4 points	
T.:	13 points	

15. The shape of a fish tank is a cuboid. The lengths of the three edges from a particular vertex are 30 cm, 40 cm, and 50 cm.

a) How many litres does this fish tank hold? (Ignore the thickness of the walls.)

Consider the triangle shown in the diagram. The sides of the triangle are formed by the three different face diagonals of the cuboid.



b) Calculate the measure of the smallest angle of this triangle. Give your answer in degrees, rounded to the nearest integer.

a)	3 points	
b)	8 points	
T.:	11 points	

B

You are required to solve any two of the problems 16 to 18. Enter the number of the problem not selected in the blank square on page 3.

16. The first term of an arithmetic sequence is 56, the common difference is –4.

a) Calculate the sum of the first 25 terms of this sequence.

b) Find the value of n and also the n^{th} term of the sequence, given that the sum of the first n terms is 408.

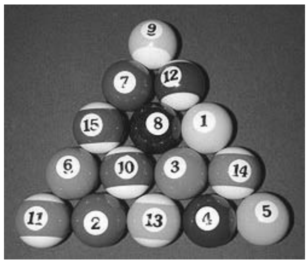
The first term of a geometric sequence is 10^{25}, the common ratio is 0.01.

c) Which term of this sequence is 100 000?

a)	2 points	
b)	8 points	
c)	7 points	
T.:	17 points	

You are required to solve any two of the problems 16 to 18. Enter the number of the problem not selected in the blank square on page 3.

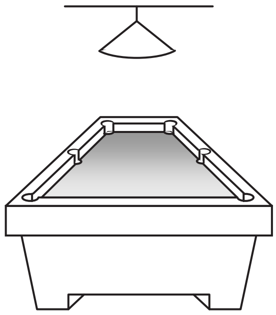
17. A game of billiards begins with placing 15 balls of equal size but bearing different colour patterns on the table in a triangular arrangement. In the first row of the triangle there are 5 balls, in the second row there are 4, then 3, 2, and 1 balls respectively. (For now, ignore all other rules governing the placement of balls.)



a) How many different ways are there to select the 5 balls forming the first row from among the 15? (Ignore the order of the 5 balls here.)

b) How many different ways are there to place the 9 balls forming the first two rows, if the order of the balls is also considered important?

The bed (play area) of a billiards table is a 194 cm × 97 cm rectangle. 85 cm above the centre of the bed, there is a point-source lamp that casts a cone of light on the table. The angle between opposite generators of this cone is 100°.



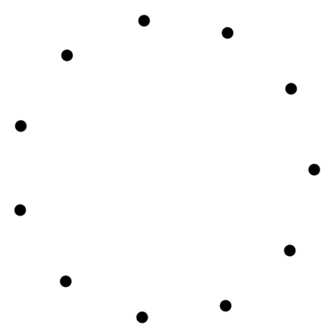
c) By calculation, determine whether the lamp lights up every point of the play area.

a)	3 points	
b)	3 points	
c)	11 points	
T.:	17 points	

You are required to solve any two of the problems 16 to 18. Enter the number of the problem not selected in the blank square on page 3.

18. The 11 players of a football team are arriving to practice. Some of them are shaking hands. (Any two players will only shake hands once.) Their manager took notes how many times each player shook hands with another and got the following numbers: 0; 1; 2; 2; 2; 5; 0; 0; 4; 4; 2.

a) Draw a possible graph representing the handshakes. Points stand for players and an edge is drawn between two points wherever the respective players shook hands.



b) What was the total number of handshakes?

Another time, the manager got the numbers again. Of the 11 non-negative integers it is known that their single mode is 2, their median is 3, their arithmetic mean is 4, and their range is 5.

c) Give 11 non-negative integers that fit the above conditions.

Members of the team are practicing the penalty kick.
One of the players hits the goal at a probability of 0.9.

d) What is the probability of this player hitting the goal at least once out of three trials? Give the exact value of the probability.

a)	3 points	
b)	2 points	
c)	5 points	
d)	7 points	
T.:	17 points	

	number of problem	maximum score	points awarded	total
Part II.A	13.	12		
	14.	13		
	15.	11		
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/score rounded to the nearest **integer**	programba beírt **egész** pontszám/ **integer** score entered into the program
Part I		
Part II		

javító tanár/examiner jegyző/registrar

dátum/date dátum/date