

ÉRETTSÉGI VIZSGA • 2015. október 13.

**MATEMATIKA
ANGOL NYELVEN**

**KÖZÉPSZINTŰ
ÍRÁSBELI VIZSGA**

2015. október 13. 8:00

I.

Időtartam: 45 perc

| Pótlapok száma | |
|----------------|--|
| Tisztázati | |
| Piszkozati | |

**EMBERI ERŐFORRÁSOK
MINISZTERIUMA**

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. Solve the equation $x^2 - 4x - 21 = 0$ in the set of real numbers.

| | | |
|-------|----------|--|
| $x =$ | 2 points | |
|-------|----------|--|

2. The **exterior** angle at vertex A of triangle ABC is 104° , the **interior** angle at vertex B is 74° .
Give the degree measure of the **exterior** angle at vertex C . Explain your answer.

| | | |
|---|----------|--|
| | 2 points | |
| The measure of the exterior angle at vertex C is: | 1 point | |

3. The function $f(x) = 1 + \sin x$ is defined over the set of real numbers.
Give the range of this function.

| | | |
|------------|----------|--|
| The range: | 2 points | |
|------------|----------|--|

4. The following functions are defined over the set of positive numbers:

$$f(x) = -5x;$$

$$g(x) = 5\sqrt{x};$$

$$h(x) = \frac{5}{x};$$

$$i(x) = 5 - x.$$

Give the letter designating the function that describes inverse proportionality.

| | | |
|----------------|----------|--|
| The answer is: | 2 points | |
|----------------|----------|--|

5. The elements of set A are the positive divisors of 28, the elements of set B are the positive divisors of 49. Give sets $A \cap B$ and $B \setminus A$ by listing their elements. Show your work.

| | | |
|-------------------|---------|--|
| | 1 point | |
| $A \cap B =$ | 1 point | |
| $B \setminus A =$ | 1 point | |

6. Consider the set $\{2; 3; 5; 7; 11\}$. How many subsets of this set contain exactly two elements?

| | | |
|---|----------|--|
| The number of subsets containing two elements is: | 2 points | |
|---|----------|--|

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

A) $\sqrt{(-5)^2} = 5$

B) For all $x \in \mathbf{R}$ it is true that $\sqrt{x^2} = x$.

C) $2^{\frac{5}{2}} = \sqrt{32}$

| | | |
|----|----------|--|
| A) | 2 points | |
| B) | | |
| C) | | |

8. A number is greater than x by 2. The absolute value of this number is 6. Give all possible values of x .

| | | |
|-------|----------|--|
| $x =$ | 2 points | |
|-------|----------|--|

9. Determine the range, mean and standard deviation of the following set of data.

1; 1; 1; 1; 3; 3; 3; 5; 5; 7

| | | |
|-------------------------|----------|--|
| The range: | 1 point | |
| The mean: | 1 point | |
| The standard deviation: | 2 points | |

10. Out of the positive even numbers not greater than 50 one number is randomly selected. What is the probability that the selected number is divisible by 4? Explain your answer.

| | | |
|---------------------|----------|--|
| | 2 points | |
| The probability is: | 1 point | |

- 11.** VAT (value-added tax) increases the net price of clothing items by 27%. The sum of the net price and VAT is the gross price, this is the price to be paid by consumers at the time of purchase. We paid 6350 Ft for a pair of trousers.
How many forints of VAT are included in this price? Show your work.

| | | |
|---|----------|--|
| | 2 points | |
| The price of this pair of trousers contains Ft of VAT. | 1 point | |

- 12.** There were seven contestants at a school’s table tennis tournament. Every contestant plays every other contestant exactly once. So far, Anita has played all 6 of her games, Zsuzsa has played 2, Gabi, Szilvi, Kati and Orsi have played one game each.
How many games has Flóra, the seventh contestant, played so far?

| | | |
|--|----------|--|
| So far, Flóra played games. | 2 points | |
|--|----------|--|

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

_____ date

_____ examiner

| | elért pontszám egész számra kerekítve/ score rounded to the nearest integer | programba beírt egész pontszám/ integer score entered 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 if it does not continue with Part II.

**MATEMATIKA
ANGOL NYELVEN**

**KÖZÉPSZINTŰ
ÍRÁSBELI VIZSGA**

2015. október 13. 8:00

II.

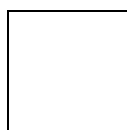
Időtartam: 135 perc

| | |
|----------------|--|
| Pótlapok száma | |
| Tisztázati | |
| Piszkozati | |

**EMBERI ERŐFORRÁSOK
MINISZTERIUMA**

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 points will be awarded for this.**
6. **Make sure that calculations of intermediate results are also possible to be followed.**
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. Three consecutive terms of an arithmetic progression are 32, a and 18, respectively.

a) Give the value of a and also the common difference of this progression.

Three consecutive terms of a geometric progression are 32, b and 18, respectively.

b) Give the value of b and also the common ratio (quotient) of this progression.

It is known about the numbers 32, c and 18, that their mean is 2 less than their median, and also that $32 > c > 18$ is true.

c) Give the value of c .

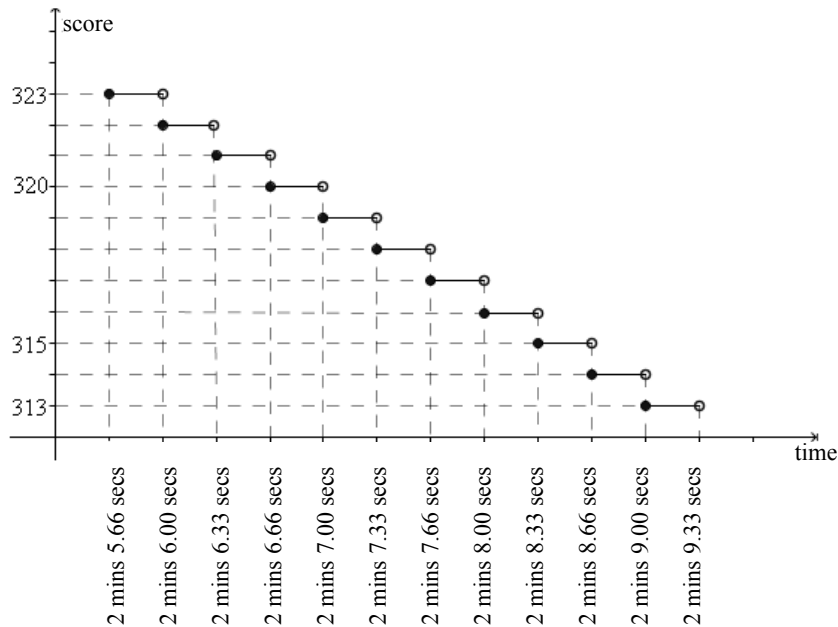
| | | |
|------------|-----------|--|
| a) | 3 points | |
| b) | 5 points | |
| c) | 5 points | |
| T.: | 13 points | |

14. There are 31 contestants competing at a pentathlon contest. The first event is fencing; here every contestant meets every other contestant for exactly one bout (match). 250 points are awarded to any contestant who wins 21 bouts. For each bout won beyond 21, another 7 points per bout are awarded on top of the first 250 points. If a contestant wins less than 21 bouts, as many times 7 points are taken away from the 250 as many wins are missing to make 21. (There is always a winner, fencing bouts do not end in draws.)

a) How many points were awarded to Péter, who lost 5 bouts?

b) Bence earned 215 points. How many times did he win?

The swimming event in pentathlon is a 200 m race. The graph below shows the amount of points awarded for certain finishing time intervals.



c) Mark the correct answer for each of the following two questions:

How many points did Robi get, whose finishing time was 2 minutes 6.28 seconds?

- A:** 320 **B:** 321 **C:** 322 **D:** 323

Péter got 317 points. Which of the following time results is Péter's?

- A:** 2 mins 7.00 secs **B:** 2 mins 7.60 secs **C:** 2 mins 7.80 secs **D:** 2 mins 8.00 secs

During horse riding, contestants jump across twelve different obstacles. Obstacles are placed into three categories according to difficulty: *A*, *B* or *C*. While warming up before the event, Ádám jumped across the five obstacles of category *A* first, then the four obstacles of category *B*, and finally the three obstacles of category *C*, jumping across each of these obstacles exactly once. During the warm-up, the order of jumping across obstacles within the same category is chosen freely by the contestant.

- d)** Calculate the number of possible orders at which Ádám can jump across the twelve obstacles during warm-up.

| | | |
|------------|-----------|--|
| a) | 3 points | |
| b) | 3 points | |
| c) | 2 points | |
| d) | 4 points | |
| T.: | 12 points | |

15. Leg AC of the right triangle ABC is 6 cm, leg BC is 8 cm long.

a) Calculate the measure of each acute angle of triangle ABC .

Leg DE of the right triangle DEF is 7 cm shorter than leg DF . The hypotenuse is 2 cm longer than leg DF .

b) Calculate the length of each side of triangle DEF .

| | | |
|------------|-----------|--|
| a) | 3 points | |
| b) | 8 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 3.

16. The angle between vectors \vec{AB} and \vec{AC} is 120° and both vectors are 5 units long.

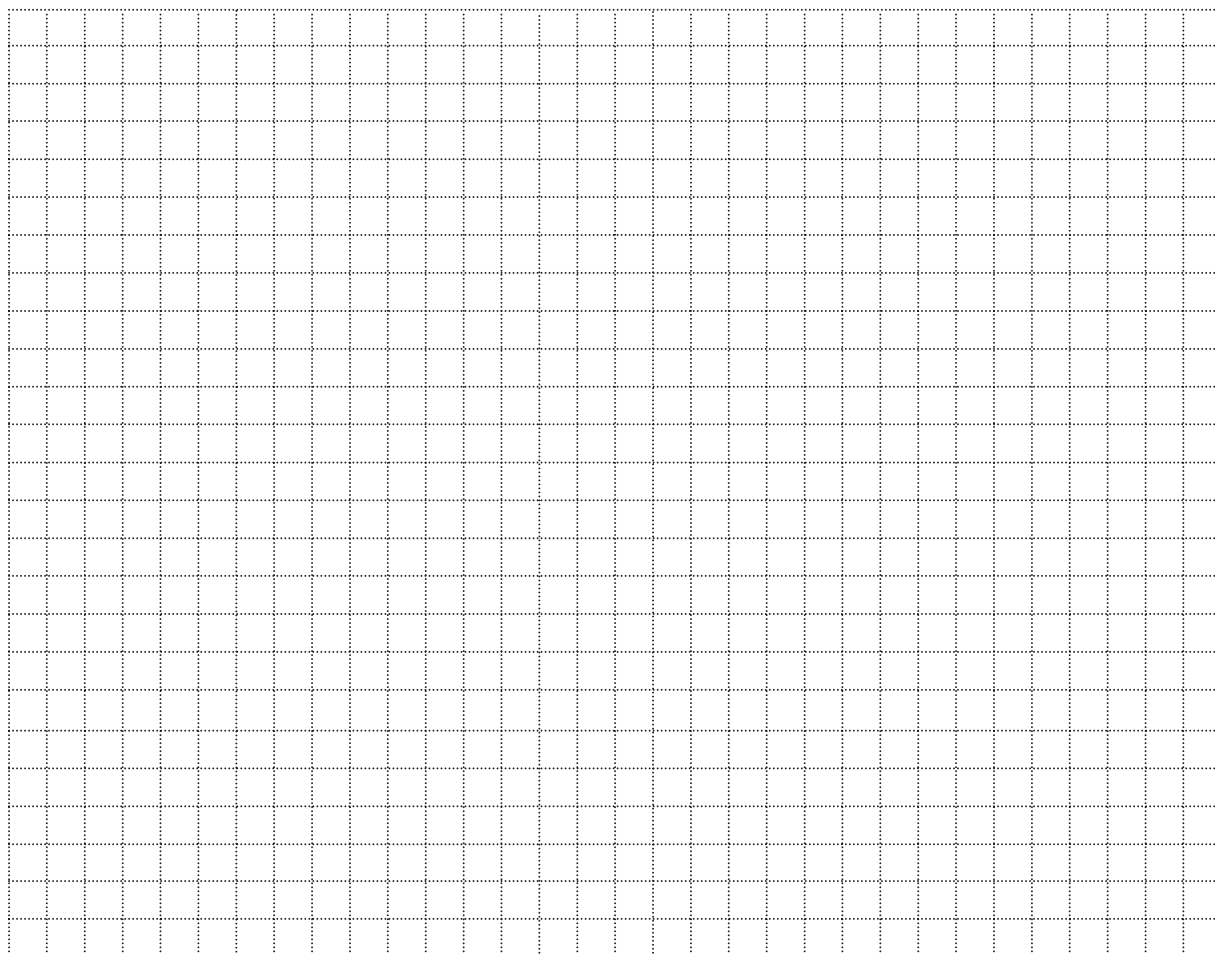
a) Calculate the length of vector $\vec{AB} + \vec{AC}$.

b) Calculate the length of vector $\vec{AB} - \vec{AC}$.

The centre of rhombus $PRST$ is the point $K(4; -3)$, one of its vertices is $T(7; 1)$.
The length of diagonal RT is half of the length of diagonal PS .

c) Give the coordinates of vertices P , R and S .

| | | |
|------------|-----------|--|
| a) | 3 points | |
| b) | 4 points | |
| c) | 10 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.** A study, made at the end of 2014, predicts that the number t of tigers living in India (at the end of each consecutive year) will approximately follow the formula $t(x) = 3600 \cdot 0.854^x$, where x refers to the number of years passed since 2014.

a) Based on the above prediction, calculate the percentage loss in the number of tigers by the end of the year 2016, as compared to the number at the end of 2014.

b) In which year is the number of tigers expected to drop below 900?

To promote the survival of tigers, a zoo starts a preservation program. They have bought 4 male and 5 female tiger cubs, which they would show in two holding pens, one smaller and one larger, following each of the four rules below:

- (I) no less than 3 tigers per holding pen;
- (II) the larger pen will hold more tigers than the smaller one;
- (III) both male and female tigers must be placed into each pen;
- (IV) in each holding pen, the number of male tigers must not be more than the number of females.

c) How many different ways are there to place the 9 tigers into the two holding pens? (All tigers are different, and two arrangements are considered different if there is at least one tiger that is placed into one holding pen in one of the arrangements and into the other pen in the other arrangement.)

| | | |
|------------|-----------|--|
| 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.

- 18.** A plastic products factory manufactures flower boxes for a flower farm. The shape of each box is a regular hexagonal truncated pyramid, open from above (see picture). The base of the truncated pyramid is a regular hexagon with 13 cm sides, the top is a regular hexagon with 7 cm sides, the lateral edges are 8 cm long.



- a)** A molding machine can make a plastic sheet of 0.93 m^2 area from 1 kg plastic granulate, such that the thickness of the plastic sheet is equal to the required thickness of the flower box. Calculate the number of boxes that could be produced using 1 kg of plastic granulate.

Some of the many flower bulbs on this farm will never spring into flowers. The probability of a bulb springing into flower is only 0.91.

- b)** Calculate the probability that out of 10 bulbs at least 8 will spring into flowers. Round your answer to three decimal places.

| | | |
|------------|-----------|--|
| a) | 11 points | |
| b) | 6 points | |
| T.: | 17 points | |

| | number of problem | maximum score | points awarded | total |
|--------------|-------------------|---------------|------------------------|-------|
| Part II.A | 13. | 13 | | |
| | 14. | 12 | | |
| | 15. | 11 | | |
| Part II.B | | 17 | | |
| | | 17 | | |
| | | | ← problem not selected | |
| TOTAL | | 70 | | |

| | maximum score | points awarded |
|-------------------------------------|---------------|----------------|
| Part I | 30 | |
| Part II | 70 | |
| 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 /I. rész | | |
| Part II /II. rész | | |

_____ javító tanár/examiner

_____ jegyző/registrar

_____ dátum/date

_____ dátum/date