ÉRETTSÉGI VIZSGA ● 2008. május 6.

MATEMATIKA ANGOL NYELVEN

KÖZÉPSZINTŰ ÍRÁSBELI ÉRETTSÉGI VIZSGA

JAVÍTÁSI-ÉRTÉKELÉSI ÚTMUTATÓ

OKTATÁSI ÉS KULTURÁLIS MINISZTÉRIUM

Important Information

Formal requirements:

1. The papers must be assessed in **pen and of different colour** than the one used by the candidates. Errors and flaws should be indicated according to ordinary teaching practice.
2. The first one among the shaded rectangles next to each question contains the maximal score for that question. The **score** given by the examiner should be entered into the other **rectangle**.
3. **In case of correct solutions**, it is enough to enter the maximal score into the corresponding rectangle.
4. In case of faulty or incomplete solutions, please indicate the corresponding partial scores within the body of the paper.
5. Nothing, apart from the diagrams, can be evaluated if written in pencil.

Substantial requirements:

1. In case of some problems there are more than one marking schemes given. However, if you happen to come across with some **solution different** from those outlined here, please identify the parts equivalent to those in the solution provided here and do your marking accordingly.
2. The scores in this assessment **can be split further**. Keep in mind, however, that the number of points awarded for any item can be an integer number only.
3. In case of a correct answer and a valid argument the maximal score can be awarded even if the actual solution is **less detailed** than that in this booklet.
4. If there is a **calculation error** or any other flaw in the solution, then the score should be deducted for the actual item only where the error has occured. If the candidate is going on working with the faulty intermediate result and the problem has not suffered substantial damage due to the error, then the subsequent partial scores should be awarded.
5. If there is a **fatal error** within an item (these are separated by double lines in this booklet), then even formally correct steps should not be given any points, whatsoever. However, if the wrong result obtained by the invalid argument is used correctly throughout the subsequent steps, the candidate should be given the maximal score for the remaing parts, unless the problem has been changed essentially due to the error.
6. If an **additional remark** or a **measuring unit** occurs in brackets in this booklet, the solution is complete even if the candidate does not mention it.
7. If there are more than one correct attempts to solve a problem, it is the **one indicated by the candidate that can be marked**.
8. You should **not give any bonus points** (points beyond the maximal score for a solution or for some part of the solution).
9. You should not reduce the score for erroneous calculations or steps unless its results are actually used by the candidate in the course of the solution.
10. **There are only 2 questions to be marked out of the 3 in part II/B of this exam paper.** Hopefully, the candidate has entered the number of the question not to be marked in the square provided for this. Accordingly, this question should not be assessed even if there is some kind of solution contained in the paper. Should there be any ambiguity about the student's request with respect to the question not to be considered, it is the last one in this problem set, by default, that should not be marked.

I.

1.		
The possible values of *x* are: 1; 4; 7.	2 points	*These 2 points cannot be split.*
Total:	**2 points**	

2.		
The obtuse angle is 135 °.	2 points	*−45° as an answer is worth 0 points.. If, apart from 135°, some kind of period is also indicated then 1 point should be given.*
Total:	**2 points**	

3.		
a) 8	1 point	
b) 10	1 point	
c) 34	1 point	
Total :	**3 points**	

4.		
$x = -6$.	1 point	
The minimum value is 0.	1 point	
Total:	**2 points**	

5.		
The correct answer is b)	2 points	
Total:	**2 points**	

6.		
At least 17 students are 168 cm tall or below. or : at least 17 students are 168 cm tall or beyond.	2 points	*The 2 points may be given if the concept of median is used correctly in any possible way. If a candidate assumes that there is exactly one student int he line whose height is 168 cm, then 1 point can be given only.*
Answer : no, this is not possible.	1 point	
Total:	**3 points**	

7.		
$a - 2\sqrt{ab} + b$	2 points	$(\sqrt{a})^2 - 2\sqrt{a}\sqrt{b} + (\sqrt{b})^2$ *is worth 1 point only, but* $a - 2\sqrt{a} \cdot \sqrt{b} + b$ *should be accepted.*
Total:	**2 points**	

8.		
$\overrightarrow{DF} = \dfrac{1}{2}\,\mathbf{b}$	1 point	*This point is due if the answer is correct.*
$\overrightarrow{AF} = \mathbf{a} + \dfrac{1}{2}\,\mathbf{b}$	1 point	
Total:	**2 points**	

9.		
2.5 is 1% of the total score.	1 point	*These 2 points should be given for any kind of correct reasoning.*
8·2,5=20	1 point	
The males got 20 points more.	1 point	
Total:	**3 points**	

10.		
A) false B) true C) true D) false	4 points	
Total:	**4 points**	

11.		
The following should be clearly indicated on the diagram: the degree of the vertex *A* is 4,	1 point	
the degree of any other vertex is 3,	1 point	
the vertices *E* and *D* are not connected.	1 point	
Total:	**3 points**	

| **12.**		
When cutting one gets 40 pieces of matting and	1 point	
the stacked pieces arrive to the height of 60 (=40·1.5) cm.	1 point	
Total:	**2 points**	*If the reasoning is correct but the units are messed up, then at most 1 point may be given.*

II/A

13. a)

The weekly output forms an arithmetic progression defined by $a_1 = 200$, $d = 3$.	1 point	*This point should be given even if this idea is implicitly present only in the use of the correct formulas.*
There were $a_{15} = 200 + 14 \cdot 3 = 242$ items produced on the 15th week.	2 points	
Total:	**3 points**	

13. b)

$S_{52} = \dfrac{a_1 + a_{52}}{2} \cdot 52$ is the output in question.	2 points	*This 2 points should be given even if this idea is implicitly present only in the use of the correct formulas*
$S_{52} = \dfrac{200 + 200 + 153}{2} \cdot 52$	1 point	
14 378 products are made during the whole year.	1 point	
Total:	**4 points**	

13. c)

The doubled figure is: 400.	1 point	
$400 \leq 200 + (n-1) \cdot 3$	1 point	*The 3 points are due even if the candidate writes down an equation here.*
$n \geq 67\dfrac{2}{3}$	2 points	
After the 68th week.	1 point	*This point cannot be given if the answer is $67\dfrac{2}{3}$.*
Total:	**5 points**	

14.
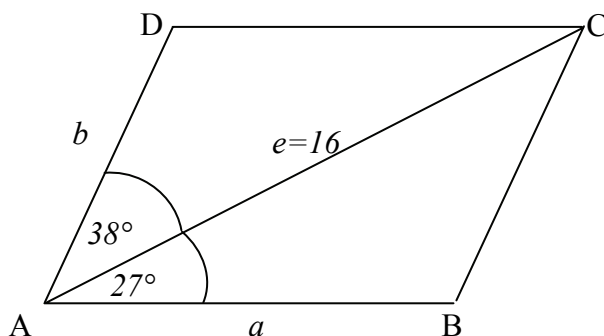
One angle of the parallelogram is 65° and the other one is 115°.	2 points	
The sides are computed by using the sine rule in the triangle *ACD.*.	1 point	*This point should be given if this idea is clear from the solution.*
$\dfrac{a}{e} = \dfrac{\sin 38°}{\sin 115°}$	2 points	
$a = 16 \cdot \dfrac{\sin 38°}{\sin 115°} \approx 11$	1 point	
$b = 16 \cdot \dfrac{\sin 27°}{\sin 115°} \approx 8$	3 points	
$k = 38$ cm	1 point	
$t = ab \cdot \sin 65° \approx 8 \cdot 11 \cdot \sin 65° \approx 80$ cm^2	2 points	*79 cm² (due to the order of roundings) may also be accepted.*
Total:	**12 points**	

In case of erroneous rounding the total score should be reduced by 1 point.

15. a)

Six (or five) candidates have to be chosen out of eleven students in every possible way and their order is not considered.	1 point	*This 1 point should be given if this idea is clear from the calculations..*
$\binom{11}{6}=\binom{11}{5}$	1 point	*Any form is worth 1 point.*
There are 462 ways to choose the first group.	1 point	
Total:	**3 points**	

15. b)

No,	1 point	
Because there are 6! = 720 orders of the six presentations.	1 point	
Total:	**2 points**	

15. c)

There are 12 ones not about modern Hungarian literature among the topics.	1 point	
There are 12 favourable ones out of the 20 equally probable outcomes.	1 point	
According to the classical model the given probability is $p=\dfrac{12}{20}\left(=0.6\right)$.	1 point	
Total:	**3 points**	*If the answer is correct but there is no explanation, then at most 2 points can be given.*

15. d)

There were 6 questions drawn in the first group and 1 more in the second one so the second student is to draw out of 13 questions.	2 points	
There are 7 of the topics left about modern hungarian literature, leaving 7 favourable outcomes	1 point	
According to the classical model the given probability $p=\dfrac{7}{13}\left(\approx 0.54\right)$.	1 point	
Total:	**4 points**	*If the answer is correct but there is no explanation, then at most 2 points can be given.*

II/B

16. a)

The common points of k and f can be obtained by solving the system formed by their respective equations.	1 point	*This point should be given if this idea is appearing in the solution.*
Substituting y yields $3{,}25x^2 + 26x + 52 = 0$	2 points	
$x_{1,2} = -4$	1 point	
The only common point of k and f is $F (-4, -1)$.	1 point	
Total:	**5 points**	
If, instead of calculation, the coordinates of the common point are deduced from a clear diagram then 1 point may be given out of this 5.		

16. b)

The coordinates of E are obtained by solving the system formed by the equations of e and the line c perpendicular from C to e.	1 point	*This point should be given if this idea is clear from the solution.*

$\mathbf{n}_c$ (2;3)	1 point	
The equation of c is $2x + 3y = -11$	1 point	
$e \cap c = E(-1; -3)$	2 points	
The radius of the circle is the segment CE: $r^2 = 13$.	1 point	
The equation of the circle k' is $(x - 2)^2 + (y + 5)^2 = 13$.	1 point	
Total:	**7 points**	

If, instead of calculation, the coordinates of the point of tangency are deduced from a clear diagram then 2 points may be given out of the first 5.

16. c)

Completing the square in the equation of k: $(x–2)^2+(y+5)^2–52=0$,	2 point	*These 2 points cannot be split.*
therefore the centre of k is $K(2,-5)$, its radius is $R=\sqrt{52}$.	1 point	
k and k' are concentric circles,	1 point	
$R=2r$ (since $2\sqrt{13} = \sqrt{52}$), therefore k is the enlargement of k' from the point C by 2.	1 point	
Total:	**5 points**	

17. a)

Let's check for the rules of rounding:				
	1980	**2000**	3 points	*1-1 point should be given for every correct line.*
Debrecen	correct	correct		
Győr	wrong	correct		
Pécs	wrong	wrong		
		Total:	**3 points**	

17. b)

The 1980 mean is $153\,671 \approx 153\,700$, and the 2000 mean is $148\,014 \approx 148\,000$	2 points	*These 2 points should be given even if the result is not rounded to the nearest hundreds.*
$\dfrac{148\,000}{153\,700}$ or $\dfrac{148\,014}{153\,671} \approx 0{,}963$	2 points	
therefore, the mean population has decreased by 3,7%.	1 point	
Total:	**5 points**	

17. c)

The measure and the nature of the changes are included in the table below:

	Proportion of the change	Percentage of the change
Debrecen	*1,027*	2,7% growth
Győr	1,024	2,4% growth
Miskolc	0,828	17,2% decrement
Nyíregyháza	1,039	3,9% growth
Pécs	0,930	7,0% decrement
Szeged	0,962	3,8% decrement
Székesfehérvár	1,014	1,4% growth

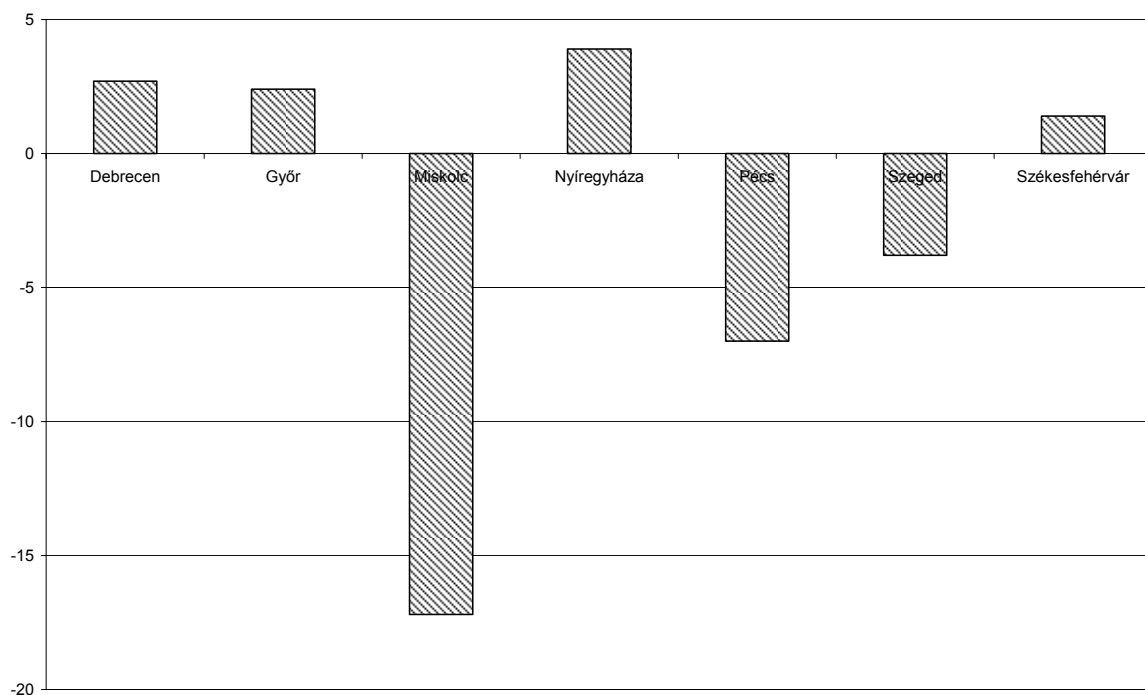|		
2 points for each column.	4 points	*1 points for at most two errors per column.*
According to the proportion change Nyíregyháza has developed the most.	1 point	
It is the population of Miskolc that has changed the most.	1 point	
Total:	**6 points**	

17. d)

Appropriate scaling.	1 point	*This point may not be given if the unit is not indicated.*
Correct chart.	2 points	*1 point may be given if there are at most two wrong bars.*
Total:	**3 points**	

18. a)

$t = 0$; $m(0)$ is to be found.	2 points	*This 2 points should be given if this idea is clear from the calculation.*
$m(0) = 0{,}8$ (in milligramms) is the mass of the population at the beginning of the observation.	1 point	
Total:	**3 points**	

18. b)

After the first 24 hours the mass of the population is $m(24) = 0{,}8 \cdot 10^{0,48} =$	1 point	
$= 2{,}4$ (mg)	1 point	
The mass of the population after 48 hours is $m(48) = 0{,}8 \cdot 10^{0,96} =$	2 points	
$= 7{,}3$ (mg)	1 point	
The increment of mass in the second 24 hours is $7{,}3 - 2{,}4 = 4{,}9$ (mg).	2 points	
Total:	**7 points**	

18. c)

The equation $12{,}68 = 0{,}8 \cdot 10^{0,02t}$ should be solved.	2 points	*This 2 points should be given if this idea appears in the calculation only.*
$15{,}85 = 10^{0,02t}$	1 point	
$\lg 15{,}85 = 0{,}02t$	2 points	
$t = 60$ (hours),	1 point	
therefore, the experiment had to be stopped on the third day of the observation.	1 point	
Total:	**7 points**	