ÉRETTSÉGI VIZSGA • 2005. május 28.

MATEMATIKA
ANGOL NYELVEN
MATHEMATICS

KÖZÉPSZINTŰ
ÉRETTSÉGI VIZSGA
STANDARD LEVEL
FINAL EXAMINATION

Az írásbeli vizsga időtartama: 180 perc
Time allowed for the examination: 180 minutes

JAVÍTÁSI-ÉRTÉKELÉSI
ÚTMUTATÓ
MARKSCHEME

OKTATÁSI MINISZTÉRIUM
MINISTRY OF EDUCATION

Instructions to examiners

Formal requirements:

- Mark the paper in **ink, different in colour** from the one used by the candidate. Indicate the errors, incomplete solutions, etc. in the conventional way.
- The first one of the rectangles under each problem shows the maximum attainable score on that problem. The **points** given by the examiner are to be entered **in the rectangle** next to that.
- **If the solution is perfect,** it is enough to enter the maximum scores in the appropriate rectangles.
- If the solution is incomplete or incorrect, please indicate the individual **subtotals** on the paper, too.

Assessment of content:

- The markscheme contains more than one solution for some of the problems. If the solution by the candidate is different, allocate the points by identifying the parts of the solution equivalent to those of the one given in the markscheme.
- The subtotals in the markscheme can be **further divided**, but the scores awarded should always be whole numbers.
- If it is clear that the reasoning and the final answer are both correct, you may award the maximum score even if the solution is **less detailed** than the one in the markscheme.
- If there is a **calculation error** or inaccuracy in the solution, only take off the points for that part where the error is made. If the reasoning remains correct and the error is carried forward, the points for the rest of the solution should be awarded.
- **In the case of a principal error,** no points should be awarded at all for that section of the solution, not even for steps that are formally correct. (These logical sections of the solutions are separated by double lines in the markscheme.) However, if the wrong information obtained owing to the principal error is carried forward to the next section or in the next part of the problem and used correctly, the maximum score is due for the next part.
- Where the markscheme shows a **unit** in brackets, the solution should be considered complete without that unit as well.
- If there are more than one different approaches to a problem, **assess only one** of them (the one that is worth the largest number of points).
- **Do not give extra points** (i.e. more than the score due for the problem or part of problem).
- **Do not take off points** for steps or calculations that contain errors but are not actually used by the candidate in the solution of the problem.
- **Assess only two out of the three problems in part B of Paper II.** The candidate was requested to indicate in the appropriate square the number of the problem not to be assessed and counted in their total score. Should there be a solution to that problem, it does not need to be marked. However, if it is still not clear which problem the candidate does not want to be assessed, assume automatically that it is the last one in the question paper, and do not assess that problem.

I.

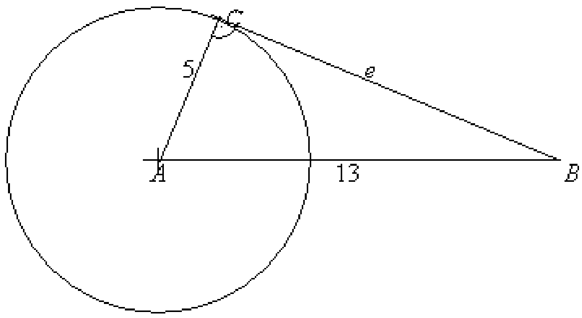
1.		
$x_1 = -7$.	1 point	
$x_2 = 7$.	1 point	
Total:	**2 points**	

2.		
The sale price of the coat is 36 000 Ft.	2 points	
Total:	**2 points**	

3.		
$A = 2 \cdot (15 \cdot 12 + 15 \cdot 8 + 8 \cdot 12) = 792$.	2 points	
The surface area of the cuboid: 792 cm^2.	1 point	*The point is only due if the unit is there.*
Total:	**3 points**	

4.		
$t = \frac{\alpha° \cdot r^2 \pi}{360°} = 12\pi \text{ cm}^2 \approx 37.7 \text{cm}^2$.	2 points	*Award the 2 points if the correct answer is stated in either form.*
Total:	**2 points**	

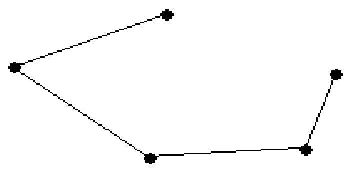
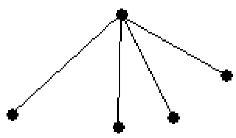
5.		
B	2 points	
Total:	**2 points**	

6.		
	1 point	*The point is due for the diagram if the right angle is also indicated. The 1 point should also be awarded if there is no diagram or the diagram is incomplete but it is clear from the solution that the relationship of tangent and radius is known.*
The Pythagorean theorem applied to the right-angled triangle *ABC* gives us: $e^2 = 13^2 - 5^2$.	1 point	*The 1 point is also due if no explanation is given.*
e = 12 cm.	1 point	
Total:	**3 points**	

7.		
B	2 points	
Total:	**2 points**	

8.		
$\frac{20}{80}$ or $\frac{1}{4}$ or 0.25 or 25%.	2 points	*Award the 2 points if the correct answer is stated in either form.*
Total:	**2 points**	

9.		
$\alpha_1 = 45°$.	1 point	
$\alpha_2 = 135°$.	1 point	
Total:	**2 points**	*The 2 points are also due if the correct answers are given in radians.* *If a period appears then 1 point should be given*

10. E.g.		
 or 	2 points	*2 points for any correct solution. Do not give partial credit.*
Total:	**2 points**	

11.		
$V = r^2 \cdot \pi \cdot m = 10^2 \cdot \pi \cdot 14$.	2 points	*3 points are due for finding the volume of the pot correctly. If the diameter is substituted for the radius, award a maximum of 2 points out of the 3 points.*
$V \approx 4398\ \text{cm}^3$. (in case of $\pi \approx 3.14$ V=4396 cm^3)	1 point	
5 litres = 5000 cm^3, therefore the pot is not large enough for the soup.	1 point	*1 point should be given for any correct answer even in the absence of conversion.*
Total:	**4 points**	

12.		
a)		
$\lvert\underline{a}\rvert = 5$.	2 points	
Total:	**2 points**	
b)		

$(2;4)$.	2 points	*The 2 points are also due if the answer was obtained by a correct figure*
Total:	**2 points**	

II/A

13.		
a)		
$5\cdot(x-1)+4x=40$,	2 points	
hence $x = 5$.	2 points	
This is a solution of the original equation. /substitution or equivalence/	1 point	
Total:	**5 points**	

b)		
Domain: x > 1.	1 point*	
Using an identity of logarithms: $\lg 4(x-1)=2$.	2 points	*The 2+2 points are also due if there is no reference to the relationships applied.*
By the definition of logarithm: $4(x-1)=100$.	2 points	
$x = 26$.	1 point	
Checking.	1 point*	
Total:	**7 points**	

** Both points are due if the candidate checks the root by substitution or compares it with the correctly stated domain and refers correctly to the equivalence of transformations.*
If the domain is not correct but the root is checked by substitution 2 points should be given.
Award 1 point out of these 2 points if the domain is stated correctly but the root obtained is not compared with it.
Also award 1 point if the domain is examined and x = 26 is accepted based on that, but there is no reference to equivalent transformations.

14.		
a)		
The terms of the sequence are 6; 6 + d; 6 + 2d; 1623.	1 point	
6 + 3d = 1623.	1 point	
d = 539.	1 point	
The first number inserted: 545.	1 point	
The second number inserted: 1084.	1 point	
Total:	**5 points**	

b)		
The numbers satisfying the conditions: 8; 12; 16; … ; 1620.	2 points	
These numbers are consecutive terms of an arithmetic progression.	1point	
$1620=8+4\cdot(n-1)$.	1 point	
$n = 404$.	1 point	

$S_n = \frac{8+1620}{2} \cdot 404$.	1 point	
$S_n = 328\,856$.	1 point	
Total:	**7 points**	

15.		
a)		
15 metres.	1 point	
Total	**1 point**	

b)		
In the 30^{th} second, or in the 31^{st} second	2 points	*If more than one points of time are mentioned then no point can be given.*
Total:	**2 points**	

c)		
János.	2 points	
Total:	**2 points**	

d)		
The number of orders possible: $3 \cdot 3 \cdot 2 \cdot 1 = 18$.	3 points	*The 3 points are also due for a correct list of all the cases.*
Total:	**3 points**	

e)		
There are two cases to be investigated:	1 point	*The 1 point is also due if this is not stated but it is made clear by the solution.*
If the Dolphins finished in a tie for the first place, then the number of possible orders is $\binom{3}{1} \cdot 2 \cdot 1$;	1 point	
if the Dolphins did not finish in the first place, then the number of possible orders is $\binom{3}{2}$.	1 point	
The number of all possible orders is 9.	1 point	
Total:	**4 points**	*The 4 points are also due for a correct list of all the cases.* *If the list is not complete but more than half of the possible cases are found 1 point should be given.*

II/B

Out of problems 16 to 18, do not assess the one indicated by the candidate.

16.		
a)		
$49 + 49 + 14 - 14 - 47 \neq 0$.	1 point	
Thus the point does not lie on the circle.	1 point	
Total:	**2 points**	*The 2 points are also due if the answer based on a correct figure.*

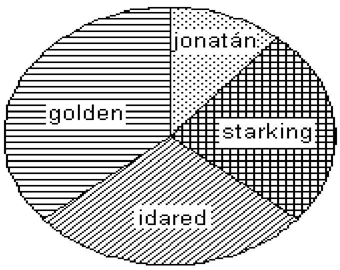
b)		
$(x+1)^2 + (y-1)^2 = 49$.	3 points	
$K\ (-1;\ 1)$.	1 point	
$r = 7$.	1 point	
Total:	**5 points**	

c)		
The third vertex of the triangle lies on the perpendicular bisector of the base.	1 point	*The point is also due if this is not stated but clearly implied by the solution.*
The midpoint of the side AB is $F\ (3.5;\ 3.5)$.	1 point	
A normal vector of the perpendicular bisector of the side AB: $\underline{n}\ (7;\ 7)$.	1 point	
The equation of the perpendicular bisector: $x + y = 7$.	1 point	
The third vertex of the triangle is obtained as the intersection of the circle and the perpendicular bisector: $\left.\begin{array}{l}(x+1)^2+(y-1)^2=49\\ y=7-x\end{array}\right\}$.	1 point	
$x^2 - 5x - 6 = 0$.	2 points	
$x_1 = 6$; $x_2 -1$.	1 point	
$y_1 = 1$; $y_2 = 8$.	1 point	
$C_1(6;\ 1)$ and $C_2(-1;\ 8)$.	1 point	*Can only be given if points A,B and C make a triangle indeed.*
Total:	**10 points**	

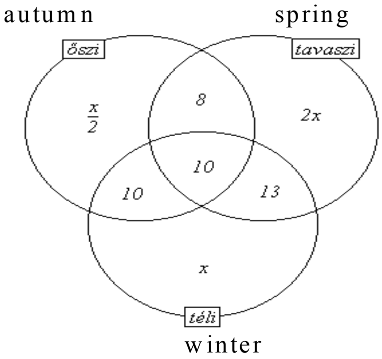
17.		
a)		
$\frac{120}{85} \approx 1.41$.	1 point	
Jonatan apples cost about 41% more.	1 point	
Total:	**2 points**	
b)		
$60 \cdot 120 + 150 \cdot 120 + 195 \cdot 85 + 135 \cdot 85 =$	1 point	

= 53 250 Ft.	1 point	
Total:	**2 points**	

c)		
The apples weigh 540 kg altogether.	1 point	
The average price is $\frac{53\,250}{540} =$	1 point	
≈ 98.6 Ft.	1 point	
Total:	**3 points**	

d)		
The central angles representing the quantities of the various kinds of apples: 60 kg: $\frac{60\cdot 360°}{540} = 40°$; 135 kg: 90°; 150 kg: 100°; 195 kg: 130°.	2 points	*1 point if only 2 or 3 of the calculations are correct. Differences caused by correct rounding can be accepted.*
	4 points	*If it is not made clear by the pie chart which sector represents which kind of apples, award only 2 points*
Total:	**6 points**	

e)		
The ratio of Jonatan and Idared apples that fell out: 1.25 : 1.	2 points	
The probability in question: $\frac{1.25}{2.25} = \frac{5}{9} \approx 0.56$.	2 points	
Total:	**4 points**	

18.		
		
a)		
8; 10; 10, 13 are written in the intersections.	4 points	
Total:	**4 points**	
b)		
The students who only played in the winter: x	1 point	*4 points are due altogether for stating the correct ratios, even if they are not written in the set diagram.*
2x students only played in the spring	1 point	
Then $\frac{x}{2}$ students only played in the autumn.	2 points	
The equation is $x+\frac{x}{2}+2x+10+10+13+8=188$.	2 points	
Hence: $x = 42$.	1 point	
Thus there are 42 students who only played in the winter.	1 point	
Total:	**8 points**	
c)		
There are $\binom{32}{5}$ ways to select 5 students out of the class A.	1 point	
There are $\binom{28}{5}$ ways to select 5 students out of the class B.	1 point	
The number of favourable cases: $\binom{32}{5}\cdot\binom{28}{5}$.	1 point	
The number of all cases: $\binom{60}{10}$.	1 point	
The probability in question: $\frac{\binom{32}{5}\cdot\binom{28}{5}}{\binom{60}{10}}\approx 0.26$.	1 point	*The point is also due if the rounded value is not calculated.*
Total:	**5 points**	