ÉRETTSÉGI VIZSGA ● 2005. október 25.

MATEMATIKA
ANGOL NYELVEN
MATHEMATICS

KÖZÉPSZINTŰ
ÉRETTSÉGI VIZSGA
STANDARD LEVEL
FINAL EXAMINATION

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.

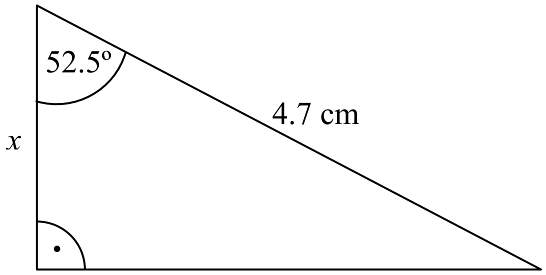
Assessment of content:

- The markscheme may contain 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.		
The numerator: $x(x - 3)$.	1 point	
The simplified form of the fraction: $x - 3$.	1 point	
Total:	**2 points**	*The 2 points are also due if the product form is not shown.*

2.		
The sum of the digits is not a multiple of three. (0 does not change the sum.)	1 point	
Peter's friend cannot be right..	1 point	
Total:	**2 points**	

3.		
 Diagram showing the data.	1 point	
$x = 4.7 \cdot \cos 52.5° = 2.861$	1 point	
The rounded value of the length of the leg is 2.9 cm.	1 point	*Only due if the rounding is correct.*
Total:	**3 points**	

4.		
B	2 points	
Total:	**2 points**	

5.		
$5x + 8y = -10 + 56$	1 point	*For using an appropriate form of the equation.*
$5x + 8y = 46$	1 point	*For correct substitution.*
Total:	**2 points**	*Award the 2 points if the correct result is stated only.*

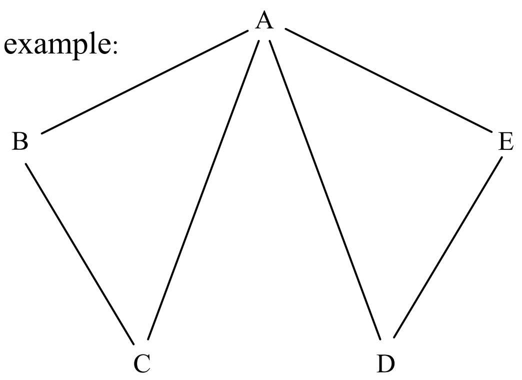
6.		
$\left(\frac{y}{x}\right)^2 = \frac{y^2}{x^2} = \frac{1}{\frac{x^2}{y^2}} = \frac{1}{\left(\frac{x}{y}\right)^2}$	2 points	*Any of these forms is acceptable. The 2 points should not be divided.*
Total:	**2 points**	

7.		
$6 - b_1 = 11$	1 point	
$4 - b_2 = 5$	1 point	
$\underline{\boldsymbol{b}}\,(-5; -1)$	1 point	
Total:	**3 points**	*Award the 3 points if* $\underline{\boldsymbol{b}}$ *is correct.*

8.		
For knowing that the inequality $10 - x > 0$ has to be true.	1 point	*Award the 2 points for the correct answer without stating this.*
$x < 10$	1 point	
Total:	**2 points**	*Full mark for the correct answer. Award a maximum of 1 point if the candidate allows x = 10, too.*

9.

For example:



A diagram showing five points, including a fourth-degree point.	1 point	
Exactly four second-degree points are shown.	2 points	
Total:	**3 points**	*For a correct diagram without explanation, award the 3 points.*

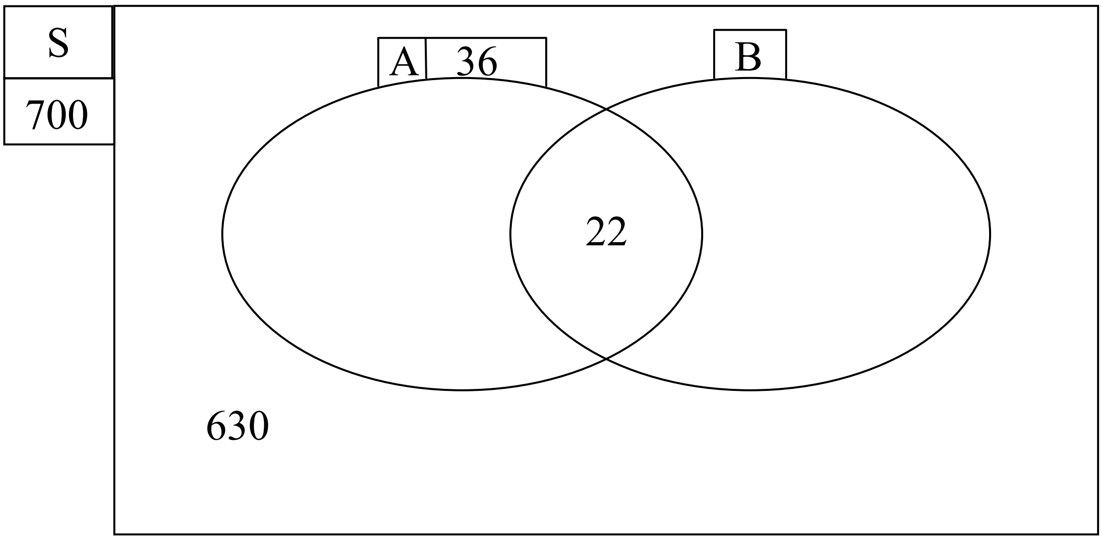
10.		
A: false	1 point	
B: true	1 point	
C: false	1 point	
Total:	**3 points**	

11.		
The class A is fixed for the first dance. The remaining four dances have 4! possible orders.	2 points	*Listing all cases is also acceptable as an explanation.*
There are 24 different orders possible.	1 point	
Total:	**3 points**	*Award 1 point if the answer is 5!.*

12.		
a) $2 \le x \le 6$	2 points	*Award a maximum of 1 point if one of the endpoints is wrong. Only 1 point is due if equality is not included. Award 1 point for the answer* $4 \le x \le 12$.
b) The largest value of $f(x)$ is 3 (or $y = 3$).	1 point	*Award the 1 point for the answer y = 6 if the unit was read incorrectly above.*
Total:	**3 points**	

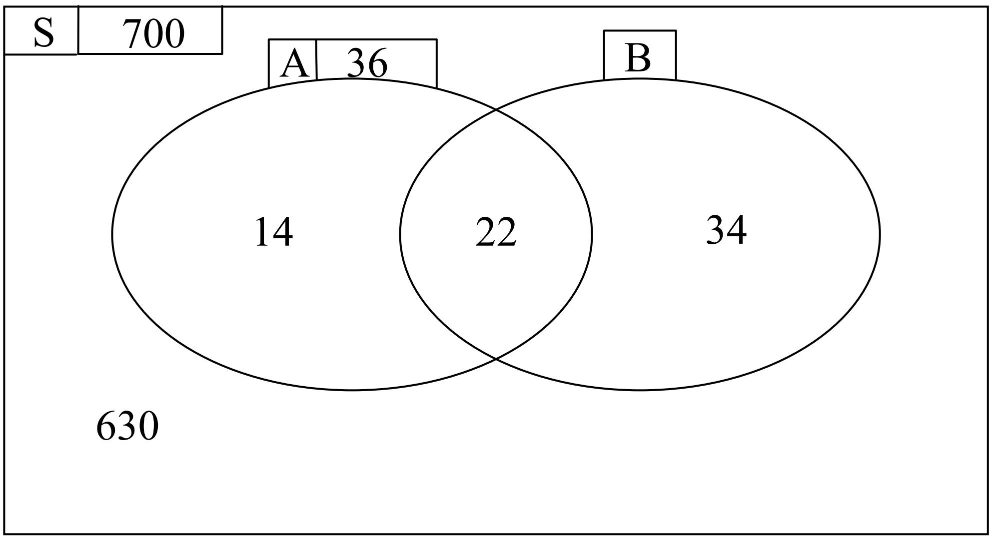
II/A

13. a)



A set diagram of the correct structure.	2 points	
The data shown correctly in the diagram.	2 points	
Total:	**4 points**	*Award a maximum of 2 points if the diagram only shows the students doing sports.*

13. b)



22 of the 36 athletes also play basketball, thus there are 14 who only do athletics.	1 point	
70 students are doing sports altogether, so there are 34 who only do basketball.	2 points	
22 + 34 = 56 students play basketball.	1 point	
Total:	**4 points**	*The 4 points are due for either a verbal reasoning or the use of the diagram.*

13. c)		
The classical model can be applied,* we are selecting from 50 basketball players. (These are all the cases.)	1 point	** The 1 point is also due if this observation is not stated.*
17 of them also do athletics. (These are the favourable cases.)	1 point	
The probability in question is $\frac{17}{50}$ (= 0.34)	2 points	
Total:	**4 points**	*2 points for just stating the correct answer, 4 points if there is any correct explanation.*

14.		
Let n be the number of rows.	1 point*	*The asterisked points are also due if the reasoning is made clear by the correct use of the formulae only.*
The numbers of seats in the individual rows are consecutive terms of an arithmetic progression with a common difference of $d = 2$.	1 point*	
$a_1 = 20$	1 point*	
The nth term (the number of seats in the first row) is $a_n = 20 + (n - 1)\cdot 2$.	1 point*	
There are $S_n = \frac{n}{2}\cdot(a_1 + a_n)$ seats altogether.	1 point*	
$510 = \frac{n}{2}\cdot(20 + 20 + (n-1)\cdot 2)$	2 points	
$2n^2 + 38n - 1020 = 0$	2 points	
$n_1 = 15$ and $n_2 = -34$	1 point*	**Both points are due if the candidate only states that n_2 is negative and thus it is not a solution.*
n_2 is not a solution.	1 point*	
There are 15 rows of seats in the auditorium.	1 point	
		5 points if the answer $n = 15$ is obtained by adding the terms one by one, 2 more points for stating that there is no other solution.
Total:	**12 points**	

15. a)

m(g)	33	34	35	36	37	38	39	40
frequency	2	0	4	4	6	2	0	1

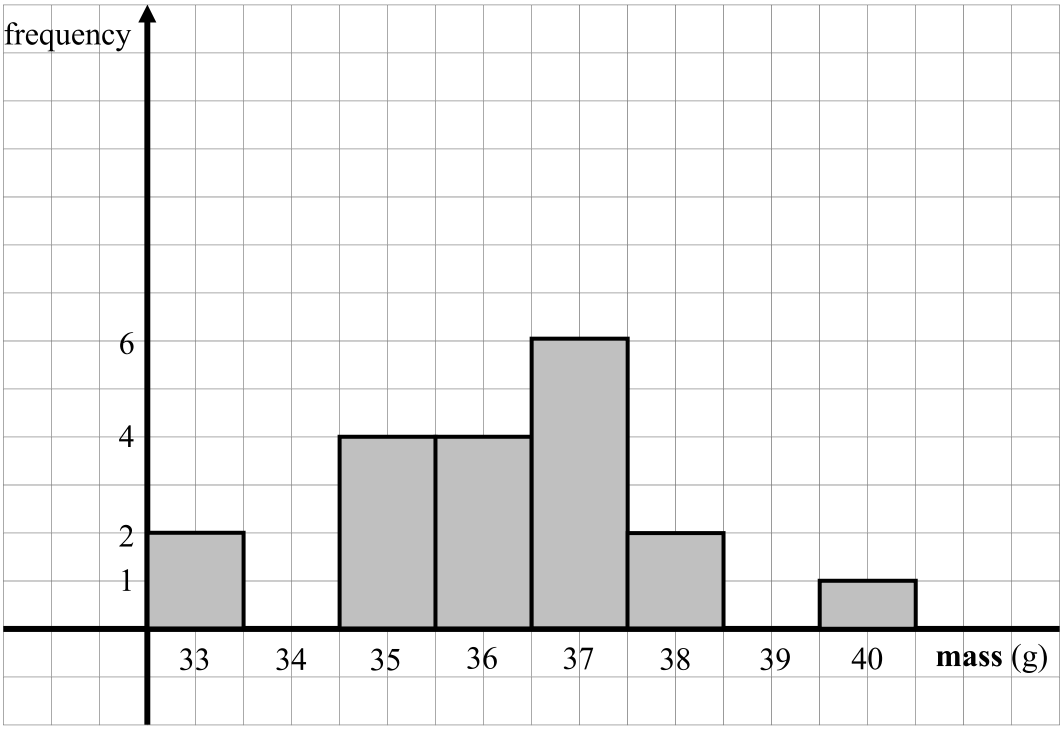
3 points — *2 points for 1 or 2 wrong pairs of data, 0 points if the number of errors is more than that. The data of 0 frequency do not need to be shown.*

Total: 3 points

15. b)		
$\overline{m} = \frac{2\cdot 33 + 4\cdot 35 + 4\cdot 36 + 6\cdot 37 + 2\cdot 38 + 40}{19} =$	1 point*	
$= 36.21$	1 point	
$36.21 \approx 36$ grams	1 point	*The 1 point for rounding is also due if no unit is stated.*
Total:	**3 points**	
**The point is also due if the fraction is not shown but the correct result is obtained by calculator.*		

15. c)		
Median: 36	1 point	
Mode: 37	1 point	
Total:	**2 points**	

15. d)



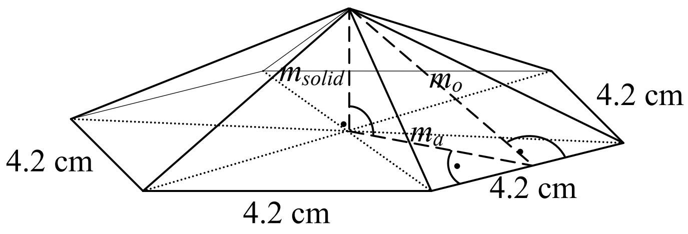
Total:	**4 points**	*Award the 4 points for a diagram obtained correctly from the wrong table. Take off 1 point if no scale is shown on the axes and also 1 point if the axes are not labelled correctly.*

II/B

16. a)		
Applying the definition of logarithm: $\sqrt{x+1}+1 = 3^2$.	2 points	*The 2 points are also due if there is no verbal explanation.*
$\sqrt{x+1} = 8$	1 point	
$x + 1 = 64$	1 point	
$x = 63$	1 point	
Checking.	1 point	
Total:	**6 points**	

16. b)		
With the substitution of $\cos^2 x = 1 - \sin^2 x$,	1 point	*The 2 points are due for the correct substitution.*
$2 - 2\sin^2 x + 5\sin x - 4 = 0$.	1 point	
With the new variable $\sin x = z$, $2z^2 - 5z + 2 = 0$.	1 point	*The 1 point is also due if there is no new variable.*
$z_1 = 2$ and $z_2 = \frac{1}{2}$.	2 points	
$z = 2$ is not a solution since $\lvert \sin x \rvert \le 1$.	1 point	
$x = \frac{1}{6}\pi + k \cdot 2\pi$, or $x = \frac{5}{6}\pi + k \cdot 2\pi$,	3 points*	*Award a maximum of 2 points if periodicity is not considered. The solution is also acceptable in degrees. Award a maximum of 2 points if the measures of the angle are used inconsistently.*
$k \in \mathbf{Z}$	1 point	
Checking or stating that these are solutions since the transformations have been equivalent.	1 point	
Total:	**11 points**	
**1 point for $x = \frac{1}{6}\pi$, 1 point for $x = \frac{5}{6}\pi$, 1 point for the period.*		

17.



17. a)

$V=\frac{1}{3}T_{hexagon}\cdot m=\frac{1}{3}\cdot 6\cdot T_{triangle}\cdot m$	1 point	*The points are also due if the reasoning is made clear by the correct use of the formulae only. Take off 1 point if the answer is given in mm³.*
m = 25 mm = 2.5 cm	1 point	
The pyramid contains V = 38.19 cm³ ≈ 38.2 cm³ of wood.	2 points	
Total:	**4 points**	

17. b)

The area of the lateral surface is $T_{lateral} = 6T_{lateral\ face} = 3am_o$	1 point	
$m_o^2 = m_a^2 + m_{solid}^2$	2 points	
$m_a=\sqrt{4.2^2-2.1^2}$ *or* $m_a=\frac{4.2}{2}\cdot\sqrt{3}$	2 points	
m_a = 3.64 cm	1 point	
m_o = 4.41 cm	1 point	
$T_{lateral}$ = 55.6 cm², this is the surface area painted.	1 point	
Total:	**8 points**	

17. c)

Six colours can be painted in 6! different orders.	1 point	
Since the pyramid has rotational symmetry, the number of colourings is 5! = 120.	2 points	
Total:	**3 points**	

17. d)

The ten times magnified version contains 10^3 = 1000 times as much wood.	2 points	*1 point for an answer without explanation.*
Total:	**2 points**	

18. a)		
They paid $h = 1.12(240 + 39 \cdot 19.8 + 24 \cdot 10.2) = 1407.84$	2 points	*Award a maximum of 1 point if tax is not considered.*
≈ 1408 forints.	1 point	
Total:	**3 points**	

18. b)		
$F = 1.12(240 + 19.8x + 10.2y)$	3 points	*Award a maximum of 1 point if tax is not considered or the flat fee is missing.*
Total:	**3 points**	

18. c)		
$5456 = 1.12(240 + 19.8x + 10.2y)$	2 points	*The 4 points are due for a correct equation in terms of a single unknown, too.*
$x = 2y$	2 points	
$4871.43 = 240 + 39.6y + 10.2y$	1 point	
$4631.43 = 49.8y$	1 point	
$y = 93$	1 point	
Their consumption was 186 kWh at the normal rate, and 93 kWh at the reduced rate.	1 point	
Total:	**8 points**	

18. d)		
$19.8x = 10.2y$	1 point	
The ratio in question is $\frac{x}{y} = \frac{10.2}{19.8} \approx 0.515$.	2 points	*The 2 points are also due if no approximate value is given.*
Total:	**3 points**	