Advanced Level Practice Set - 2026 (March 2026)

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From 2005, the Hungarian school-leaving exam (érettségi) in mathematics can be taken at two levels: standard level and advanced level. The advanced-level exam also serves as the university entrance exam in mathematics.
The written part of the advanced-level exam takes 240 minutes. Part I consists of 4 problems worth 51 points in all. Part II consists of 5 problems worth 16 points each, of which students choose and solve 4, for 64 points. So there is a total of 115 points possible.
This problem set is similar to such an exam. We advise the reader to work through the problem set while measuring the time. There are 240 minutes to solve and present the problems.

Part I

1. a) Solve the following system of equations over the set of pairs of real numbers.

$$\begin{aligned} \frac{5}{x+y}+\frac{4}{x-2y} &= \frac{3}{4} \\ \frac{15}{x+y}-\frac{8}{x-2y} &= 1 \end{aligned}$$

(9 points)

b) A two-digit number leaves remainder 2 when divided by 5, remainder 3 when divided by 6, and remainder 6 when divided by 9. Find the two-digit number. *(5 points)*

2. Ferenc Szatmári and his family traveled by car from Budapest to Kisvárda on a hot summer day. They left at 7:50. In 25 minutes, after 12 km, they reached the M3 highway. At 10:55 they left the highway for road 403, and after another 40 km, having driven 284 km in all, they arrived in Kisvárda at 11:35.

a) What was the average speed of the car on the highway? *(3 points)*

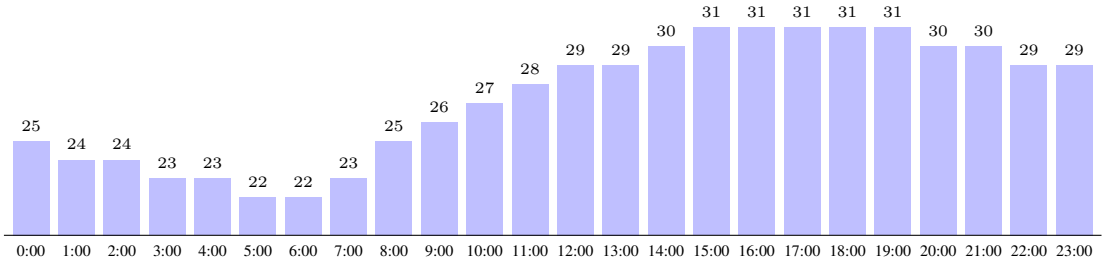
On the M3, at five places, there were speed limits because of road repairs, on 20 km in all. On these sections the speed limit was 80 km/h, but the drivers could only drive at 50 km/h.

b) Ferenc thought that if he could have driven at 120 km/h here, they would have arrived in Kisvárda at least half an hour earlier. Is he right? *(3 points)*

The three children of the family, Péter, Anna, and Lilla, traveled on the back seat of the car, where three people may sit. Péter asked not to sit in the middle; he does not like to travel between the two girls.

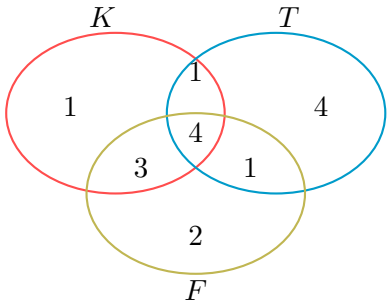
c) In how many ways could they sit on the three back seats, if they respected Péter's request? *(3 points)*

The hourly weather forecast for that day in a weather app (temperatures in °C):



d) Find the mode and the median of the hourly temperature values of this day. What is the average temperature based on the hourly data? *(4 points)*

3. The 30 students of class 11a took part in many kinds of summer programs. Among others, they traveled abroad (K), were at a camp at Lake Balaton (T), and went to a pop music festival (F). The Venn diagram shows how many students took part in which programs.



a) How many students went neither abroad, nor to the camp, nor to the festival? *(2 points)*

b) We choose a student of the class at random. What is the probability that the student was abroad or at the camp, but not at the festival? *(3 points)*

Reading the required and recommended books is not always easy. In a school year, the reading list can contain as many as 15 literary works.

c) Soma plans to read a required book of 405 pages in exactly 15 days as follows. From the second day on, he reads one page more each day than on the day before. How many pages does he plan to read on the first day, and how many on the fifteenth day? *(5 points)*

7 students came to a meeting of a math club. Their math teacher usually starts the club with a conversation.

d) The teacher asked them how many of the students present they had called on their cell phones the previous week. They said these numbers: Péter 4, Sári 1, Balázs 0, Sanyi 2, Bori 2, Ernő 4, Miki 2. The teacher said that somebody remembered wrong. What did the teacher base this opinion on? *(2 points)*

4. Prove the following statements.

a) $\binom{2024}{10} + 2\binom{2024}{11} + \binom{2024}{12} = \binom{2026}{12}$ *(4 points)*

b) If n is a positive integer, then $(n-1)! + n! + (n+1)! = (n+1)! \cdot \frac{n+1}{n}$. *(4 points)*

c) $\frac{3^{150} - 2 \cdot 3^{149} + 3^{148}}{3^{147} + 3^{146}} = 9$ *(4 points)*

Part II

5. a) Solve the equation $\left(\sin x - \frac{\sqrt{3}}{2}\right)\left(\cos x + \frac{\sqrt{2}}{2}\right) = 0$ over the set of real numbers. *(7 points)*

b) Find the range of the function $f : \mathbb{R} \to \mathbb{R}$, $x \mapsto \frac{1}{\sin x + 2}$. *(4 points)*

A store sells four kinds of pocket calculators: the PÖPEC brand for 9500 or 6100 forints, and the SPICC brand for 5800 or 7100 forints. According to the store's statistics, 60% of the customers buy the PÖPEC brand and 40% choose SPICC. 40% of the customers who buy PÖPEC choose the more expensive model, and in the case of SPICC, 65% choose the more expensive one.

c) What percent of the customers buy a calculator cheaper than 7000 forints? *(5 points)*

6. Consider the function $f : [0, 4] \to \mathbb{R}$, $x \mapsto \frac{1}{4}(x-4)^2$.

a) Find the coordinates of the common points of the graph of the function and the coordinate axes. *(4 points)*

b) Find the area of the region enclosed by the graph of the function and the coordinate axes. *(6 points)*

c) Find the inverse of the function f. *(6 points)*

7. The equation of the line e is $4x + 3y = 120$ and the equation of the line f is $3x - 4y = -60$. In the quadrilateral $ABCD$, the vertex A is the point $(0, 0)$, the vertex B is on the x-axis, and the vertex D is on the y-axis. The side BC is on the line e and the side CD is on the line f.

   a) Find the coordinates of the vertices B, C, D of the quadrilateral. *(4 points)*

   b) Prove that the quadrilateral is cyclic. *(5 points)*

   c) Write the equation of the circumscribed circle of the quadrilateral. *(4 points)*

   We found a practice problem set with 25 problems on the internet. 8 of the problems are about sequences, 6 about functions, 4 about combinatorics, and 7 about coordinate geometry.

   d) We choose five of these problems at random, at the same time, so that every problem is chosen with the same chance. What is the probability that there are 3 problems about sequences and 2 problems about coordinate geometry among the chosen ones? *(3 points)*

8. A company growing fir trees made a plan for the three years from 2025 to 2027. By their estimate, they had 10 000 fir trees on their land in September 2025. Every year they want to plant 2000 new trees in mid-October, and cut down 10% of the trees in December.

   a) How many trees do they plan to cut down in these three years in all? *(5 points)*

   Let a_n be the planned number of trees at the end of the nth year, that is, at the end of the year $2024 + n$. We assume that they manage the trees by the same principles in the following years too.

   b) Find the general term of the sequence a_n. *(6 points)*

   At one market, three kinds of fir trees have been competing for the customers' favor before Christmas for years: the Nordmann fir, the Norway spruce, and the silver fir. 45% of the customers choose the Nordmann fir, 37% the Norway spruce, and 13% the silver fir. Other kinds of trees account for 5% of the sales.

   c) If we ask six randomly chosen people who bought a tree what kind of tree they bought, what is the probability that three of them bought a Nordmann fir, two a Norway spruce, and one a silver fir? Give the probability to three decimal places. (We assume that everybody bought exactly one tree.) *(5 points)*

9. a) Solve the inequality $\lg\left(36 + 2^{\sqrt{3x}}\right) > 2$ over the set of real numbers. ($\lg$ denotes the base 10 logarithm.) *(7 points)*

   b) State the converse of the following statement. Decide whether the statement and its converse are true.

   If a real number is greater than 5, then the base 10 logarithm of the number is defined. *(3 points)*

   Part II of an advanced-level school-leaving exam has five problems, numbered 5 to 9. The students have to solve only four of them.

   c) In a math group of 17 students, everybody wrote the advanced-level exam. Péter and Anna are talking.

   Péter: It is certain that at least four of us left out the same problem.

   Anna: It is certain that there was a problem that exactly four of us left out.

   Whose statement is true? Justify your answer. *(4 points)*

   The table below shows how many students chose each problem and, of those who worked on it, how many solved it perfectly, for 16 points.

	problem 5	problem 6	problem 7	problem 8	problem 9
worked on it	14	14	16	13	11
16 points	4	6	9	3	5

   d) What is the probability that if we choose one of the 17 exam papers at random, we see that the student solved problem 8 for 16 points? *(2 points)*

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