Sample entrance exam questions
BA in Economics (ELTECON)
at Eötvös Loránd University (ELTE), Budapest

Spring 2018

Note: Many of these sample questions are taken from previous years' high school final exams in Mathematics in Hungary, with some modifications.

Part A: Functions, equations and inequalities

Problem 1

Solve the following equations for real numbers:

a.

$$x^2 - 10x + 24 = 0$$

b.

$$\log_2(4x) = 9$$

c.

$$4 \cdot 5^x + 3 \cdot 5^{x+1} = 475.$$

Problem 2

Solve the following system of equations for real numbers:

$$\begin{aligned} 2x + 3y &= 18 \\ 7x + 5y &= 41. \end{aligned}$$

Problem 3

Given the function $f : \mathbb{R} \to \mathbb{R}$, $f(x) = x^2 - x$,

a. Find the real value(s) x such that $f(x) = -0.21$.

b. Find the minimum value of the function. Where does it attain the minimum?

c. Sketch the graph of the function and determine its range (i.e. the set of real numbers it may attain).

Problem 4

Solve the following inequalities for real numbers:

a.

$$x^2 - 4x < 5$$

b.

$$0.5^{(2x-3)} > 2.$$

Problem 5

Let f and g denote two $\mathbb{R} \to \mathbb{R}$ functions: $f(x) = |2x - 10|$ and $g(x) = x - 2$.

a. Draw the graphs of the functions.

b. Find the values of x such that $f(x) = g(x)$.

Problem 6

Find the real values of x for which the expression $\sqrt{2x - 5}$ is defined.

Part B: Word problems

Problem 7

The distance between Budapest and Miskolc, two cities in Hungary, is 180 kilometres by car. We started our journey from Budapest to Miskolc at 9am in the morning. Our average speed was 120 km/h (kilometres per hour), with an average gasoline consumption of 7.5 litres per 100 km. After spending 3 hours in Miskolc, we took the journey back to Budapest at an average speed of 80 km/h due to a traffic jam, and our average gasoline consumption was 6.5 litres per 100 km. The price of gasoline in Hungary is 350 HUF per litre.

a. When did we arrive back in Budapest?

b. What was our average speed (counting only the outbound and inbound journey, and excluding our stay in Miskolc)?

c. What was our average gasoline consumption?

d. Calculate the cost of gasoline consumed during the journey.

Problem 8

The grading of the Econometrics course at ELTECON consists of three parts: a midterm and final exam (for a maximum of 30 points each), home assignments (for a maximum of 30 points) and an oral presentation (for a maximum of 10 points). Altogether 80 points are needed out of the total 100 points to achieve the best ("excellent") grade.
A student achieved 67% in the midterm exam, 82% in home assignments, 9% in the oral presentation. What percentage should he/she achieve in the final exam to obtain the excellent grade?

Problem 9

30 students were interviewed about the sports they followed on TV. Of them, 15 answered that they followed football, 12 indicated that they followed basketball and 10 said that they followed both. How many students did not follow any of the two sports on TV?

Part C: Other topics

Problem 10

Let $A = \{a; b; c; d; e; f\}$, $B = \{d; e; f; g; h\}$, $C = \{c; d; e; f; g\}$ be three sets.
By listing their elements, give the sets $A \cap B \cap C$ and $(A \cup B) \setminus C$.

Problem 11

The mean (average) of five real numbers is 6.6. Four out of the five numbers are the following: $\{3, 9, 9, 7\}$.

a. Find the remaining number in the set.

b. Find the median and the mode of the five numbers.

Problem 12

One red and one black fair gambling dice are thrown together.
What is the probability that the sum of the numbers thrown is 12?