Practice Problems

Mathematics

For applicants to the Bachelor's program in Business and Economics 2026/27.

WIRTSCHAFTS UNIVERSITÄT WIEN VIENNA UNIVERSITY OF ECONOMICS AND BUSINESS

These practice problems are meant to help you prepare and give you an idea of what to expect. Please note that they do not cover all topics that may be included in the exam.

The entrance exam is designed as a multiple-choice test.

At least one answer option is correct, but it is also possible that all answers are correct. Partial credit is awarded for partially correct answers.

Math Skills

Notes:

- **A period (.) is used as the decimal separator, e.g. 3.2%.**
- **A space is used as the thousands separator, e.g. 3 200 EUR.**

Notation

- interval notation

(a, b)	set of all points x with $a < x < b$
$[a, b]$	set of all points x with $a \leq x \leq b$
$(a, b]$	set of all points x with $a < x \leq b$
$[a, b)$	set of all points x with $a \leq x < b$

Some formulae (to be used as required)

$$ax^2 + bx + c = 0 \quad \Rightarrow \quad x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}, \quad a \neq 0 \tag{1}$$

$$f(x) = c \quad \Rightarrow \quad f'(x) = 0 \tag{2}$$

$$f(x) = x^n \quad \Rightarrow \quad f'(x) = nx^{n-1} \tag{3}$$

$$f(x) = c \cdot g(x) \quad \Rightarrow \quad f'(x) = c \cdot g'(x) \tag{4}$$

$$f(x) = g(x) \pm h(x) \quad \Rightarrow \quad f'(x) = g'(x) \pm h'(x) \tag{5}$$

$$f(x) = g(x)h(x) \quad \Rightarrow \quad f'(x) = g'(x)h(x) + g(x)h'(x) \tag{6}$$

$$f(x) = \frac{g(x)}{h(x)} \quad \Rightarrow \quad f'(x) = \frac{g'(x)h(x) - g(x)h'(x)}{[h(x)]^2} \tag{7}$$

$$f(x) = g(h(x)) \quad \Rightarrow \quad f'(x) = g'(h(x)) \cdot h'(x) \tag{8}$$

$$f(x) = \ln x \quad \Rightarrow \quad f'(x) = \frac{1}{x} \tag{9}$$

$$f(x) = e^x \quad \Rightarrow \quad f'(x) = e^x \tag{10}$$

$$\binom{n}{k} = \frac{n!}{k!(n-k)!} \tag{11}$$

$$a + ar + ar^2 + \cdots + ar^n = a\frac{1 - r^{n+1}}{1 - r}, \quad r \neq 1 \tag{12}$$

Logic

Which of the following statements is/are correct

		True
a	The statement "Every mathematics student can solve equations." is equivalent to the statement "If a person cannot solve equations, (s)he is not a mathematics student.".	○
b	The statement "If the sun does not shine, we will not have lunch outside." is a negation of the statement "If the sun shines, we will have lunch outside.".	○
c	For $x \in \mathbb{R}$, the statement "$(x^4 + 8x^2 + 15 \leq 0) \Leftrightarrow x^2 \in [-5, -3]$" is true.	○
d	The statement "If a natural number x is divisible by 3, then it is divisible by 9." is true.	○
e	The statement "x is divisible by 12 and x is not divisible by 11." is true for every x that is a positive integer multiple of 24.	○

Elementary Algebra

Let *x, y, z* be real numbers.

Which of the following statements is/are correct?

		True
a	For $y \neq 0$, it holds that $\frac{4(2y)}{(-2y)^2} = -\frac{2}{y}$.	○
b	For $x, y, z \neq 0$, it holds that $\frac{3yz}{4x} \cdot \frac{2x^3y^2}{5} \div \frac{3(xy)^2}{4z} = \frac{2yz^2}{5}$.	○
c	For $x \neq \pm 1$, it holds that $\frac{4x-2}{x^2-1} - \frac{3}{1+x} + \frac{1}{x-1} - \frac{2}{1-x} = \frac{4}{x-1}$.	○
d	For $x, y \neq 0, x \neq -y$, it holds that $\frac{2}{x} + \frac{3}{y} = \frac{2y+3x}{x+y}$.	○
e	For $x \neq 0$, it holds that $(2x^{-1}-1)(2x^{-1}+1) = \frac{1}{4x^2} - 1$.	○

Equations

Which of the following statements is/are correct?

		True
a	If one side of a rectangle is by 3 cm longer than the other one and the rectangle's area is 40 cm², then the length of the longer side is 5 cm.	○
b	A car travels at an average speed of 64 km/h. At 3 pm, it has traveled a total distance of 112 km. Then it started traveling at 1:15 pm.	○
c	A recipe calls for 5% vinegar. If the cook only has 1 liter of 8% vinegar, he needs to mix it with 0.6 liters water to get the right concentration.	○
d	The solution of the equation $\log \sqrt[3]{x} + \log \frac{1}{x^3} - \log x^2 + \frac{16}{3} = \frac{\log x^2}{1 + \log 100}$, where $\log x$ denotes the decadic logarithm of x, is smaller than 5.	○
e	A prize money of 12 200 EUR is supposed to be split among the winners in a way that the 2nd placed obtains 80% of the amount the 1st placed obtains, and the 3rd placed obtains 80% of the 2nd placed. Then the prize for the 2nd place is 4 000 EUR.	○

Linear equations in two unknowns

Two small business owners, Frank and Julia, are assembling purses for an order. If they had worked together the entire time, they would have finalized the order in 6 hours. However, after 3 hours, Frank felt too sick to continue. To finish the order, Julia had to work another 5 hours.

Which of the following statements is/are correct?

		True
a	If Frank worked alone the entire time, it would take him 15 hours to finish the order.	○
b	If the order was for 150 purses, then the difference between the times Frank and Julia need to assemble one purse is more than 3 minutes.	○
c	If the situation were reversed, that is, Julia would feel sick and leave after three hours, then Frank would need more than 10 hours to finish the order.	○
d	If the order were twice as big as the original one, Julia would need 10 hours to finish the order after Frank left due to sickness.	○
e	If they had completed the entire order together, Frank would have completed 40% of the order.	○

Inequalities

Which of the following statements is/are correct?

		True
a	A farmer is planning a new rectangular field. He has 80 meters of fencing available. If he wants the field area to be at least 48 m² and to maintain the ratio 3:1 between the longer and shorter side of the field, then the shorter side can be between 4 and 20 meters long (both values included).	○
b	If the position of an object above ground in meters after x seconds is described by the function $f(x) = -5x^2 + 70x + 3$, then the object is more than 123 meters above ground between 2 and 12 seconds.	○
c	If the costs of producing x units of a product are $150 + 0.2x$ EUR, at least 83 units must be produced for the average costs per unit to be below 2 EUR (note that only whole numbers of units can be produced).	○
d	To produce one unit of a certain product, three raw materials – A, B, and C – are required. Specifically, 3 units of A, 2 units of B, and 4 units of C are used. The raw materials cost 40 EUR, 50 EUR, and 25 EUR per unit, respectively, and the production of one unit of the product costs 12 EUR. The producer has a total budget of 21 400 EUR and storage capacity for at most 475 units of all raw materials combined. Then, the maximum number of products that can be produced is less than 50.	○
e	The inequality system $\frac{4}{x} < x < \lvert 2 - 3x \rvert$ is satisfied if and only if $\lvert x \rvert > 2$.	○

Power functions

The production function $W(L) = 0.25L^r,\ r \in \mathbb{R}$ describes the wheat output $W(L)$, in kilograms, of farmer Ben depending on the hours of work L (labor). To produce 4 kilograms of wheat, the farmer needs to work for 32 hours.

Which of the following statements is/are correct?

		True
a	It holds that $r > 0.5$.	○
b	With 64 hours of labor, Ben produces more than 8 kilograms of wheat.	○
c	Assume that for Ben's neighbor, the wheat production function is the same as for Ben. If Ben works $L1$ hours and the neighbor works $L2 > L1$ hours, then Ben's increase in production from an additional hour of labor is greater than the neighbor's increase when working an additional hour.	○
d	The amount of labor necessary for a given wheat output is a power function, too.	○
e	To double the wheat output, the amount of labor must be more than doubled.	○

Exponential and logarithmic functions

Denote by *f(t)* the population of a country (the number of inhabitants) after *t* years, where *f(0)* is the current population. The current population is 10 millions and it is assumed that it grows by 1.2% per year.

Which of the following statements is/are correct?

		True
a	It holds that $f(t) = 10 \cdot 1.012^t$.	○
b	After 30 years, the population will have grown by more than 50%.	○
c	The head economist of the country predicts that the GDP of the country grows by 4% per year. Then the GDP per capita grows by more than 3% per year.	○
d	Assume that after 5 years, the growth slows down to 1% per year. Then the population of 12 millions will be attained at $t > 15$.	○
e	If the population of a neighboring country can be expressed as $8 \cdot 10^6 e^{0.02t}$, then the growth rate of this neighboring country is smaller than 2% per year.	○

Binomial distribution

From long term observations, it has been calculated that a tennis player wins on average 17 out of 25 games.

Which of the following statements is/are correct?

		True
a	The probability that the player loses the next game is 0.32.	○
b	The expected number of games the player wins in a competition series of 12 games is 4.08.	○
c	The variance of the number of games the player wins out of 50 games is 10.88.	○
d	The probability that the player wins the next three games is less than 0.3.	○
e	The probability that the player wins at most four out of the next 6 games is more than 0.6.	○

Answer sheet:

- **Logic: a,c**
- **Elementary Algebra: b,c**
- **Equations: b,c,e**
- **Linear equations in two unknowns a,e**
- **Inequalities: b**
- **Power functions: a,c,d,e**
- **Exponential and logarithmic functions: d**
- **Binomial distribution: a,c,e**