



## **Information on additional exams**

### **INFORMATION & SAMPLE QUESTIONS**

**VALID FROM YEAR 2024**

**MCI | THE ENTREPRENEURIAL SCHOOL<sup>®</sup>**

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## 1 University entrance requirements/bachelor studies

Applicants with a university entrance qualification from abroad might fall under the regulations for additional examinations. Your program representatives will have more information.

## 2 Additional Examinations

The persons mentioned under Point 1 have to take additional examinations, which are based on the contents and level of the examination subjects of the Austrian university entrance examination. Additional examinations include the following subjects:

- English | B2 (for economics courses of study & technical courses of study)
- Mathematics (for business courses of study and technical courses of study)
- Chemistry (for technical courses of study)
- Physics (for technical courses of study)

### 2.1 OVERVIEW

Below you will find an overview of the additional examinations to be taken in the individual degree programs:

Course of studies	German	English	Mathematics	Chemistry	Physics
Biotechnology & Food Engineering	x	x	x	x	x
Business Administration Online	x	x	x		
Business Administration Online (English)		x	x		
Business & Management	x	x	x		
Business & Management (English)		x	x		
Digital Business & Software Engineering	x	x	x		
Environmental, Process & Energy Engineering	x	x	x	x	x
Industrial Engineering & Management	x	x	x		x
Management, Communication & IT	x	x	x		
Management & Law	x	x	x		
Mechatronics	x	x	x		x
Medical, Health and Sport Technologies	x	x	x		x
Nonprofit-, Social- & Health Care Management	x	x	x		
Smart Building Technologies	x	x	x		x
Social Work	x	x	x		
Tourism Business Studies	x	x	x		

The additional exam in Mathematics is generally taken in German. For non-German-speaking students the exam can be taken in English. In this case, please clarify with the study program in advance.

## 2.2 EXAMINATION CONTENTS

### 2.2.1 English (B2)

The additional examination in English corresponds to level B2 according to the European Framework of Reference for Languages. Qualifications are described as follows:

Ability to understand the main content of complex texts on concrete and abstract topics; ability to understand technical discussions in one's own special field. Ability to communicate spontaneously and fluently so that a normal conversation with native speakers is possible without much effort on both sides.

### 2.2.2 Mathematics

The additional examination in mathematics consists of questions on basic mathematical concepts, based on the standardized qualification-oriented Austrian university entrance examination in mathematics. The basic mathematics skills test essentially covers:

- Numbers and measures (e.g. sets of numbers,...)
- Algebra and geometry (e.g. system of linear equations, quadratic equation, right triangle,...)
- Functional relations (including polynomial functions, trigonometric functions, exponential function, logarithm,...)
- Analysis (including derivation, curve sketching,...)
- Probability and statistics (e.g. tree diagram, complementary probability, location parameter, measure of dispersion, box plot,...)

Further information on qualification requirements can be found at [www.matura.gv.at](http://www.matura.gv.at).

#### Recommended literature mathematics:

<https://openstax.org/books/precalculus-2e/pages/1-introduction-to-functions>

<https://www.ggverlag.at/produktkatalog/kompetent-aufsteigen-mathematik-8-zentralmatura-2020/>

<https://www.amazon.de/Durchstarten-Zentralmatura-Neubearbeitung-Mathematik-%C3%9Cbungsbuch/dp/3710133246>

### 2.2.3 Chemistry

The additional examination in chemistry covers the following topics from chemistry:

Substances, states and reactions: the properties of matter, measurements and units of measurement; substances and their properties; physical and chemical properties; substances and mixtures; measurements and units of measurement; the international system of units; accuracy and precision in measurements and calculations; calculations taking into account significant places; percentage by mass

The structure of matter: the periodic table; atoms; ion bond; covalent bond

Properties of gases: the gas laws; pressure; the ideal gas

## 2.2.4 Physics

The additional examination in physics is intended to test scientific thinking and methodologies and covers the following topics from core areas of physics: atomic physics (atomic structure), electricity (basic electrical quantities, electrical work and power, simple circuits), mechanics (kinematics and dynamics of translation as well as rotation, forces, work, energy, power, conservation laws), optics (propagation of light, refraction, electromagnetic waves, reflection), basic physical quantities (SI unit system, conversion of units) and thermodynamics (general gas law, thermal expansion, heat transfer).

## 3 Exam mode of written examination

Place of examination	Only on site at one of the MCI locations. The exact location of the examination will be announced in due time.
Number of examination attempts	Applicants without a university entrance qualification have a total of three examination attempts per exam section.
Date	<p>According to the FHG (University of Applied Sciences Act), the additional examination must be taken by the time the student enters the second year of study.</p> <p>Examination dates in the first year of study: March, June, September</p> <p>Applicants are automatically allocated to the dates and informed of the exact dates.</p> <p>On a voluntary basis, the additional examination can be taken in September at the start of the program. To do so, applicants must actively contact the Office Management of the degree program.</p>
Duration	<p>60 minutes per subject with a 30 minutes break in between the subjects.</p> <p>On examination dates with a high number of applications the examinations will be held in the morning and afternoon.</p> <p>For study programs with more than three examination subjects, the examinations extend into the afternoon. The exact starting time will be announced in due time.</p>
Permitted aids	All necessary tools are provided by the MCI. For mathematics, the Texas Instruments TI-30Xa calculator will be used. Using your own tools is treated as cheating.
Important notes on the examination	<ul style="list-style-type: none"><li>• You must bring a valid photo ID.</li><li>• The use of the Internet or a mobile phone or other technical devices (smartwatches etc.) during the test is prohibited.</li><li>• Any paper used (also sheets from notepads) must be handed in. Everything that is not to be assessed (concept etc.) must be clearly crossed out.</li></ul>

Assessment	<ul style="list-style-type: none"> <li>For the written part of the additional examination, there is a maximum of 100 achievable points. A minimum of 50 points is required for the written part in the respective subject to be considered "passed".</li> <li>If you fail an examination, that examination may be repeated up to <b>two times</b>.</li> <li>If the examination is aborted prematurely without good cause by the candidate, it is considered not passed. Admissible grounds of excuse are sickness and unforeseen or unavoidable events for which the candidate is not responsible.</li> </ul>
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## 4 Sample questions with notes

### 4.1 ADDITIONAL EXAMINATION: ENGLISH

#### 4.1.1 General Information

The English Exam is an electronic test and comprises a writing exercise plus up to 6 different parts dealing with all or some of the following topics:

PART	MAIN SKILL FOCUS	RESPONSE	HOW CAN YOU PREPARE?
1	Grammatical Accuracy  <i>...tests your ability to express yourself accurately</i>	Multiple Choice Test Matching	Any practice in the grammatical and structural aspects of the language
2	Vocabulary Section  <i>...tests your ability to recognize clear and concise expression.</i>	Multiple Choice Test	Expose yourself to a wide range of texts taken from all kinds of settings
3	Reading for gist and specific information  <i>...tests your ability to understand the substance and logical structure of a selection of texts.</i>	Multiple Choice True/False Statements	Expose yourself to a wide range of texts taken from all kinds of settings  You are not expected to understand every word in the text, but you should be able to pick out salient points.

4	Writing  <b>...tests your ability to present an argument, to explain, describe and draw conclusions in writing</b>	e.g. stating opinion, agreeing/disagreeing, explaining... (medium may be letter, e-mail, memo, summary, short report.)	Familiarize yourself with a variety of text types.  Learn how to structure texts
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#### 4.1.2 Example Part 1

1.	Heathrow, London, .....more international traffic than any other airport. A handles                      B is handling                      C handle                      D handling
2.	If you reduce the price, we..... your offer. A accept                      B would accept                      C will accept                      D would have accepted
3.	It is .....hot today. A terrible                      B terribly                      C too terrible                      D most terrible

#### 4.1.3 Example Part 2a

Bill Bullen had always dreamed of going 1 _____ Europe on a bus. As a child, he had seen Cliff Richard's film <i>Summer Holiday</i> , in which Cliff and his friends travel through southern Europe on a red double-decker bus, and he 2 _____ always wanted to do the same thing. In 1998 he decided to make his dream come true, and he bought a twenty-year old bus 3 _____ had been fitted with a kitchen, toilet, and a CD player.			
1	A up	B over	C round
2	A has	B had	C is
3	A whose	B who	C which

#### 4.1.4 Example Part 2b

<i>Match the following words and descriptions:</i>			
<b>1 innovative</b>			
A	modern	B new	C state-of-the-art
<b>2 consider</b>			
A	to think about	B to wonder	C to know
<b>3 qualification</b>			
A	ability	B requirement	C standard

#### 4.1.5 Example Part 3

One aspect of business life which managers are unhappy with is the need to attend meetings. Research indicates that managers will spend between a third and half of their working lives in meetings. Although most managers would agree that it is hard to think of an alternative to meetings, as a means of considering information and making collective decisions, their length and frequency can cause problems with the workload of even the best-organised executives.
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**What do most managers think about meetings?**

- A. Meetings take up most of their working life.
- B. Meetings allow them to monitor decision-making.
- C. Meetings prevent them from establishing a routine.
- D. Meetings are the only way they know of achieving certain objectives.

## 4.2 ADDITIONAL EXAMINATION: MATHEMATICS

The supplementary mathematics examination comprises questions with the following answer formats, based on the standardized competence-oriented school-leaving exam:

- Open answer formats, i.e. the tasks can be processed in different ways depending on the task.
- Semi-open answer formats, i.e. the correct answer must be inserted into a given equation or function, etc.
- Multiple-choice answer formats, i.e. the answer options that apply to the corresponding question set must be ticked.
- Construction format, i.e. provided illustrations, diagrams, graphs, etc. must be supplemented by graphs, points, vectors, etc.

Exercise examples can be found at <https://www.matura.gv.at>

### 4.2.1 Mathematics sample problems

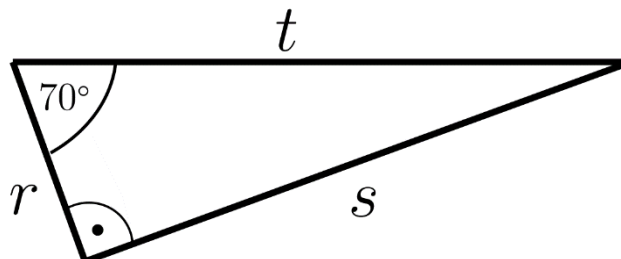
#### Numbers and measures

For the two whole numbers  $a, b$ , with  $a < 0$  and  $b < 0$ ,  $b = 2 \cdot a$  applies. Which of the following calculations always have a natural number as a result? Tick the correct answers.

- ☐  $a + b$
- ☐  $b : a$
- ☐  $a : b$
- ☐  $a \cdot b$
- ☐  $b - a$

#### Algebra and geometry

For the following triangle with the lengths  $r, s$  and  $t$ .



determine the relationship  $\frac{r}{t}$ .



## Functional dependencies

Driving school students learn the following formula to calculate the approximate stopping distance  $s$ .  $v$  is the speed of the vehicle ( $s$  in m,  $v$  in km/h).

$$s = \frac{v}{10} \cdot 3 + \left(\frac{v}{10}\right)^2$$

When driving attentively, the vehicle speed must be adapted to ensure the stopping distance does not exceed the sight distance. This ensures that the vehicle can stop in time and avoid hitting an object. "Sight distance" is the length of roadway which the driver is able to see. Calculate the maximum permissible speed at a sight distance of 25 m.

The function for the permissible speed is  $v_{1,2} =$  \_\_\_\_\_ and the speed is  $\approx$  \_\_\_\_\_ km/h.

## Analysis

We have a given function  $f: \mathbb{R} \rightarrow \mathbb{R}$  with  $f(x) = 3 \cdot e^x$ . The following statements describe properties of the function  $f$  or its derivative  $f'$ . Tick the correct statements.

- ☐ There is a point  $x \in \mathbb{R}$  with  $f'(x) = 2$ .
- ☐ For all  $x \in \mathbb{R}$ ,  $f'(x) > f'(x + 1)$  applies.
- ☐ For all  $x \in \mathbb{R}$ ,  $f'(x) = 3 \cdot f(x)$  applies.
- ☐ There is a point  $x \in \mathbb{R}$  with  $f'(x) = 0$ .
- ☐ For all  $x \in \mathbb{R}$ ,  $f'(x) \geq 0$  applies.

## Stochastic processes

Pharmaceutical companies are required to indicate any known side effects of a medicine in the patient information leaflet. The frequency of any known side effects is indicated based on the following categories:

Label	Frequency of side effects
Very common	More than 1 in 10 patients experience side effects.
Common	Between 1 and 10 patients in 100 experience side effects.
Uncommon	Between 1 and 10 patients in 1,000 experience side effects.
Rare	Between 1 and 10 patients in 10,000 experience side effects.
Very rare	Fewer than 1 in 10,000 patients experience side effects.
Unknown	The probability of experiencing side effects cannot be determined due to the lack of relevant data.

In the patient information leaflet for a medicine, a specific side effect is categorized as "Rare". 50,000 patients are treated with the same medicine independently of one another. A specific number of patients experience the side effect in question.

Use the above frequencies as probabilities and determine the minimum number of patients expected to experience side effects.

Source: <https://www.matura.gv.at>

#### 4.2.2 Mathematics solutions

##### Solution: Numbers and measures

- ☐
- ✓  $b : a$
- ☐
- ✓  $a \cdot b$
- ☐

##### Solution: Algebra and geometry

$$\frac{r}{t} = \cos 70^\circ \approx 0.34$$

##### Solution: Functional dependencies

The function for the permissible speed is described by  $v_{1,2} = -15 \pm \sqrt{15^2 + 100 \cdot s}$  and the speed is  $\approx 37.2$  km/h.

##### Solution: Analysis

- ✓ There is a point  $x \in \mathbb{R}$  with  $f'(x) = 2$ .
- ☐
- ☐
- ☐
- ✓ For all  $x \in \mathbb{R}$ ,  $f'(x) \geq 0$  applies.

##### Solution: Stochastic processes

$$E(x) = n \cdot p = 50,000 \cdot \frac{1}{10,000} = 5$$

#### 4.3 ADDITIONAL EXAMINATION: CHEMISTRY

##### 4.3.1 Chemistry sample problems

###### Problem 1:

What is the following salt called?  $\text{Ca}(\text{NO}_2)_2$

1. potassium nitrate
2. potassium nitrite
3. calcium nitrite
4. potassium nitrate

Problem 2:

What are the stoichiometric coefficients for the following reaction:  $a \text{Fe}^{2+} + b \text{H}^+ + c \text{NO}_3^- \rightarrow d \text{Fe}^{3+} + e \text{NO} + f \text{H}_2\text{O}$

1.  $a=2$  ;  $b=1$  ;  $c=-1$  ;  $d=3$  ;  $e=0$  ;  $f=0$
2.  $a=1$  ;  $b=1$  ;  $c=3$  ;  $d=1$  ;  $e=1$  ;  $f=2$
3.  $a=0$  ;  $b=0$  ;  $c=3$  ;  $d=0$  ;  $e=1$  ;  $f=2$
4.  $a=3$  ;  $b=4$  ;  $c=1$  ;  $d=3$  ;  $e=1$  ;  $f=2$

Problem 3:

The occupation of electrons in orbitals is described by what, among other things?

1. Hund's rule
2. Schrödinger's cat
3. Fischer projection
4. Snake formula

Problem 4:

Calculate the mass of potassium permanganate necessary to prepare 250 ml of a 0.0380 M  $\text{KMnO}_4$  solution.

1. 1.20 g
2. 1.30 g
3. 1.40 g
4. 1.50 g

Problem 5:

What mass of aluminum must be used for a reaction so that the reaction with 10.0 kg of chromium(III) oxide results in a complete conversion of the oxide to elemental chromium?

- 3.55 kg
- 5.55 kg
- 7.55 kg
- 9.55 kg

**4.3.2 Chemistry solutions**

- Chemistry Problem 1: 3. calcium nitrite
- Chemistry Problem 2: 4.  $a=3$  ;  $b=4$  ;  $c=1$  ;  $d=3$  ;  $e=1$  ;  $f=2$
- Chemistry Problem 3: 1. Hund's rule
- Chemistry Problem 4: 4. 1.50 g
- Chemistry Problem 5: 1. 3.55 kg

#### 4.4 ADDITIONAL EXAMINATION: PHYSICS

##### 4.4.1 Physics sample problems

###### Problem 1:

An ideal gas flows from the high pressure side to the low pressure side through a porous medium. How does the temperature change?

1. The temperature rises
2. The temperature drops
3. The temperature remains constant
4. It is not possible to make a general statement about the temperature change

###### Problem 2:

Martin carries one liter of water 1 km through the city and then to the 3rd floor, 10 m up. How much work did he expend?

1. Between 0 and 5 J
2. Between 5 and 50 J
3. Between 50 and 500 J
4. Between 500 and 5,000 J
5. More than 5 kJ

###### Problem 3:

How far does a steel ball fly when fired horizontally from a height of 5 m above a plane? The muzzle velocity is 10 m/s and air friction can be neglected.

1. Approx. 1 m
2. Approx. 10 m
3. Approx. 100 m
4. More than 100 m

###### Problem 4:

Lightning strikes, you hear the thunder 5 s after you have seen the lightning. How far away did lightning strike?

1. Less than 100 m
2. Between 100m and 1 km
3. Between 1 and 3 km
4. Between 3 and 5 km
5. Between 5 and 10 km
6. Further than 10 km

###### Problem 5:

The power or active factor  $P/S$  in AC technology is related to the phase difference  $\varphi$  of voltage and current. This is described by which law?

1.  $P/S = \cos(\varphi)$
2.  $P/S = \sin(\varphi)$
3.  $P/S = \tan(\varphi)$
4.  $P/S = \varphi^2$
5.  $P/S = \log(\varphi)$

Problem 6:

The SI unit system is based on 7 basic units. Which of the following units belong to these base units?

1. ampere (A)
2. newton (N)
3. mole (mol)
4. kilogram (kg)
5. Volt (V)

Problem 7:

Which of the following density conversions is correct?

1.  $5 \frac{\text{g}}{\text{cm}^3} = 0.005 \frac{\text{kg}}{\text{m}^3}$
2.  $5 \frac{\text{g}}{\text{cm}^3} = 500 \frac{\text{kg}}{\text{m}^3}$
3.  $5 \frac{\text{g}}{\text{cm}^3} = 5,000 \frac{\text{kg}}{\text{m}^3}$
4.  $5 \frac{\text{g}}{\text{cm}^3} = 0.000005 \frac{\text{kg}}{\text{m}^3}$

Problem 8:

Which of these physical quantities are vector quantities?

1. Energy
2. Velocity
3. Power
4. Force

Problem 9:

Which statement on the centrifugal force is correct?

1. The centrifugal force points in the direction of the centripetal force.
2. The centrifugal force occurs in inertial frames of reference.
3. The centrifugal force occurs in rotating frames of reference.
4. The centrifugal force is independent of radius.

Problem 10:

Which statement about isotopes of a chemical element is correct?

1. Isotopes have the same mass number A, but different atomic number Z and neutron number N.
2. Isotopes have the same number of neutrons N, but different atomic number Z and thus different mass number A.
3. Isotopes have the same atomic number Z and neutron number N, but different mass number A.
4. Isotopes have the same atomic number Z, but different neutron number N and thus different mass number A.

#### 4.4.2 Physics solutions

Physics Problem 1:	3. The temperature remains constant.
Physics Problem 2:	3. between 50 and 500 J
Physics Problem 3:	2. approx. 10 m
Physics Problem 4:	3. between 1 and 3 km
Physics Problem 5:	1. $P/S = \cos(\varphi)$
Physics Problem 6:	1. ampere (A), 3. mol (mol) and 4. kilogram (kg)
Physics Problem 7:	3. $5 \frac{\text{g}}{\text{cm}^3} = 5,000 \frac{\text{kg}}{\text{m}^3}$
Physics Problem 8:	2. velocity, 4. force
Physics Problem 9:	3. The centrifugal force occurs in rotating reference systems.
Physics Problem 10:	4. Isotopes have the same atomic number Z, but different neutron number N and thus different mass number A.