**ЗАКАРПАТСЬКИЙ УГОРСЬКИЙ ІНСТИТУТ ІМЕНІ ФЕРЕНЦА РАКОЦІ ІІ**
**II. RÁKÓCZI FERENC KÁRPÁTALJAI MAGYAR FŐISKOLA**

**Кафедра математики та інформатики**
**Matematika és Informatika Tanszék**

# «ENGLISH FOR MATHEMATICIANS»
# (МЕТОДИЧНІ ВКАЗІВКИ ДЛЯ САМОСТІЙНОЇ РОБОТИ)

(для студентів 4-го курсу спеціальності 014 Середня освіта (Математика)

# ENGLISH FOR MATHEMATICIANS

## (Módszertani utmutató önálló munkához)

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(ступінь вищої освіти /a felsőoktatás szintje)

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(галузь знань / képzési ág)

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Посібник з англійської мови для математиків призначений для студентів IV курсу Закарпатського угорського інституту імені Ференца Ракоці спеціальності 014 Середня освіта (Математика) денної та заочної форми навчання з метою організації самостійної роботи з курсу "Іноземна мова за професійним спрямуванням".

Матеріал призначений для використання як навчально-методичний посібник з дисципліни "Іноземна мова за професійним спрямуванням ".

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Ez a jegyzet elsősorban matematika szakos hallgatók számára készült, de hasznos lehet mindazok számára, akik bármely más szakon tanulnak matematikát.

Az oktatási folyamatban történő felhasználását jóváhagyta
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# MODULE 1: PROFESSIONAL COMMUNICATION BASICS

**Self-Study Section: Talking about Your Studies and Specialization**

## Objectives:

By the end of this section, students should be able to:

- Deliver a coherent and detailed introduction of themselves and their academic background in English.
- Articulate their area of specialization using precise academic vocabulary.
- Discuss their major courses, research interests, and current projects in a professional context.
- Prepare both written and oral introductions suitable for academic presentations or networking.

**1. Key Academic Vocabulary and Expressions**

### Introducing Yourself Professionally:

- I am currently pursuing a Bachelor's degree in Mathematics at …
- I am enrolled in the … program with a focus on …
- My academic background includes coursework in …
- My research interests are centered around …

### Describing Specialization and Research Focus:

- My primary area of specialization is …
- I concentrate on …
- I am particularly interested in …
- My current project involves …
- I have undertaken studies in …, which has enabled me to …

### Examples:

- "I am currently a third-year undergraduate student at [University Name], pursuing a specialization in Mathematics. My academic training encompasses courses in Linear Algebra, Mathematical Analysis, and Probability Theory. I am particularly interested in optimization problems and mathematical modeling."
- "My research focuses on functional equations and their applications in computer simulations. I am developing methods to analyze complex systems through algebraic and numerical approaches."

**2. Exercises for Self-Study**

### Exercise 1: Elaborate Your Self-Introduction

Write a paragraph (7–10 sentences) presenting yourself, your study program, and your specialization. Include:

- Academic background
- Major courses and areas of focus
- Research interests or projects
- Future academic or professional goals

**Exercise 2: Oral Practice**

- Prepare a 2–3 minute oral presentation introducing yourself and your studies.
- Emphasize academic terminology and coherence.
- Record your speech and evaluate fluency, pronunciation, and clarity.

**Exercise 3: Peer Discussion Simulation**

- Pair with a classmate or practice with a peer online.
- Exchange self-introductions and ask follow-up questions such as:
    - "Which course do you find most challenging and why?"
    - "Can you describe a project you are currently working on?"
    - "How does your specialization relate to potential future research or career opportunities?"

**3. Additional Recommendations**

- Use complex sentence structures, e.g., relative clauses and passive voice, to sound more formal.
- Incorporate advanced academic vocabulary (e.g., *pursuing, concentrate on, undertake, encompass, methodology, framework*).
- Focus on clarity and logical flow in both writing and speaking.
- Practice delivering your self-introduction in front of a mirror or record it to improve confidence and pronunciation.

# MODULE 2: ADVANCED PROFESSIONAL SELF-PRESENTATION

**Self-Study Section: Introducing Yourself and Your Work**

## Objectives:

By the end of this section, students will be able to:

- Present themselves and their professional profile in a highly structured, formal manner.
- Integrate detailed academic and professional information into self-introductions.
- Apply advanced vocabulary and complex grammatical structures to enhance clarity and authority.
- Adapt self-introductions to different academic and professional contexts, including conferences, interviews, and networking events.

**1. Advanced Academic and Professional Vocabulary**

### Introducing Yourself in an Academic Context:

- I am currently enrolled in a Bachelor's program in Mathematics at …, where my focus lies in …
- My academic journey has been shaped by extensive coursework in …, as well as independent study in …
- I have developed strong competencies in …, which have been applied in both research and practical projects.
- Over the past [X] years, I have been engaged in [specific activity], which has contributed to my expertise in …

### Describing Your Work and Achievements:

- My research primarily addresses …, with a particular emphasis on …
- I am involved in a project aimed at …, which employs methodologies from …
- In my recent work, I have investigated …, resulting in [outcome, e.g., a conference presentation, a publication, or a mathematical model].
- I collaborate with [team/organization] to develop solutions for …, integrating both theoretical and computational approaches.

### Example of an Advanced Self-Introduction:

"I am a final-year undergraduate student at [University Name], majoring in Mathematics with a specialization in Differential Equations and Mathematical Modelling. My academic background encompasses advanced studies in Functional Analysis, Probability Theory, and Numerical Methods. My current research explores stability analysis in nonlinear dynamic systems, combining analytical methods with computational simulations. I have presented preliminary results at the [Conference Name], and I am preparing a manuscript for submission to an indexed mathematics journal. In addition, I am actively engaged in tutoring junior students, which has further refined my ability to communicate complex concepts effectively."

**2. Self-Study Exercises**

**Exercise 1: Structured Academic Self-Introduction**
Write a formal self-introduction (10–12 sentences) that includes:

- Academic background and field of specialization.
- Current research or academic projects.
- Professional or extracurricular achievements.
- Short-term and long-term academic goals.

**Exercise 2: Precision Vocabulary Integration**

Incorporate at least 8 of the following terms into your self-introduction: *pursue, specialize, expertise, interdisciplinary, methodology, analytical, computational, dissemination, empirical, theoretical framework, academic contribution.*

**Exercise 3: Oral Presentation Simulation**
Prepare a 3–4 minute oral presentation introducing yourself and your current academic work:

- Use formal register and complex sentence structures (relative clauses, passive voice, nominalization).
- Record yourself, then critically evaluate:
    - Accuracy of vocabulary usage.
    - Coherence and logical flow.
    - Pronunciation and intonation.

**Exercise 4: Peer Feedback**
Exchange presentations with a peer. Ask and answer questions such as:

- "What specific methodologies have you employed in your current research?"
- "How does your work contribute to existing knowledge in your field?"
- "What challenges have you encountered in your research process, and how have you addressed them?"

**3. Recommendations for Improvement**

- Develop a professional portfolio including your CV, abstracts of research, and a concise biography for conference use.
- Attend academic seminars and observe how experienced researchers introduce themselves.
- Practice introducing yourself in various time formats (30 seconds, 1 minute, 3 minutes) to adapt to different situations.
- Refine your introduction over time, incorporating feedback from mentors and peers.

# MODULE 3: ACADEMIC LANGUAGE PROFICIENCY

**Self-Study Section: Common Phrases in Academic English**

## Objectives:

By the end of this section, students will be able to:

- Accurately use advanced academic expressions in both written and spoken contexts.
- Integrate precise, discipline-appropriate vocabulary into academic communication.
- Recognize stylistic differences between formal academic English and informal speech.
- Apply set phrases effectively in research writing, oral presentations, and professional correspondence.

**1. Academic English: Characteristics and Importance**

Academic English is characterized by precision, formality, and objectivity. It often employs:

- **Nominalization** (transforming verbs into nouns) for conciseness — e.g., *analyze* → *analysis*.
- **Impersonal structures** for objectivity — e.g., *It is widely accepted that…*.
- **Lexical density** (more content words per sentence) for complexity.
- **Linking devices** to maintain logical flow — e.g., *however, consequently, in contrast*.

**2. Core Phrases for Academic Communication**

### Introducing a Topic or Research

- *The primary aim of this study is to…*
- *This research seeks to address the question of…*
- *The present paper explores…*
- *This investigation is concerned with…*

### Describing Methodology

- *Data were collected through…*
- *The methodology employed in this research involves…*
- *A mixed-methods approach was adopted to…*
- *The experimental procedure was carried out under the following conditions…*

### Presenting Results and Findings

- *The analysis reveals that…*
- *The results indicate a significant correlation between…*
- *It was observed that…*
- *These findings support the hypothesis that…*

**Discussing and Interpreting Data**

- *This can be attributed to…*
- *A possible explanation for this is…*
- *The implications of these results are…*
- *It is important to note that…*

**Drawing Conclusions and Implications**

- *In conclusion, the evidence suggests that…*
- *This study contributes to our understanding of…*
- *Further research is needed to…*
- *The findings have significant implications for…*

**Academic Politeness and Formality**

- *It is respectfully suggested that…*
- *With reference to the aforementioned study…*
- *In accordance with established academic practice…*
- *The authors would like to acknowledge…*

### 3. Self-Study Exercises

**Exercise 1: Contextual Application**
Rewrite the following informal statements using advanced academic expressions:

1. *I looked at how students use computers.*
2. *We found that the new method works better.*
3. *This shows that we need more research.*

**Exercise 2: Phrase Integration in Writing**
Write a short (150–200 word) abstract for a hypothetical mathematics research paper. Incorporate at least **five** of the core phrases from each of the following categories:

- Introducing a topic.
- Describing methodology.
- Presenting results.
- Drawing conclusions.

**Exercise 3: Oral Practice**
Prepare a 2–3 minute conference-style presentation introducing your research. Use:

- At least **three** introductory phrases.
- **Two** methodology phrases.
- **Three** conclusion phrases.

**Exercise 4: Peer Review Simulation**
In pairs, present your abstracts and ask clarifying questions, such as:

- “Could you elaborate on the methodological framework you adopted?”
- “How do your findings align with existing literature?”
- “What potential applications could this research have in industry or academia?”

**4. Recommendations for Mastery**

- Maintain a personal glossary of academic expressions encountered in journals, lectures, and conferences.
- Practice paraphrasing published abstracts using alternative formal phrases.
- Listen to academic talks and note recurring expressions used by experts in mathematics.
- Avoid overuse of generic phrases (e.g., *in conclusion, as a result*) — opt for discipline-specific alternatives.

# MODULE 4: MATHEMATICAL AND SCIENTIFIC COMMUNICATION

**Self-Study Section: Talking about Numbers and Data in English**

## Objectives:

By the end of this section, students will be able to:

- Accurately describe numerical information and datasets using advanced academic language.
- Interpret and explain quantitative results in a clear, formal, and discipline-appropriate manner.
- Employ correct forms for approximations, proportions, comparisons, and trends.
- Integrate statistical terminology into written reports and oral presentations.

### 1. Principles of Academic Data Description

In academic communication, numerical and statistical information must be:

- **Precise** — avoid vague expressions; state exact values where possible (*the mean value was 3.76*).
- **Contextualized** — numbers should be accompanied by their significance (*a 12% increase compared to last year's baseline*).
- **Logically ordered** — present data from general to specific, or from highest to lowest values.
- **Interpreted** — provide insight, not just raw figures (*the observed variance indicates…*).

### 2. Core Vocabulary and Structures

#### Describing Quantities and Proportions

- *The dataset comprises a total of…*
- *The proportion of X to Y is approximately…*
- *X accounts for nearly one-third of the total.*
- *The majority/minority of the data points fall within the range of…*

#### Expressing Change and Trends

- *The figures demonstrate a consistent upward/downward trend.*
- *There was a marked increase of 15% in the number of…*
- *The rate of change slowed considerably during the second quarter.*
- *A gradual decline was observed over the three-year period.*

#### Comparing Values

- *X is significantly greater than Y, with a difference of…*
- *The value for Group A is twice as high as that for Group B.*
- *In contrast to the baseline measurement, the latest result…*

**Precision and Approximation**

- *The measurement is accurate to two decimal places.*
- *Approximately 72% of participants…*
- *The value is estimated at around 1.45 million units.*

**Statistical Significance and Interpretation**

- *The results are statistically significant at the 0.05 level.*
- *The correlation coefficient indicates a strong positive relationship.*
- *The standard deviation suggests a high degree of variability.*

### 3. Examples in Context

**Example 1 — Written Report Extract:**

The survey encompassed 256 respondents, representing 84% of the targeted population. Approximately 62% expressed a preference for hybrid learning models, while only 15% favored fully remote formats. The remaining 23% reported no preference. The data demonstrate a pronounced shift toward flexible learning environments compared to last year's findings, which recorded only 48% in favor of hybrid formats.

**Example 2 — Oral Presentation:**

As illustrated in Figure 2, the number of users increased steadily from 2018 to 2022, peaking at 14,500 in the final year. The most substantial growth occurred between 2020 and 2021, when the user base expanded by 27%, likely due to the introduction of the new online platform.

### 4. Self-Study Exercises

**Exercise 1: Descriptive Analysis**
Given the following dataset, write a 5–6 sentence paragraph describing key figures, trends, and comparisons. Include proportions, change expressions, and at least one interpretation.

| Year | Number of Participants | Satisfaction Rate (%) |
|---|---|---|
| 2020 | 120 | 68 |
| 2021 | 150 | 74 |
| 2022 | 198 | 81 |

**Exercise 2: Visual Data Commentary**
Select a chart or graph from a mathematical journal or statistical report. Write a 150-word commentary explaining the data using:

- Two trend phrases.
- Two proportion phrases.
- One statistical interpretation phrase.

**Exercise 3: Oral Data Reporting**
Prepare a 2-minute spoken summary of a dataset related to your field of study. Include:

- Introduction of the data source.
- Key findings with specific numerical references.
- At least one hypothesis explaining observed trends.

**5. Recommendations for Mastery**

- Study abstracts and results sections from peer-reviewed mathematical journals to see authentic usage of statistical language.
- Practice converting raw numerical tables into cohesive paragraphs.
- When speaking, combine numerical precision with interpretative commentary to maintain listener engagement.
- Avoid overloading sentences with figures — balance them with analysis.

# MODULE 5: SCIENTIFIC LITERACY SKILLS

**Self-Study Section: Understanding Short Scientific Articles**

## Objectives:

By the end of this section, students will be able to:

- Comprehend and critically evaluate short scientific articles in English, especially those in mathematical and applied scientific contexts.
- Identify the structural components of a scientific article and understand their communicative function.
- Extract key findings, methodological details, and the significance of results.
- Apply advanced reading strategies for precision, efficiency, and critical engagement.

### 1. Structure and Logic of Short Scientific Articles

While the format of short articles may vary by journal, most include the following key sections:

1. **Title and Abstract** — *The "informational gateway"*.
    - Should concisely reflect the research question, methodology, and main findings.
    - Abstracts in mathematics often summarize theorems, proofs, or computational results in compressed form.
2. **Introduction** — *The context and rationale*.
    - Presents the problem statement, theoretical background, and motivation for the research.
    - Often ends with the main objective or research hypothesis.
3. **Methods / Approach** — *The blueprint of the research process*.
    - In applied mathematics: algorithms, models, and computational frameworks.
    - In theoretical work: definitions, assumptions, and logical structure.
4. **Results** — *The evidence*.
    - Key equations, numerical data, or theoretical conclusions.
    - Often illustrated with graphs, diagrams, or formula derivations.
5. **Discussion / Conclusion** — *The interpretation*.
    - Explains the significance of the findings, their limitations, and possible applications.

### 2. Advanced Reading Strategies for Efficiency

#### Skimming for Structure

- Read the **title**, **abstract**, and **section headings** first to get a global overview.
- Identify keywords indicating mathematical focus (*asymptotic behaviour*, *convergence*, *optimization*).

#### Scanning for Specifics

- Locate crucial equations, data tables, or definitions without reading full paragraphs.
- Pay attention to words like *proves*, *demonstrates*, *establishes*, *suggests*.

### Close Reading for Argumentation

- In mathematics, proofs and derivations require careful, line-by-line reading.
- Note the logical connectors (*therefore*, *hence*, *it follows that*) to follow reasoning.

### Annotation and Summarizing

- Write marginal notes summarizing each paragraph.
- Create a 3–4 sentence abstract in your own words to ensure comprehension.

#### 3. Core Vocabulary for Article Analysis

### Describing the Paper's Purpose

- *The article addresses the problem of…*
- *The study investigates the properties of…*
- *This work contributes to the field by…*

### Referring to Methods

- *The authors apply a numerical approach to…*
- *The methodology is based on the principles of…*
- *The research framework incorporates…*

### Discussing Results and Implications

- *The findings provide evidence that…*
- *The results confirm the validity of…*
- *These conclusions may have implications for…*

#### 4. Examples

### Example 1 – Mathematical Abstract:

*This paper presents a new proof of the stability of solutions to a class of nonlinear differential equations. By applying Lyapunov's direct method, we derive sufficient conditions for global stability and illustrate the approach with two computational examples. The results extend existing theorems in the literature and may be applicable to control theory and engineering systems.*

### Example 2 – Application-Focused Abstract:

*A fast Fourier transform (FFT)-based method for solving convolution-type integral equations is introduced. Computational experiments demonstrate a reduction in execution time by 45% compared to classical methods. The approach can be extended to high-dimensional problems in image processing and physics simulations.*

**5. Self-Study Exercises**

**Exercise 1 – Structural Breakdown**
Select a short scientific article in your field (max. 5 pages). Identify:

- The research problem.
- The methodology used.
- The key results.
- The significance of the findings.

**Exercise 2 – Abstract Paraphrasing**
Choose an abstract from a mathematics or applied sciences journal. Rewrite it in simpler English while retaining all essential details. Then rewrite it in a more formal, complex form to refine your style.

**Exercise 3 – Critical Evaluation**
Read a short article and answer:

- What is the novelty of the work?
- Are the methods appropriate and well-justified?
- What further research could be pursued based on these results?

**6. Recommendations for Mastery**

- Regularly read abstracts from journals indexed in Scopus (e.g., *Aequationes Mathematicae*, *Journal of Mathematical Analysis and Applications*) to familiarize yourself with discipline-specific writing.
- Develop the habit of writing **article digests** — one-page summaries highlighting purpose, method, and key result.
- Use dual reading: first for *comprehension*, second for *critical analysis*.

# MODULE 6: ACADEMIC READING COMPETENCE

### Self-Study Section: Identifying Key Information and Terms

## Objectives:

By the end of this section, students will be able to:

- Recognize and extract essential information from complex academic texts in mathematics and related disciplines.
- Distinguish between primary content (core concepts, main results) and secondary content (background, illustrative examples).
- Accurately identify, define, and contextualize domain-specific terminology.
- Apply systematic annotation and summarization techniques for professional academic reading.

### 1. Understanding Key Information in Academic Texts

In academic reading, especially in mathematics, *key information* refers to the central concepts, hypotheses, results, or definitions that form the intellectual backbone of the text. These are often:

- Explicitly highlighted through **topic sentences** or **theorem statements**.
- Presented in **mathematical notation** alongside verbal explanation.
- Reinforced in the **abstract**, **conclusion**, or **summary sections**.

**Indicators of key information:**

- Transitional markers (*The main result is…*, *This study demonstrates…*).
- Typographical emphasis (bold, italics, numbering in theorem environments).
- Repetition or rephrasing of a concept in multiple sections.

### 2. Identifying and Understanding Key Terms

**Key terms** are discipline-specific words or phrases whose precise meaning is critical for comprehension. In mathematics, terms are often formal definitions that:

- Have strict, context-dependent meanings (*bijective mapping*, *eigenvalue*, *asymptotic convergence*).
- Are not interchangeable with everyday synonyms.
- May be introduced with signals like *is defined as*, *denotes*, *refers to*.

**Example:**

*A sequence* $(a_n)$ *is said to converge to L if for every* $\varepsilon > 0$, *there exists* $N \in \mathbb{N}$ *such that for all* $n \geq N, |\, a_n - L \,| < \varepsilon|$.

Here, *sequence*, *converge*, and *epsilon* are all key terms requiring precise understanding.

### 3. Advanced Strategies for Extraction

## A. Macro-Level Scanning

- Read **titles, headings, and subheadings** to anticipate core topics.
- Examine the **abstract** and **conclusion** for condensed key points.

## B. Micro-Level Annotation

- Underline or highlight **definitions, theorems, and main claims**.
- Circle unfamiliar terms for later lookup and contextual analysis.

## C. Semantic Mapping

- Create **concept maps** linking new terms to prior knowledge.
- Identify hierarchical relationships (e.g., *group → abelian group → cyclic group*).

## D. Functional Categorization

Label each key piece of information as:

1. **Conceptual** — definitions, principles.
2. **Procedural** — methods, algorithms.
3. **Empirical/Theoretical Findings** — results, proofs.

### 4. Examples

**Example 1 – From Applied Mathematics:**
Text: *The Navier–Stokes equations describe the motion of viscous fluid substances.*
Key Information:

- Governing equations for fluid dynamics.
- Applicable to viscous fluids.
  Key Terms:
- *Navier–Stokes equations*, *viscous*, *fluid dynamics*.

**Example 2 – From Pure Mathematics:**
Text: *A group $G$ is called cyclic if there exists $g \in G$ such that every element of $G$ can be expressed as $g^n$ for some integer $n$.*
Key Information:

- Definition of cyclic group.
  Key Terms:
- *group*, *cyclic*, *generator*.

### 5. Self-Study Exercises

**Exercise 1 – Key Term Identification**
Select a short research note or textbook excerpt. List:

- All newly introduced technical terms.
- Their definitions in the author's wording.
- Paraphrased definitions in your own words.

**Exercise 2 – Information Filtering**
Given a one-page article, underline only the **central claims and results**. Ignore supporting examples unless they introduce new concepts.

**Exercise 3 – Concept Mapping**
From a short mathematical paper, create a diagram linking terms and theorems, showing logical dependencies.

**Exercise 4 – Precision Paraphrasing**
Take three sentences containing both key information and key terms. Rewrite them preserving exact meaning but using alternative sentence structures.

**6. Recommendations for Mastery**

- Develop a personal **academic glossary** with definitions, notations, and examples.
- Train to read **symbolic and textual information in parallel**, as both contribute to meaning.
- Revisit definitions regularly; in mathematics, nuanced understanding often develops over repeated encounters.
- Use **iterative reading**: first pass for general meaning, second pass for detailed term identification, third for critical analysis.

# MODULE 7: INTERPRETING VISUAL DATA REPRESENTATIONS

**Self-Study Section: Reading Graphs, Tables, and Charts**

## Objectives:

By the end of this section, students will be able to:

- Systematically interpret graphs, tables, and charts in mathematical and scientific contexts.
- Identify explicit and implicit trends, patterns, and anomalies in quantitative data.
- Describe visual data in precise, formal academic English, integrating both numerical and qualitative observations.
- Translate visual representations into coherent written or oral explanations, using discipline-specific terminology.

### 1. The Role of Visual Data in Academic Communication

In academic mathematics and applied sciences, visual data representation is essential for:

- **Condensing large datasets** into interpretable formats.
- **Illustrating relationships** between variables.
- **Highlighting trends and patterns** not immediately evident from raw data.
  Graphs, tables, and charts serve as *cognitive shortcuts*, allowing rapid assimilation of complex quantitative information.

However, accurate reading requires **critical engagement**, not just passive observation. Misinterpretation can occur if axes, scales, and contextual parameters are ignored.

### 2. Key Principles of Interpretation

#### A. Structural Awareness

- **Title & Caption Analysis** – Identify the purpose of the visual. Titles often summarize the relationship depicted; captions may contain methodological details.
- **Axis Examination** – Note variable names, measurement units, and scale types (linear, logarithmic, categorical).
- **Legend Decoding** – Interpret color codes, symbols, or line styles representing different datasets or categories.

#### B. Pattern Recognition

- **Trend Identification** – Ascertain whether the data show positive/negative correlation, exponential growth, periodic fluctuation, or stability.
- **Outlier Detection** – Locate data points deviating significantly from the general pattern; consider possible causes.
- **Comparative Analysis** – Evaluate relative differences between data groups, noting both absolute and proportional changes.

### C. Contextual Interpretation

- Relate observed patterns to **theoretical expectations** or known mathematical models.
- Consider **external influencing factors** that could explain observed deviations.
- Avoid overgeneralization; acknowledge limitations of the data set.

#### 3. Academic Language for Describing Visual Data

When discussing visual data, precision and clarity are paramount. The following expressions are typical in academic contexts:

**For Trends:**

- *The data exhibit a steady upward trajectory from X to Y.*
- *An exponential increase is observed between years A and B.*
- *The function demonstrates periodic oscillations with a frequency of…*

**For Comparisons:**

- *Dataset A consistently exceeds Dataset B by approximately N%.*
- *There is a marked disparity between… and…*
- *The growth rate in category C is twice that of category D.*

**For Outliers and Exceptions:**

- *A single anomalous value at X deviates significantly from the regression line.*
- *This irregularity may be attributable to measurement error or atypical conditions.*

#### 4. Worked Example

**Example – Interpreting a Function Graph:**
Consider the plotted graph of $f(x) = e^{-x}sin\,(2\pi x)$ for $x \in [0,4]$.

Key Observations:

- Amplitude decreases exponentially with increasing $x$.
- The function exhibits four oscillations within the given interval.
- The zero crossings occur at integer and half-integer points.

**Academic Description:**

*The graph of $f(x)$ reveals a damped sinusoidal pattern, characterized by exponentially decaying amplitude and a fixed oscillation frequency of two cycles per unit interval. The decay rate aligns with the factor $e^{-x}$, while the sinusoidal component dictates periodicity.*

**5. Self-Study Exercises**

**Exercise 1 – Structural Analysis**
Select a chart from a mathematical research paper. Identify and document:

- The variables represented on each axis.
- The type of scale used.
- All symbols and color codes in the legend.

**Exercise 2 – Pattern and Outlier Identification**
Using a statistical dataset in table form, plot it as a line graph. Mark:

- The general trend.
- Any points that deviate significantly.
- The interval(s) with the steepest change.

**Exercise 3 – Verbal Description Practice**

Write a 150–200 word academic description of a table showing numerical results from a computational experiment. Your description should integrate specific numerical references and interpretive commentary.

**Exercise 4 – Comparative Analysis**

Take two different charts from related studies. Compare and contrast their findings, noting both visual differences and underlying causes in methodology or sample size.

**6. Recommendations for Mastery**

- Always **cross-reference text and visuals**—the meaning of a chart often depends on surrounding discussion.
- Be alert to **scale manipulations** (e.g., truncated y-axes) that may exaggerate or minimize trends.
- Practice *dual coding*: translate visuals into verbal form and vice versa.
- Develop familiarity with **common chart types** (scatter plots, histograms, box plots, heat maps) to interpret them efficiently in academic contexts.

# MODULE 8: DIGITAL RESEARCH COMPETENCE

**Self-Study Section: Extracting Information from Online Resources**

## Objectives:

By the end of this section, students will be able to:

- Efficiently locate, assess, and extract relevant information from credible online resources in English.
- Apply advanced reading and skimming strategies to identify key data within digital academic texts.
- Evaluate the reliability, validity, and academic appropriateness of online sources.
- Synthesize extracted information into structured written or oral outputs, integrating correct academic citation practices.

### 1. The Importance of Digital Literacy in Academic Research

In the 21st century, scholarly inquiry increasingly depends on **digital information ecosystems**, encompassing academic databases, open-access journals, institutional repositories, and specialized online archives. For mathematicians, these may include:

- **Research databases** (e.g., *Scopus*, *Web of Science*, *MathSciNet*).
- **Preprint servers** (e.g., *arXiv*, *bioRxiv* for interdisciplinary applications).
- **Specialized online encyclopedias** (e.g., *Encyclopedia of Mathematics*).

The challenge is no longer access, but **selectivity**—identifying the most relevant and credible information amidst a vast quantity of digital content.

### 2. Critical Phases of Online Information Extraction

#### A. Source Identification

- Use **precise search queries** with Boolean operators (*AND*, *OR*, *NOT*) to refine results.
- Apply advanced search filters (date range, subject area, peer-reviewed status, language).
- Prefer domain-specific sources (*.edu*, *.ac.uk*, *.org*, or *.gov*) over commercial or unverified websites.

#### B. Content Relevance Assessment

- **Title and Abstract Scanning** – Determine potential relevance before investing time in full-text reading.
- **Keyword Matching** – Cross-check search terms with text frequency and distribution.
- **Contextual Fit** – Ensure that the resource aligns with your research focus rather than merely containing related terms.

#### C. Credibility Verification

- **Author Credentials** – Review academic affiliation, publication history, and field expertise.
- **Journal Reputation** – Check impact factor, indexation in *Scopus* or *Web of Science*, and peer-review policies.
- **Citation Count** – Higher citation counts often indicate greater academic influence.

**D. Data Extraction and Documentation**

- Identify **primary findings, equations, datasets, and methodologies** relevant to your research.
- Extract information using paraphrasing to avoid plagiarism, maintaining original meaning.
- Record bibliographic details in APA, IEEE, or another required citation style.

### 3. Academic Language for Online Information Processing

When discussing online resource use in academic English, precise formulations are expected:

**Referring to Source Location:**

- *This dataset was retrieved from the [Database Name] repository.*
- *An extensive review of recent literature was conducted via the Scopus database.*

**Evaluating Credibility:**

- *The source demonstrates methodological rigor and is published in a high-impact, peer-reviewed journal.*
- *The author's affiliation with [Institution] enhances the reliability of the findings.*

**Extracting and Integrating Content:**

- *The study provides empirical evidence supporting the hypothesis that…*
- *The extracted data indicate a statistically significant correlation between variables X and Y.*

### 4. Worked Example – Extracting Information from an Academic Preprint

**Scenario:**
You are tasked with writing a literature review on *applications of graph theory in network security*.

**Step-by-Step Process:**

1. **Locate Sources** – Search *arXiv* with query "graph theory" AND "network security" filtered to last five years.
2. **Assess Relevance** – Read abstracts, highlighting those discussing algorithmic complexity and cryptographic applications.
3. **Verify Credibility** – Identify authors affiliated with leading institutions and cross-check if work has later appeared in peer-reviewed journals.
4. **Extract Information** – Note the key algorithms (e.g., minimum cut, maximal flow) and their reported performance metrics.

5. **Document Findings** – Summarize each paper's contributions and limitations in your own words, citing appropriately.

**Academic Summary Example:**

*The preprint by Li et al. (2023) presents a polynomial-time approximation algorithm for detecting vulnerabilities in decentralized network topologies. Although the work is not yet peer-reviewed, its methodological foundation is robust, and preliminary performance benchmarks outperform existing methods by an estimated 15% in large-scale simulations.*

#### 5. Self-Study Exercises

**Exercise 1 – Search Strategy Design**

Develop a search plan for finding English-language research articles on a mathematical topic of your choice. Specify:

- Search engines/databases used.
- Exact Boolean search string.
- Filters applied.

**Exercise 2 – Relevance and Credibility Evaluation**
Select two online resources on the same topic—one from a peer-reviewed journal, one from a blog. Write a comparative evaluation discussing:

- Reliability of content.
- Academic appropriateness.
- Depth of analysis.

**Exercise 3 – Structured Data Extraction**
From an open-access research article, extract:

- Key definitions and theorems.
- Main results (including numerical data).
- Limitations noted by the authors.

**Exercise 4 – Integration and Paraphrasing**
Write a 200-word synthesis integrating extracted information from at least two sources, ensuring smooth transitions and proper academic vocabulary.

#### 6. Recommendations for Mastery

- Avoid *information overload* by setting clear objectives before starting research.
- Maintain a personal **annotated bibliography** for quick reference.
- Practice *triaging*—quickly discarding irrelevant sources to save time.
- Regularly update search queries to incorporate new publications.

# MODULE 9: ACADEMIC WRITING SKILLS

### Self-Study Section: Writing Short Summaries and Abstracts

**Objectives:**
By the end of this section, students will be able to:

- Distinguish between an academic summary and an abstract in terms of purpose, structure, and stylistic conventions.
- Condense complex academic content into concise, logically structured, and terminologically precise text.
- Employ advanced academic vocabulary and cohesive devices to ensure clarity and coherence.
- Integrate methodological, contextual, and results-oriented information into short academic texts without distortion of meaning.

### 1. Understanding the Difference: Summary vs. Abstract

While both **summaries** and **abstracts** condense larger works, their **communicative functions** differ:

| Feature | Summary | Abstract |
|---|---|---|
| **Purpose** | Provide an overview of the main points, often for study or review purposes. | Present the essential information of a scholarly work for indexing, searchability, and quick evaluation by potential readers. |
| **Length** | Variable (usually 100–300 words for academic purposes). | Strictly limited (often 150–250 words in academic publishing). |
| **Content** | May include selective details depending on audience needs. | Must encapsulate purpose, methodology, results, and conclusion without omission. |
| **Tone** | Can be adapted for specific readerships. | Always formal, objective, and free of evaluative language unless required (e.g., critical abstracts). |

### 2. Structural Elements of Effective Summaries and Abstracts

**Academic Abstracts** typically follow the **IMRaD model** (*Introduction, Methods, Results, and Discussion*):

1. **Purpose/Objective** – Briefly state the research aim or problem addressed.
    - *This study aims to investigate…*
    - *The objective is to develop…*
2. **Methodology** – Describe the approach, data sources, or experimental framework.
    - *A numerical simulation was conducted using…*

    - *The proposed algorithm was tested on…*
3. **Results** – Present major findings without excessive detail.
    - *The results demonstrate a significant improvement in…*
4. **Conclusions/Implications** – Indicate the significance, potential applications, or limitations.
    - *These findings contribute to the understanding of…*

**Summaries** may use a more flexible order, but should:

- Identify the **central thesis** or research question.
- Highlight **main arguments** or evidence.
- Omit minor details, data points, or redundancies.

#### 3. Stylistic Conventions

- **Brevity with precision** – Each word must add value; avoid redundancy.
- **Nominalization** – Use noun forms to condense information (e.g., "analysis" instead of "we analyze").
- **Passive voice** – Common in abstracts for objectivity (*The experiment was conducted…*).
- **Tense usage** –
    - Present simple for established facts (*This paper presents…*).
    - Past simple for methods and specific results (*The model was tested…*).
- **Cohesion markers** – *Furthermore, consequently, in addition, as a result*.

#### 4. Example of a High-Quality Academic Abstract (Mathematics Context)

*This paper presents a novel approach to solving large-scale systems of nonlinear equations by integrating adaptive mesh refinement with parallel processing techniques. The methodology is implemented using a hybrid finite element framework and evaluated on benchmark datasets in computational fluid dynamics. Results indicate a reduction in computation time by 27% without compromising accuracy. These findings provide an efficient computational tool for engineers and applied mathematicians working with high-dimensional models.*

#### 5. Self-Study Exercises

**Exercise 1 – Abstract Reconstruction**

Read the introduction and conclusion of a research paper in your field (preferably in mathematics). Write an abstract that includes all four IMRaD elements, ensuring it does not exceed 200 words.

**Exercise 2 – Summary Condensation**
Take a 5-page academic article and produce:

- A **detailed summary** of 250 words.
- An **ultra-condensed version** of 100 words.
  Compare the two to observe differences in information density and style.

**Exercise 3 – Precision and Paraphrasing**

Extract 5 complex sentences from an academic text. Rewrite them in more concise academic English without changing meaning.

**Exercise 4 – Critical Language Review**
Swap abstracts with a peer. Evaluate:

- Relevance of included content.
- Lexical precision.
- Cohesion and clarity.

**6. Recommendations for Mastery**

- Regularly analyze abstracts from high-impact journals in your field (e.g., *Aequationes Mathematicae, Journal of Computational Mathematics*) to internalize structural patterns.
- Maintain a **personal phrase bank** of academic expressions for stating aims, describing methods, and summarizing findings.
- Practice "blind summarizing": read a paper once, then write your summary without looking back—this enhances retention and concision.
- Use online word count tools to ensure compliance with journal or conference submission guidelines.

# MODULE 10: ACADEMIC REPORTING SKILLS

**Self-Study Section: Writing Reports on Assignments or Projects**

## Objectives:

By the end of this section, students will be able to:

- Structure formal academic reports in accordance with international academic conventions.
- Use precise mathematical and technical terminology to present project results.
- Integrate data, figures, and analytical commentary coherently.
- Apply formal, objective, and concise style in both descriptive and analytical sections.

### 1. Purpose and Role of Academic Reports

Academic reports on assignments or projects serve as **formal documentation** of the work conducted, the methodology applied, and the conclusions reached. Unlike informal reflections, they:

- Provide a **permanent academic record** of the research or problem-solving process.
- Allow peer verification and replication of methods.
- Demonstrate the student's ability to work with academic standards in writing.

In mathematics, such reports often include **theoretical frameworks, proofs, computational algorithms, and numerical results**, making clarity and precision essential.

### 2. Structural Components of a High-Level Academic Report

A formal project or assignment report should generally follow this structure:

1. **Title Page**
   - Report title, author's name, course, date, and institutional affiliation.
2. **Abstract** *(150–250 words)*
   - Concise summary of the purpose, methodology, results, and conclusions.
   - Should be self-contained and understandable without reference to the full text.
3. **Table of Contents**
   - Generated automatically in most word processors.
4. **Introduction** *(Purpose and Scope)*
   - State the research question, context, and objectives.
   - Example: *The purpose of this report is to analyze the efficiency of various numerical methods for solving partial differential equations in fluid dynamics.*
5. **Literature Review / Theoretical Background**
   - Present relevant theories, prior research, and models.
   - Use citations following academic style (APA, IEEE, etc.).
6. **Methodology**
   - Describe the tools, algorithms, datasets, or experiments used.
   - Must be **detailed enough** for reproducibility.
7. **Results**
   - Present findings using **tables, charts, and graphs** (with proper captions).

    - Avoid interpretation here; focus on factual reporting.
8. **Discussion / Analysis**
    - Interpret results, compare with expectations or literature, identify limitations.
9. **Conclusion and Recommendations**
    - Summarize key findings, outline implications, and suggest further research.
10. **References**
    - All cited works in proper format.
11. **Appendices** *(if necessary)*
    - Extended proofs, raw data, or supplementary materials.

**3. Stylistic Features of High-Quality Academic Reports**

- **Formality and Objectivity** – Avoid personal pronouns unless the discipline explicitly allows them.
- **Mathematical Precision** – Define all variables, state assumptions, and ensure notation is consistent.
- **Nominalization** – Condense complex ideas into noun forms (*analysis of convergence rates, evaluation of algorithmic efficiency*).
- **Logical Cohesion** – Use linking devices (*therefore, consequently, as demonstrated in…*).
- **Consistency in Figures and Units** – Follow SI standards unless otherwise required.

**4. Example of an Academic Report Abstract (Mathematics Context)**

*This report examines the comparative efficiency of the Newton–Raphson method and the Bisection method for root-finding problems in engineering applications. The methods were implemented in MATLAB and tested across 50 randomly generated non-linear equations. Results indicate that while the Newton–Raphson method achieved convergence in fewer iterations, the Bisection method demonstrated higher reliability in cases involving discontinuities. These findings suggest that a hybrid approach may yield optimal performance for industrial-scale computational tasks.*

**5. Self-Study Exercises**

**Exercise 1 – Structural Reconstruction**

Take a completed mathematics assignment. Reformat it into a formal report with all required sections, ensuring logical progression from introduction to conclusion.

**Exercise 2 – Abstract Development**

Write both a **descriptive abstract** (focusing on what the report covers) and an **informative abstract** (including results and implications) for the same project. Compare the difference in tone and detail.

**Exercise 3 – Methodology Expansion**

Select a simple computational or theoretical task (e.g., solving a set of equations) and write a methodology section so detailed that another student could replicate the work without further guidance.

**Exercise 4 – Peer Review Simulation**
Exchange reports with a peer and evaluate:

- Clarity of problem statement.
- Logical flow of arguments.
- Accuracy of mathematical content.
- Professional formatting and style.

**6. Recommendations for Mastery**

- Regularly review **sample reports from international mathematics conferences** to familiarize yourself with structure and style.
- Use **LaTeX** for mathematical reports to ensure professional typesetting.
- Maintain a **personal style checklist** (font, margins, equation formatting) for consistency.
- Keep detailed project notes during the assignment phase — these will make report writing more efficient.

# MODULE 11: ADVANCED PROBLEM–SOLUTION DISCOURSE

**Self-Study Section: Describing Problems and Solutions in English**

## Objectives:

By the end of this section, students will be able to:

- Formulate complex problem statements in precise and formal academic English.
- Articulate logical, methodologically sound solutions using appropriate technical vocabulary.
- Integrate evidence, data, and reasoning to justify proposed solutions.
- Use problem–solution structures effectively in oral presentations, written assignments, and research reports.

### 1. The Problem–Solution Framework in Academic Communication

In mathematics and applied sciences, a **problem–solution structure** serves not merely to describe challenges, but to:

- Define **scope and constraints** with analytical clarity.
- Demonstrate a logical **pathway from identification to resolution**.
- Facilitate **critical evaluation** by peers and instructors.

**Core components of an academic problem–solution text:**

1. **Problem Identification** – Defining the issue precisely, avoiding vague or colloquial expressions.
2. **Contextualization** – Explaining why the problem is relevant within academic, professional, or industrial contexts.
3. **Methodological Approach** – Outlining the strategy or process to solve the problem.
4. **Solution Description** – Presenting the resolution with clarity, supported by evidence.
5. **Evaluation** – Assessing the effectiveness, limitations, and potential for further refinement.

### 2. Advanced Vocabulary and Phrases

**Describing Problems:**

- *The primary issue under investigation is…*
- *A critical obstacle in this field involves…*
- *One of the most pressing challenges concerns…*
- *An unresolved aspect of the problem lies in…*

**Presenting Causes or Contributing Factors:**

- *This difficulty arises from…*
- *The root cause can be attributed to…*
- *Complications emerge due to…*
- *This is exacerbated by…*

**Describing Solutions:**

- *A viable approach involves…*
- *The problem can be mitigated through…*
- *One promising method to address this challenge is…*
- *This strategy ensures… while minimizing…*

**Evaluating Solutions:**

- *Although the proposed method is effective in…, it remains limited by…*
- *This approach demonstrates a high degree of efficiency in… but may not generalize to…*
- *Further investigation is required to…*

### 3. Example in a Mathematical Context

**Problem Statement:**

*In large-scale numerical simulations of nonlinear systems, iterative solvers frequently fail to converge within an acceptable time frame, particularly when initial approximations deviate significantly from the true solution.*

**Proposed Solution:**

*A hybrid iterative–direct approach is implemented, wherein the initial iterations employ the Bisection method to approximate the root, followed by Newton–Raphson refinement. This reduces overall computation time while maintaining stability.*

**Evaluation:**

*Experimental results on 500 test cases reveal an average reduction of 42% in computation time compared to pure Newton–Raphson implementation, with no observed divergence. However, performance gains are less significant for problems exhibiting near-linear behavior, suggesting selective applicability.*

### 4. Self-Study Exercises

**Exercise 1 – Problem–Solution Writing Task**

Select a real or hypothetical mathematical problem (e.g., instability in numerical integration methods). Write:

- A concise problem statement (3–5 sentences).
- A detailed proposed solution (5–7 sentences).
- An evaluation paragraph (3–5 sentences).

**Exercise 2 – Vocabulary Application**
Transform the following informal sentences into formal academic English:

1. *The method takes too long to work in some cases.*
2. *We can fix this problem if we try a different algorithm.*
3. *The results are okay, but not perfect.*

**Exercise 3 – Oral Presentation Simulation**

Prepare a 3–4 minute oral explanation of a problem and its solution from one of your mathematics assignments.

- Include problem background, methodology, and results.
- Record and evaluate your clarity, pacing, and academic register.

**Exercise 4 – Peer Review Analysis**
Exchange problem–solution write-ups with a peer. Provide feedback on:

- Problem clarity and precision.
- Coherence of the proposed solution.
- Appropriateness of vocabulary and formality level.

**5. Recommendations for Excellence**

- **Anchor problems in empirical or theoretical evidence** — avoid vague, generalised statements.
- **Balance concision and detail** — excessive background can obscure the central issue.
- **Integrate visuals** — diagrams, graphs, and mathematical notation often clarify complex solutions.
- **Compare alternative solutions** — demonstrating awareness of multiple approaches strengthens your argument.
- **Use passive voice strategically** — e.g., *"The algorithm was implemented using…"* to emphasize process over actor.

# MODULE 12: PROFESSIONAL COMMUNICATION SKILLS

**Self-Study Section: Writing Professional Emails**

## Objectives:

By the end of this section, students should be able to:

- Construct professional, clear, and concise emails in English, adhering to academic and workplace conventions.
- Employ appropriate register, tone, and politeness strategies for different recipients (professors, peers, or external collaborators).
- Integrate precise mathematical and technical terminology without compromising clarity.
- Use advanced cohesive devices and structured formats to enhance readability.

### 1. Key Features of Professional Emails

A professional email should exhibit the following qualities:

1. **Clarity and Brevity** – Communicate the message efficiently without unnecessary verbosity.
2. **Formal Tone** – Avoid colloquialisms; maintain respect and politeness.
3. **Structured Organization** – Include a clear subject line, appropriate salutation, concise body, and formal closing.
4. **Accuracy** – Ensure proper spelling, grammar, and punctuation; technical terms should be precise.
5. **Purpose-Oriented Content** – Explicitly indicate the goal of the email, whether it is to request, inform, or provide feedback.

### 2. Email Structure and Conventions

#### A. Subject Line

- Concise and informative: *"Request for Feedback on Linear Algebra Assignment"*, *"Collaboration Proposal for Research Project"*.
- Avoid vague titles such as *"Hello"* or *"Question"*.

#### B. Salutation

- Formal: *Dear Professor Smith,*
- Semi-formal (for peers or collaborators): *Dear John,*

#### C. Opening Sentence

- Indicate the purpose: *I am writing to request your guidance regarding…*
- Establish context if necessary: *Following our discussion in last week's seminar…*

#### D. Body Paragraphs

- **Problem/Request:** Clearly describe the issue or inquiry.
- **Supporting Details:** Provide necessary background, references to assignments, projects, or data.
- **Action Request or Outcome:** Specify the desired response or next steps.

**E. Closing**

- Formal: *Yours sincerely, [Full Name]* or *Best regards, [Full Name]*
- Include affiliation or course: *BSc Mathematics, Year 3, [University Name]*

#### 3. Advanced Phrases and Vocabulary

**Making Requests:**

- *I would greatly appreciate it if you could…*
- *Could you kindly provide feedback on…*
- *I am seeking your advice regarding…*

**Providing Information:**

- *Please find attached the report on…*
- *The dataset used for this analysis can be accessed via…*
- *I would like to inform you that…*

**Clarifying or Confirming:**

- *To clarify, my understanding is that…*
- *Could you please confirm whether…*
- *I would be grateful if you could verify…*

**Polite Closures:**

- *Thank you in advance for your time and assistance.*
- *I look forward to your response.*
- *Please do not hesitate to contact me if further information is required.*

#### 4. Examples of Professional Emails

**Example 1 – Requesting Guidance:**

**Subject:** Request for Guidance on Optimization Assignment

Dear Professor Johnson,

I am writing to seek your advice regarding the upcoming assignment on optimization algorithms. I have implemented the gradient descent method for a set of test functions, but I am encountering convergence issues in specific cases.

I would greatly appreciate it if you could suggest strategies to improve the efficiency and accuracy of my implementation. Attached is my current code and a summary of the results obtained.

Thank you in advance for your time and assistance.

Yours sincerely,
Anna Kovacs
BSc Mathematics, Year 3, [University Name]

**Example 2 – Sending a Completed Task:**

**Subject:** Submission of Project Report on Numerical Analysis

Dear Dr. Smith,

Please find attached my completed report on the numerical solutions of partial differential equations. The report includes a detailed methodology, results, and discussion of the findings.

I would be grateful if you could provide your feedback at your earliest convenience. Should you require any additional information or clarification, please do not hesitate to contact me.

Best regards,
Peter Nagy
BSc Mathematics, Year 3, [University Name]

#### 5. Self-Study Exercises

**Exercise 1 – Drafting Emails**

- Compose three professional emails:
    1. Requesting guidance on an assignment.
    2. Sending a completed project with attachments.
    3. Asking for clarification on a lecture topic.

**Exercise 2 – Peer Review**

- Exchange emails with a classmate. Evaluate:
    - Clarity of purpose
    - Formality and tone
    - Organization and structure
    - Appropriateness of vocabulary

**Exercise 3 – Editing for Precision**

- Take informal or overly verbose emails and rewrite them in concise, professional academic English.

**Exercise 4 – Role-Play Simulation**

- Simulate an email conversation with a professor or industry collaborator. Include multiple replies with requests, clarifications, and responses to feedback.

**6. Recommendations for Excellence**

- **Use templates:** Maintain a personal email template for common academic purposes.
- **Review and proofread:** Check spelling, punctuation, and tone before sending.
- **Attachments:** Always reference attachments clearly and ensure they are properly named.
- **Timing:** Send emails during professional hours and allow reasonable response time.
- **Follow-up politely:** If no response is received within a week, a polite follow-up is acceptable.

# MODULE 13: ACADEMIC PRESENTATION SKILLS

**Self-Study Section: Presenting a Simple Mathematical Topic**

## Objectives:

By the end of this section, students should be able to:

- Deliver clear, coherent, and professional oral presentations on mathematical topics in English.
- Use appropriate academic and technical vocabulary to explain concepts, definitions, and theorems.
- Structure a presentation logically, integrating examples, proofs, and visual aids effectively.
- Engage an audience through clarity, pacing, and interaction while maintaining formal academic style.

### 1. Key Components of a Mathematical Presentation

A well-structured presentation should include:

1. **Introduction**
   - Introduce yourself and your topic.
   - State the purpose and significance of the topic.
   - Provide a brief overview of what the audience can expect.

   *Example*:
   *"Good afternoon, my name is Anna Kovacs. Today I will present a brief overview of the Pythagorean theorem and its applications in geometry and physics. The presentation will cover the theorem's statement, proof, and illustrative examples."*

2. **Background / Context**
   - Define key terms and concepts.
   - Explain why the topic is relevant or important.
   - Reference prior knowledge or standard mathematical frameworks.
3. **Main Content**
   - Present definitions, theorems, or formulas systematically.
   - Provide step-by-step derivations or proofs.
   - Include examples to demonstrate practical applications.
   - Use visual aids such as diagrams, graphs, or slides to clarify complex ideas.
4. **Conclusion**
   - Summarize the main points concisely.
   - Highlight key takeaways.
   - Optionally, suggest extensions or open questions for further study.
5. **Q&A / Interaction**
   - Invite questions from the audience.
   - Prepare responses to common queries or clarifications.

**2. Advanced Vocabulary and Phrases**

**Introducing the Topic:**

- *The focus of my presentation is…*
- *I will provide an overview of…*
- *This presentation aims to explain…*

**Explaining Definitions and Theorems:**

- *By definition, …*
- *The theorem states that…*
- *It can be proven that…*
- *A corollary of this theorem is…*

**Describing Examples and Applications:**

- *For instance, consider…*
- *This can be illustrated by…*
- *As an application, we observe that…*
- *To demonstrate, let us examine…*

**Transitioning Between Sections:**

- *Moving on to the next point…*
- *Having established this, we now consider…*
- *Let us now turn to…*

**Concluding the Presentation:**

- *In summary…*
- *To conclude…*
- *The main takeaway is…*
- *Further research could explore…*

**3. Example Presentation Outline**

**Topic:** The Fibonacci Sequence and Its Applications

1. **Introduction**
    - Introduce yourself and the topic.
    - State that the presentation covers the definition, properties, and applications of the Fibonacci sequence.
2. **Background**
    - Define the sequence: *0, 1, 1, 2, 3, 5, 8…*
    - Explain the recursive formula: $F(n) = F(n–1) + F(n–2)$
    - Mention historical context or significance in mathematics.
3. **Main Content**
    - Derive the closed-form formula (Binet's formula).

    - Demonstrate properties such as the golden ratio relationship.
    - Provide examples in nature (e.g., phyllotaxis) and computer algorithms.
4. **Conclusion**
    - Recap the definition, formula, and key properties.
    - Emphasize the sequence's relevance in both theoretical and applied mathematics.
5. **Q&A**
    - Prepare to explain why the sequence appears in diverse contexts.
    - Clarify any misconceptions about the recursive formula or applications.

**4. Self-Study Exercises**

**Exercise 1 – Outline Creation**

- Select a simple mathematical topic (e.g., prime numbers, linear functions, or the quadratic formula).
- Prepare a structured outline including introduction, main points, examples, and conclusion.

**Exercise 2 – Vocabulary Integration**

- Write 10 sentences explaining a mathematical topic using advanced academic phrases listed above.
- Ensure sentences are formal, precise, and logically connected.

**Exercise 3 – Oral Practice**

- Deliver a 3–5 minute presentation on your chosen topic.
- Record yourself and evaluate:
    - Clarity of definitions and explanations
    - Logical sequence of ideas
    - Appropriate use of mathematical vocabulary and transition phrases

**Exercise 4 – Peer Simulation**

- Present your topic to a classmate or online peer.
- Answer at least three questions from the audience, demonstrating your ability to clarify and elaborate.

**5. Recommendations for Excellence**

- **Practice articulation** – Mathematical terminology should be pronounced clearly.
- **Use visual aids** – Diagrams, tables, and graphs significantly enhance comprehension.
- **Maintain coherence** – Use transition phrases to link sections smoothly.
- **Time management** – Allocate minutes to each section to avoid rushing conclusions.
- **Anticipate questions** – Prepare explanations for common points of confusion or interest.

# MODULE 14: ADVANCED PROFESSIONAL COMMUNICATION

### Self-Study Section: Explaining a Problem and Its Solution

## Objectives:

By the end of this section, students should be able to:

- Articulate a problem clearly and precisely in formal English.
- Explain solutions step by step using advanced academic vocabulary.
- Justify reasoning logically and coherently without relying on formulas.
- Structure both written and oral explanations in a professional and persuasive manner.

### 1. Components of Problem–Solution Explanations

A comprehensive explanation should include the following elements:

1. **Problem Identification**
    - Clearly define the problem and its context.
    - Explain why it is important or relevant.
    - Highlight constraints or challenges associated with the problem.
2. **Analysis of the Problem**
    - Examine the underlying factors that contribute to the problem.
    - Discuss potential difficulties in solving it.
    - Organize observations logically to guide the solution process.
3. **Proposed Solution**
    - Present the solution step by step.
    - Explain methods, strategies, or reasoning used to reach the solution.
    - Include examples, scenarios, or analogies to illustrate key points.
4. **Justification and Evaluation**
    - Provide reasons for why the solution is valid and effective.
    - Consider alternative approaches and explain why the chosen method is preferable.
    - Discuss possible limitations or conditions where the solution may not apply.
5. **Conclusion**
    - Summarize the problem, solution, and key insights.
    - Highlight the significance of the solution in broader contexts.

### 2. Advanced Vocabulary and Phrases

## Describing the Problem:

- *The central issue under consideration is…*
- *A significant challenge arises when…*
- *The problem can be characterized as…*
- *An unresolved aspect of this issue involves…*

## Explaining the Solution:

- *The solution can be approached by…*
- *To resolve this issue, it is necessary to…*
- *The strategy involves several sequential steps, including…*
- *This method ensures that the problem is addressed systematically.*

**Justifying and Evaluating Solutions:**

- *Although this approach is effective, it may encounter difficulties under certain conditions.*
- *The proposed solution demonstrates reliability when…*
- *Alternative methods could be applied; however, they might result in…*
- *Further refinement could enhance the efficiency of this approach.*

**Concluding Statements:**

- *In summary, the problem was successfully addressed through…*
- *The key insight gained from this solution is…*
- *This resolution illustrates the importance of structured problem-solving in professional contexts.*

**3. Example Scenario**

**Problem Statement:**
*An academic research group is struggling to organize and prioritize multiple ongoing projects efficiently, leading to overlapping tasks and missed deadlines.*

**Solution Approach:**

1. **Step 1 – Problem Analysis**
    - Identify sources of inefficiency, including unclear task allocation and lack of communication.
    - Recognize critical tasks requiring immediate attention.
2. **Step 2 – Proposed Solution**
    - Implement a structured workflow with clearly defined roles and responsibilities.
    - Establish regular progress meetings to monitor milestones.
    - Introduce a shared tracking system to prioritize tasks and deadlines.
3. **Step 3 – Justification**
    - This structured approach reduces confusion and ensures that resources are allocated efficiently.
    - Regular updates and monitoring facilitate early identification of potential bottlenecks.

**Conclusion:**
*By applying a structured and transparent workflow, the research group can manage multiple projects effectively, reducing overlaps and ensuring timely completion of tasks.*

**4. Self-Study Exercises**

### Exercise 1 – Written Problem Explanation

- Choose a professional or academic problem from your experience.
- Write a clear and detailed description of the problem, including context, challenges, and significance.

### Exercise 2 – Step-by-Step Solution

- Provide a detailed solution without using formulas.
- Explain reasoning, methodology, and examples to clarify each step.

### Exercise 3 – Peer Review

- Exchange your written explanations with a classmate.
- Assess clarity, coherence, and the effectiveness of vocabulary and structure.

### Exercise 4 – Oral Practice

- Present your problem and solution orally in 3–5 minutes.
- Record yourself and evaluate:
    - Clarity of expression
    - Logical flow of steps
    - Use of advanced vocabulary and formal academic tone

**5. Recommendations for Excellence**

- **Be precise and concise** – Avoid vague statements or unnecessary repetition.
- **Use formal structures** – Employ passive voice, relative clauses, and linking words to enhance clarity.
- **Illustrate points** – Use scenarios, examples, or analogies to explain abstract concepts.
- **Compare alternatives** – Briefly mention why other approaches may be less effective.
- **Anticipate questions** – Be prepared to explain your reasoning and clarify any uncertainties.

# MODULE 15: ORAL COMMUNICATION SKILLS

**Self-Study Section: Giving a Short Oral Report**

## Objectives:

By the end of this section, students should be able to:

- Deliver concise and coherent oral reports on academic or professional topics.
- Structure presentations logically, emphasizing clarity, relevance, and audience engagement.
- Use advanced academic vocabulary and formal English to explain ideas confidently.
- Handle questions professionally and respond effectively to audience queries.

**1. Key Components of a Short Oral Report**

1. **Introduction**
    - Begin by introducing yourself and your topic.
    - State the purpose and relevance of your report.
    - Provide a brief outline of the points to be covered.

    *Example*:
    *"Good afternoon, my name is Alex Novak. Today, I will present a brief report on effective strategies for time management in academic research. The report will cover three main points: identifying priorities, planning tasks efficiently, and monitoring progress."*

2. **Main Body**
    - Present key ideas in a logical sequence.
    - Emphasize clarity and coherence.
    - Include examples, evidence, or real-life scenarios to illustrate your points.
    - Highlight connections between concepts or steps in a process.
3. **Conclusion**
    - Summarize the main points concisely.
    - Reinforce the significance of the topic.
    - Optionally, suggest implications, recommendations, or areas for further discussion.
4. **Q&A or Interaction**
    - Invite questions from the audience.
    - Provide clear, structured, and concise responses.
    - Maintain a professional tone and confidence throughout the interaction.

**2. Advanced Vocabulary and Phrases**

### Introducing Your Report:

- *The focus of my short report is…*
- *I aim to present an overview of…*
- *This report highlights the key aspects of…*

**Presenting Ideas:**

- *The main consideration here is…*
- *A critical point to note is…*
- *It is essential to emphasize that…*
- *To illustrate this point, consider…*
- *Another significant aspect involves…*

**Transitioning Between Points:**

- *Moving on to the next point…*
- *Having discussed this, we now turn to…*
- *This naturally leads us to…*

**Concluding Statements:**

- *In conclusion, the key insights are…*
- *To summarize, we have examined…*
- *This report demonstrates the importance of…*
- *Further investigation or consideration could focus on…*

**3. Example Short Oral Report**

**Topic:** Time Management Strategies in Academic Work

**Introduction:**
*Today I will briefly discuss three strategies for improving time management in academic work. These strategies help prioritize tasks, plan efficiently, and monitor progress effectively.*

**Main Points:**

1. *Prioritizing Tasks:* Identify urgent and important tasks and allocate time accordingly.
2. *Planning Efficiently:* Use daily and weekly schedules to structure activities and avoid conflicts.
3. *Monitoring Progress:* Regularly review accomplishments and adjust plans as needed to stay on track.

**Conclusion:**
*In summary, prioritizing, planning, and monitoring are fundamental strategies for effective time management. Implementing these strategies enhances productivity, reduces stress, and ensures the timely completion of academic responsibilities.*

**Q&A:**

- *A common question might be: "How can you maintain flexibility while sticking to a schedule?"*
- *Answer: "Flexibility can be achieved by setting realistic deadlines, allocating buffer time, and adjusting plans based on unforeseen circumstances."*

**4. Self-Study Exercises**

### Exercise 1 – Written Outline

- Choose a professional or academic topic.
- Write a clear outline with introduction, main points, and conclusion.
- Include at least three examples or supporting points.

### Exercise 2 – Vocabulary Practice

- Create 10 sentences explaining your topic using advanced academic phrases listed above.

### Exercise 3 – Oral Presentation Practice

- Deliver a 2–3 minute oral report on your chosen topic.
- Record yourself and evaluate:
    - Clarity and fluency
    - Use of transitions and advanced vocabulary
    - Logical structure and coherence

### Exercise 4 – Peer Interaction

- Present your report to a peer or small group.
- Respond to at least two questions, demonstrating clarity, conciseness, and professionalism.

**5. Recommendations for Excellence**

- **Practice formal pronunciation** – Ensure key terms and phrases are articulated clearly.
- **Maintain a structured flow** – Use transitions to link points logically.
- **Engage the audience** – Make eye contact, use gestures, and emphasize key points.
- **Keep it concise** – Focus on essential information; avoid unnecessary details.
- **Prepare for questions** – Anticipate likely queries and prepare structured responses.

# MODULE 16: ADVANCED ACADEMIC COMMUNICATION

**Self-Study Section: Participating in Classroom Discussions**

## Objectives:

By the end of this section, students should be able to:

- Engage confidently and effectively in academic discussions.
- Express opinions, ask questions, and respond to peers using advanced English.
- Demonstrate critical thinking, analytical reasoning, and professional language.
- Maintain coherence, politeness, and respect in interactive classroom settings.

### 1. Key Strategies for Effective Participation

1. **Active Listening**
    - Focus on understanding the speaker's main points.
    - Take brief notes of critical ideas, questions, or examples.
    - Acknowledge the speaker's contribution before responding.

    *Example Phrases:*

    - *I see your point, and I would like to add…*
    - *That's an interesting perspective; however…*
    - *Could you clarify what you mean by…?*
2. **Clear and Structured Contributions**
    - Organize thoughts logically before speaking.
    - Begin with a topic sentence, provide supporting arguments, and conclude succinctly.
    - Avoid digressions or vague statements.

    *Example Phrases:*

    - *My main argument is that…*
    - *To support this, consider…*
    - *In conclusion, this suggests that…*
3. **Asking Insightful Questions**
    - Formulate questions that stimulate discussion or clarify points.
    - Use open-ended questions to encourage deeper analysis.
    - Avoid interrupting; wait for a natural pause.

    *Example Phrases:*

    - *How does this approach compare to…?*
    - *What would be the consequences if…?*
    - *Could you elaborate on…?*
4. **Responding to Others**
    - Paraphrase or summarize the peer's point before responding.
    - Respect differing opinions, and provide evidence or reasoning for your stance.
    - Maintain a professional and constructive tone.

*Example Phrases:*

- *I understand your perspective, but I would argue…*
- *You make a valid point; additionally…*
- *While I agree with part of your argument, I think…*

5. **Managing Disagreements**
   - Stay calm, polite, and objective.
   - Focus on ideas rather than personal opinions.
   - Suggest alternatives or compromises when appropriate.

*Example Phrases:*

- *I see your argument; however, another interpretation could be…*
- *Perhaps we could consider a different approach…*
- *I respect your viewpoint, yet I propose…*

**2. Advanced Vocabulary and Phrases**

**Expressing Opinions:**

- *From my perspective…*
- *I contend that…*
- *It seems evident that…*
- *Based on this analysis…*

**Agreeing and Adding:**

- *I fully agree with this observation, and I would like to add…*
- *That's an important point, and furthermore…*
- *I would like to expand on what has been said…*

**Disagreeing Respectfully:**

- *While I appreciate your argument, I must point out…*
- *I see your perspective, but I would argue…*
- *An alternative viewpoint could be…*

**Clarifying and Questioning:**

- *Could you clarify what you mean by…?*
- *What are the implications of…?*
- *How does this relate to…?*

**Summarizing Contributions:**

- *To summarize, the main points are…*
- *In essence, we have discussed…*
- *Overall, the discussion highlights…*

### 3. Example Classroom Discussion Scenario

**Topic:** Effective Strategies for Academic Research

- **Student A:** *I believe that time management is the most critical skill for research success.*
- **Student B:** *I see your point, and I would add that collaboration with peers is equally important.*
- **Student C:** *Could you clarify how collaboration improves productivity?*
- **Student B:** *Certainly. Working with peers allows for idea exchange, immediate feedback, and division of tasks, which enhances efficiency.*
- **Student D:** *While I agree with both points, I would also argue that self-discipline and focus are indispensable for consistent progress.*

### 4. Self-Study Exercises

#### Exercise 1 – Preparing Contributions

- Choose an academic topic relevant to your studies.
- Prepare at least three points you can contribute, with supporting reasoning.

#### Exercise 2 – Role-Playing

- Pair with a classmate or practice online.
- Simulate a classroom discussion using advanced phrases.
- Take turns expressing opinions, asking questions, and responding to peers.

#### Exercise 3 – Reflection and Feedback

- Record your participation in a mock discussion.
- Evaluate clarity, vocabulary, logical flow, and engagement.
- Identify areas for improvement and plan strategies to enhance performance.

#### Exercise 4 – Critical Questioning

- Prepare five insightful questions on a topic from recent lectures or readings.
- Practice asking these questions in a structured and professional manner.

### 5. Recommendations for Excellence

- **Plan before speaking** – Structure points logically and concisely.
- **Use formal academic language** – Avoid slang and colloquial expressions.
- **Engage actively** – Listen carefully, respond thoughtfully, and ask clarifying questions.
- **Maintain professionalism** – Respect all opinions, even if you disagree.
- **Practice regularly** – Rehearse discussions to build confidence and fluency.

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Математика) денної та заочної форми навчання з метою організації самостійної роботи з курсу "Іноземна мова за професійним спрямуванням".

Матеріал призначений для використання як навчально-методичний посібник з дисципліни "Іноземна мова за професійним спрямуванням ".

Затверджено до використання у навчальному процесі
на засіданні кафедри математики та інформатики
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