

FORMAL CLASSROOM PLAN — 120 minutes

Discipline: Mathematics A

Year: 10th

Theme: Non-Euclidean Geometries

Type of Lesson: Research + Synthesis + Presentation

1. Gerais Objectives

- Understand the historical motivation of non-Euclidean geometries.
- Identify fundamental properties of elliptic and hyperbolic geometries.
- Develop mathematical research skills.
- Produce and communicate rigorous mathematical syntheses.

2. Specific Objectives

By the end of the lesson, the student should be able to:

- Describe differences between Euclidean, elliptical, and hyperbolic geometry.
- Explain the role of the 5th postulate in the construction of geometric systems.
- Recognize real-world examples of positive and negative curvature spaces.
- Develop a structured abstract on a non-Euclidean geometry.
- Communicate research results orally.

3. Competencies of the Students' Profile

- Critical and analytical thinking
- Mathematical rigor and precision
- Communication and argumentation
- Collaborative work
- Autonomy and responsibility

4. Contents

- Euclid's postulates
- 5th postulate and historical problem
- Elliptical Geometry (positive curvature)
- Hyperbolic Geometry (Negative Curvature)

- Notion of parallelism in different geometries
- Sum of the angles of a triangle
- Geometric models (sphere, Poincaré disk)

5. Methodology

- Collaborative work
- Targeted research
- Dialogued exposition
- Scientific communication
- Individual overview

6. Class Description (120 min)

1) Reception and activation (10 min)

- Review of Euclid's postulates.
- Problem-question: *"What happens if the 5th postulate fails?"*

2) Mini-exposure (15 min)

- Brief presentation of elliptic and hyperbolic geometries.
- Visual and intuitive examples.

3) Organization of the investigation (5 min)

- Formation of groups.
- Distribution of themes and worksheets.

4) Group research (40 min)

- Guided research with guiding questions.
- Record of conclusions.

5) Abstract production (20 min)

- Creation of poster/slide/summary sheet.

6) Presentation of the groups (20 min)

- 3-minute presentation per group.
- Observation grid by colleagues.

7) Final synthesis (10 min)

- Guided discussion.
- Individual record of 3 key ideas.

7. Evaluation

Training

- Direct observation
- Participation
- Quality of research
- Summary clarity
- Oral communication

Summative (if applicable)

- Summary evaluation grid
- Oral presentation grid
- Individual Responses from Part E

8. Resources

- Worksheet
- Computers/tablets
- Interactive whiteboard
- Geometric model images
- A3 paper / digital tools

9. Pedagogical Differentiation

- Heterogeneous groups
- Additional support for students with synthesis difficulties
- Possibility of alternative formats (mind map, short video)
- Extension tasks for advanced learners (e.g. connection to General Relativity)