



Sapienta
Academy

Sapienta Core Concept Learning

Secondary 5 – SO Mathematics

Overview Document (English Version)

Introducing Sapienta Core Concept Learning

What is this document ?

This document presents the scope and pedagogical approach of Sapienta Academy's *Core Concept Learning* program for Secondary 5 SO Mathematics.

We focus not just on solving problems, but on building **true mathematical understanding** through carefully constructed modules that spark curiosity and support conceptual growth.

Each module uses :

- Real-life phenomena to explore mathematical ideas
- Progressive construction of meaning (not immediate rules!)
- Visually clear, write-in spaces to support student interaction
- A tone that's rigorous, but fun, and sometimes even a little cheeky

Made by top Canadian math educators, these resources are unlike any textbook you've seen. They're designed with years of pedagogical insight, and a deep love of math.

Who can use this document ?

- Teachers can use these modules to guide weekly lessons.
- Tutors can use them in sessions for meaningful math discussions.
- Students can use them independently to explore mathematical ideas and boost their understanding.

How to Use this Document

This document is not a traditional textbook. It's a conversation.

At Sapienta, we believe that math understanding is built *through dialogue*. That's why our resources are designed around thought-provoking questions, step-by-step discoveries, and space for learners to reflect and write.

For Students

- Don't rush to find answers — *think out loud*, write your ideas, explore examples.
- Use a pencil and annotate freely : math is not a clean process.
- Whenever possible, talk through your reasoning with a peer, parent, tutor, or teacher.
- Studying alone? Use **DiaLogos**, our AI dialogue partner, to keep the learning interactive.

For Tutors and Teachers

- Resist the urge to lecture — let students grapple with ideas first.
- Use each section to initiate a meaningful dialogue and build the concept together.
- These documents are fully aligned with the latest QEP Progression of Learning and provide a perfect scaffold for targeted instruction.

Step-by-step usage

1. Start with the first question in the section. Let the student share ideas before giving explanations.
2. Encourage exploration — even if answers are messy or incomplete.
3. Use writing spaces and drawing prompts to slow down thinking and build clarity.
4. Revisit earlier examples once the formal concept appears.
5. Conclude the section with a discussion or a summary (Math Journal recommended!).

When used as intended, this document becomes more than a worksheet — it becomes a tool for *growing mathematical thought*.

Philosophy Behind the Document

The Sapienta Core Concept Learning series is inspired by the principles of **Realistic Mathematics Education (RME)**. In this approach, mathematical ideas are not delivered as fixed rules, but are *constructed by the student* through carefully designed experiences that mirror both the logic and history of how these ideas emerged.

Each module is designed to let learners :

- **Glore & Explore** the world of the concept, through activities, metaphors, games, and real-life contexts.
- **Frame & Name** the mathematical structures behind what they've discovered.
- Take **A Peek into the Past** to see how humans, across time, developed similar understandings.

These are not passive notes. The learner must stay active :

- Activities are open-ended and reflective.
- Concepts emerge from guided questioning, not from definitions.
- Practice exercises solidify concepts only after they're built from the ground up.

This structure supports **deep learning** by engaging both the student's reasoning and imagination, helping them truly "own" the math they learn.

Meet DiaLogos : Your Thought Partner in Math



When students are alone with their math thoughts, without a teacher, tutor, or classmate, learning can stall. That's where **DiaLogos** steps in.

What is DiaLogos ?

DiaLogos is Sapienta's intelligent, dialogue-based, AI tutor assistant, designed to think *with* students, not for them.

Unlike regular chatbots, DiaLogos :

- **Doesn't give away the answers**
- **Asks questions that ignite student thinking**
- **Encourages reasoning, self-explanation, and curiosity**
- **Supports students when a human guide isn't around**

DiaLogos is developed by a team of Quebec-certified educators, mathematicians, and professional programmers. Its mission is to expand students' *cognitive boundaries* through meaningful, thought-provoking dialogue.

Unlike traditional chatbots that offer answers too quickly and short-circuit the learning process, **DiaLogos** is designed to foster agency and reflection. It doesn't give answers, it gives students better vision and helps them understand better.

DiaLogos is the first tutoring assistant in Quebec built not to replace real thinking, but to complete the learning process. Whether you're stuck on a concept or trying to deepen your understanding, this AI-powered tool guides you like a curious mentor : never giving too much, always nudging you further.

Use it when you're working independently, between tutoring sessions, or anytime you want to think more clearly, more deeply, and more confidently.

Table of Contents

Included in this document

Chapter 1 – Linear Optimization

- Constraints and feasible regions
- Optimization in two variables
- Linear programming in applied contexts

Chapter 2 – Real Functions with Basic Operations

- Square root functions and their properties
- Absolute value functions and transformations
- Rational functions : behavior and restrictions

Chapter 3 – Exponential and Logarithmic Functions

- Exponential models in real phenomena
- Logarithms and inverses of exponential functions
- Solving exponential and logarithmic equations

Chapter 4 – Trigonometric Functions

- Radian measure and periodicity
- Sine, cosine, and tangent functions
- Transformations of trigonometric functions
- Solving trigonometric equations

Chapter 5 – Conic Sections

- Introduction to conics : circles, ellipses, parabolas, hyperbolas
- Algebraic forms and geometric properties
- Applications of conic sections in real contexts

Chapter 6 – Vectors

- Vector representation in the plane
- Operations with vectors (addition, scalar multiplication)
- Dot product and geometric interpretations
- Applications to displacement and forces