



(School Name)

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Course Revisor(s) \_\_\_\_\_

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**COURSE OUTLINE**

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Course Name: **Principles of Mathematics  
Grade 9 Academic**

Course Code: **MPM1D**  
Ministry Course Code: **MPM1D**

Course Type: **Academic**      Grade Level: **9**      Credit Value: **1.0**

Ministry Guideline/Date: **The Ontario Curriculum, Grades 9 and 10, Mathematics, 2005**

**Course Description/Rationale:**

This course enables students to develop an understanding of mathematical concepts related to algebra, analytic geometry, and measurement and geometry through investigation, the effective use of technology, and abstract reasoning. Students will investigate relationships, which they will then generalize as equations of lines, and will determine the connections between different representations of a linear relation. They will also explore relationships that emerge from the measurement of three-dimensional figures and two-dimensional shapes. Students will reason mathematically and communicate their thinking as they solve multi-step problems.

**Textbook(s)/Essential Resource Materials:**

- Nelson Mathematics 9, 1999
- Manipulatives (Algebra Tiles, 3-D solids (power solids) )
- Technology Supports (Geometer's Sketchpad, Computer Algebra Systems, Graphing Calculators)
- Think Literacy, Mathematics, 2004
- Algebra with Pizzazz series
- TIPS Binder (Targeted Implementation and Planning Supports) [www.curriculum.org/occ/tips/](http://www.curriculum.org/occ/tips/)
- Notable Strategies: [www.curriculum.org/occ/strategies/index.shtml#Grade9](http://www.curriculum.org/occ/strategies/index.shtml#Grade9)

**Overall Expectations of the Course:**

<b>Strand</b>	<b>By the end of this course, students will:</b>
Number Sense and Algebra	<ul style="list-style-type: none"><li>• demonstrate an understanding of the exponent rules for multiplication and division and apply them to simplify expressions;</li><li>• manipulative numerical and polynomial expressions, and solve first-degree equations;</li></ul>
Linear Relations	<ul style="list-style-type: none"><li>• apply data-management techniques to investigate relationships between two variables;</li><li>• demonstrate an understanding of the characteristics of a linear relation;</li><li>• connect various representations of a linear relation;</li></ul>
Analytic Geometry	<ul style="list-style-type: none"><li>• determine the relationship between the form of an equation and the shape of its graph with respect to linearity and non-linearity;</li><li>• determine, through investigation, the properties of the slope and y-intercept of a linear relation;</li><li>• solve problems involving linear relations;</li></ul>
Measurement and Geometry	<ul style="list-style-type: none"><li>• determine, through investigation, the optimal values of various measurements</li><li>• solve problems involving the measurements of two-dimensional shapes and the surface areas and volumes of three-dimensional figures;</li><li>• verify, through investigation facilitated by dynamic geometry software, geometric properties and relationships involving two-dimensional shapes, and apply the results to solving problems;</li></ul>

**Outline of Course Content:**

Unit	Title of Unit	No. of Periods
1	Trends in Data	8
2	Linear Relationships	10
3	Linear Models	14
4	Algebra and Solving Equations	9
5	Modelling Using Equations	7
6	Investigating Geometric Relationships	8
7	Measurement	13
8	Non-Linear Relationships	10
9	Review and Final Summative Evaluation	11
	TOTAL	90

**Teaching/Learning Strategies:**

- use of technology effectively and appropriately
- rich problem solving situations
- mastery of essential knowledge and skills, in context of various topics
- exploration of applications
- hands-on activities
- the study of examples followed by practice
- teacher-directed lessons
- method of inquiry, mathematical modelling
- determine, through investigation, using a variety of tools
- concise communication of reasoning, orally and in writing

**Assessment and Evaluation of Student Performance:**

Term (70%)	Summative Assessment (30%)
quizzes	final exam
performance tasks	summative performance task(s)
assignments, projects	components from EQAO assessment
portfolio	
unit tests	
journals	

**Evaluation (components)/Weighting of Evaluation Components:**

Category of Achievement Chart	%
Knowledge and Understanding	35
Inquiry, Thinking, Problem Solving	15
Communication	15
Application	35

**Additional Information:**

Additional considerations that have particular relevance for program planning in mathematics are noted here.

**Teaching Approaches.** Successful classroom practices involve students in activities that require higher-order thinking, with an emphasis on problem solving. Students in a mathematics class typically demonstrate diversity in the ways they learn best. It is important, therefore, that students have opportunities to learn in a variety of ways - individually, cooperatively, independently, with teacher direction, through hands-on experience, through examples followed by practice. Even at the secondary level, manipulatives are necessary tools for supporting the effective learning of mathematics. These concrete learning tools invite students to explore and represent abstract mathematical ideas in varied, concrete, tactile and visually rich ways. Manipulatives are also a valuable aid to teachers. By analysing students' concrete representations of mathematical concepts and listening carefully to their reasoning, teachers can gain useful insights into students' thinking and provide supports to help enhance their thinking.

**Education for Exceptional Students.** In planning mathematics courses for exceptional students, teachers should begin by examining both the curriculum expectations for the course and the needs of the individual student to determine which of the following options is appropriate for the student:

- no accommodations or modifications;
- accommodations only;
- modified expectations with the possibility of accommodations;

In an effort to help students understand concepts, teachers may include more concrete experiences, vary the pace of the learning, use additional examples, or insert cumulative reviews. The appropriate use of technologies (e.g., concrete materials, dynamic geometry software) will support the teacher in meeting the needs of exceptional students as set out in their Individual Education Plan. For more information see pages 24 and 25 in the curriculum document.

**The Role of Technology in the Curriculum.** Information and communication technology (ICT) provides a range of tools that can significantly extend and enrich teachers' instructional strategies and support students' learning in mathematics. Teachers can use ICT tools and resources both for whole-class instruction and to design programs that meet diverse student needs. Technology can help to reduce the time spent on routine mathematical tasks and to allow students to devote more of their efforts to thinking and concept development

Applications such as databases, spreadsheets, dynamic geometry software, dynamic statistical software, graphing software, computer algebra systems (CAS), word-processing software, and presentation software can be used to support various methods of inquiry in mathematics.

The presence of technology as part of learning mathematics makes many new things possible, but it also places an increasing importance on the ability of students to make mental judgements about expected results. For example, the student who uses a calculator to perform an arithmetic calculation should have the habit of using estimation to judge the reasonableness of the answer produced. Similarly, the student who produces a graph using technology should be capable of creating a mental approximation of the graph as a verification of the image on the screen.

**English As a Second Language and English Literacy Development (ESL/ELD).** Teachers of mathematics must incorporate appropriate strategies for instruction and assessment to facilitate the success of the ESL and ELD students in their classrooms. These strategies include:

- modification of some or all of the course expectations, based on the student's level of English proficiency;
- use of a variety of instructional strategies (e.g., extensive use of visual cues, manipulatives, pictures, diagrams, graphic organizers, attention to clarity of instructions; modelling of preferred ways of working in mathematics; previewing of textbooks; pre-teaching of key specialized vocabulary; encouragement of peer tutoring and class discussion; strategic use of students' first languages);
- use of a variety of learning resources (e.g., visual material, simplified text, bilingual dictionaries, culturally diverse materials);
- use of assessment accommodations (e.g., granting of extra time; use of alternative forms of assessment, such as oral interviews, learning logs, or portfolios; simplification of language used in problems and instructions);

Students who are no longer taking ESL or ELD courses may still need program adaptations to be successful.

**Career Education.** Teachers should promote students' awareness of careers involving mathematics by exploring applications of concepts and providing opportunities for career-related project work. Students should be made aware that mathematical literacy and problem solving are valuable assets in an ever-widening range of jobs and careers in today's society. The knowledge and skills students acquire in mathematics courses are useful in fields such as science, business, engineering, and computer studies; in the hospitality, recreation and tourism industries; and in the technical trades.

**Literacy:** Literacy skills can play an important role in student success in mathematics courses. Many of the activities and tasks students undertake in math courses involve the use of written, oral, and visual communication skills. The language of mathematics includes special terminology. The study of mathematics consequently encourages students to use language with greater care and precision and enhances their ability to communicate effectively. The Ministry of Education has facilitated the development of materials to support literacy instruction across the curriculum:

- *Think Literacy: Cross-Curricular Approaches, Grades 7-12, 2003*
- *Think Literacy, Cross-Curricular Approaches, Grades 7-12 - Mathematics: Subject-Specific Examples, Grades 7-9, 2004*

**Promoting Attitudes Conducive to Learning Mathematics:** Students' attitudes have a significant effect on how they approach problem solving and how well they succeed in mathematics. Teachers can help students develop the confidence they need by demonstrating a positive disposition towards mathematics.

Teachers need to:

- be accepting, patient, and understanding;
- defuse tense situations if they arise;
- make mathematics relevant by connecting the context with the student's life experience;
- provide many opportunities for students to be successful;
- set up programs for peer tutoring;
- use a variety of assessment techniques (journals, interviews, portfolios, projects);
- comment positively on material that is assessed;
- be aware of cultural biases.