

# Royal St. George's College

## Course Outline

Department: Mathematics

Course developer: Alex Shum                      Development date:  
21 August 2002

Course reviser: Alex Shum

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Date	01 May 2003
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Course title: Principles of Mathematics

Grade level: Grade 9

Course type: Academic

Ministry Code: MPM1D                      Credit Value: 1.0

Prerequisite(s): None

Ministry Documents: The Ontario Curriculum Grades 9 and 10, Mathematics, Revised 2005.

Growing Success: Assessment, Evaluation and Reporting in Ontario, 2010.

## Course Description

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.

# **Overall Curriculum Expectations**

By the end of this course, students will:

## **Number Sense and Algebra**

- demonstrate an understanding of the exponent rules of multiplication and division, and apply them to simplify expressions
- manipulate numerical and polynomial expressions, and solve first-degree equations.

## **Linear Relations**

- apply data-management techniques to investigate relationships between two variables;
- demonstrate an understanding of the characteristics of a linear relation;
- connect various representations of a linear relation.

## **Analytic Geometry**

- determine the relationship between the form of an equation and the shape of its graph with respect to linearity and non-linearity;
- determine, through investigation, the properties of the slope and y-intercept of a linear relation;
- solve problems involving linear relations.

## **Measurement and Geometry**

- determine, through investigation, the optimal values of various measurements;
- solve problems involving the measurements of two-dimensional shapes and the surface areas and volumes of three-dimensional figures;
- verify, through investigation facilitated by dynamic geometry software, geometric properties and relationships involving two-dimensional shapes, and apply the results to solving problems.

## Outline of the Course Content

This course has seven units of study and a total of 110 hours of instruction.

\* estimate; actual time may vary

UNIT	UNIT TITLE	ALLOCATED HOURS	OVERALL EXPECTATION	EVALUATION
1	Linear Relations Chapter 1 Mathematical Process Chapter 2 Relations	15	demonstrate an understanding of the exponent rules of multiplication and division, and apply them to simplify expressions apply data-management techniques to investigate relationships between two variables; demonstrate an understanding of the characteristics of a linear relation; connect various representations of a linear relation.	Presentation of Reasoning Mini Test Unit Test Project
2	Number Sense and Algebra Chapter 3 Polynomial Chapter 4 Equations	30	demonstrate an understanding of the exponent rules of multiplication and division, and apply them to simplify expressions manipulate numerical and polynomial expressions, and solve first-degree equations.	Presentation of Reasoning Mini Test Unit Test
3	Analytic Geometry Chapter 5 Modelling with Graphs Chapter 6 Analyse Linear Relations	40	demonstrate an understanding of the characteristics of a linear relation; connect various representations of a linear relation; determine the relationship between the form of an equation and the shape of its graph with respect to linearity and non-linearity; determine, through investigation, the properties of the slope and y-intercept of a linear relation; solve problems involving linear relations.	Presentation of Reasoning Mini Test Unit Test Project
4	Measurement and Geometry Chapter 7 Geometric Relationships Chapter 8 Measurement Relationships Chapter 9 Optimizing Measurements	25	determine, through investigation, the optimal values of various measurements; solve problems involving the measurements of two-dimensional shapes and the surface areas and volumes of three-dimensional figures; verify, through investigation facilitated by dynamic geometry software, geometric properties and relationships involving two-dimensional shapes, and apply the results to solving problems.	Presentation of Reasoning Mini Test Unit Test

## **Teaching/Learning Strategies**

At Royal St. George's College, students in mathematics courses often "discover" new concepts by examining problems and patterns through classroom discussions, exploration, and/or by collecting and analysing data. They will learn also key concepts from instruction by the teacher, guided problem-solving, group discussion, instructional videos, and examining examples of solutions from other sources. Some activities will require the use of dynamic geometry software (The Geometer's Sketchpad) and/or graphing technology (TI-83-4 Plus Graphing Calculator, MS Excel/Numbers). They will practise new skills by solving questions independently, through discussion with their peer(s)/teacher, presenting their reasoning with appropriate mathematical form and vocabulary, and in responses to items on tests and assignments.

To make new learning more accessible to students, at Royal St. George's College, mathematics teachers will draw upon the knowledge and skills students have acquired in previous years to help activate prior knowledge. It is important to assess where students are in their mathematical growth and to bring them forward in their learning of new ideas.

To apply their knowledge effectively and to continue to learn, students must have a solid conceptual and practical foundation in mathematics. Successful classroom practices involve students in activities that require higher-order thinking, with an emphasis on problem solving. Students who have completed the elementary program should have a good grounding in the investigative approach to learning new concepts, including the inquiry model of problem solving. This approach is still fundamental in the Grade 9 and 10 program; however, strong numeracy, algebraic and graphical skills remain essential to success.

Students in mathematics classes typically demonstrate diversity in the way they best learn. Our students have opportunities to learn in a variety of ways. They explore concepts individually and cooperatively; independently and with teacher direction; through hands-on experience; and through the study of examples followed by practice. In mathematics, students are required to learn concepts, procedures, and processes and to acquire skills. They become competent in these various areas with the aid of the instructional and learning strategies best suited to the particular type of learning. There is no single, correct way to teach or to learn mathematics. At Royal St. George's College, the approaches and strategies used in the classroom to help students meet the expectations of the curriculum will vary according to the object of the learning and the needs of the learner.

Learning is enhanced when embedded in a context. Well-chosen contexts for learning are those that are broad enough to allow students to explore and develop initial understanding, to identify and develop relevant skills, and to gain experience with interesting applications of new knowledge. Such rich environments open the door for students to see the "big ideas" of mathematics - the major underlying principles, pattern or relationship. Understanding key principles will encourage students to continue using mathematical reasoning throughout their lives.

In the Senior School of Royal St. George's College, online resources, computer and calculator technology as well as manipulatives are used to support the effective learning of mathematics. These tools invite students to explore and represent abstract mathematical ideas in varied, concrete, tactile, and/or visually rich ways. Through the analysis of students' analysis and representations of mathematical concepts and by listening carefully to their reasoning, teachers can gain useful insights into students' thinking and provide supports to help enhance their thinking.

Process and content, together, are important aspects of learning mathematics. An emphasis on one over the other tends to reduce the usefulness and the effectiveness of the learning. It is the integration of various aspects of mathematical knowledge that provides a powerful tool for reasoning and problem solving. This curriculum reflects a meaningful blend of both process and content.

Since the overriding aim of this course is to help students use mathematical language and concepts skillfully, confidently and flexibly, a wide variety of instructional strategies are used to provide learning opportunities to accommodate a variety of learning styles, interests and ability levels.

These include:

Using computer and calculator technology	Solving problems	Investigations
Using internet and video resources	Direct instruction	Independent Learning
Modelling and analysing models	Making presentations	Posing problems
Collecting data and using manipulatives	Cooperative tasks	Self-Assessments

### Examples of Resources

1. in-class, online and electronic notes and activities, hand-outs, presentation slides, and videos, online resources, others texts and apps;
2. Textbook:  
 McGraw-Hill Ryerson Principles of Mathematics 9 © 2006  
 Authors: Dearling, Chris, Wayne Erdman, Fred Ferneyhough et al.  
 Publisher: McGraw-Hill Ryerson  
 ISBN: 0070973199 ISBN-13: 9780070973190
3. online course conference or calendar;
4. various concrete materials, e.g., manipulative items, models of geometric shapes;
5. calculator and computer software, e.g., graphing technology, spreadsheet, geometry sketchpads
6. links to internet websites

## **Strategies for the Assessment and the Evaluation of Student Performance**

Assessment and evaluation in this course will be based on the provincial curriculum expectations and the achievement levels.

Assessment and evaluation will be based on the categories of knowledge and skills and the achievement level descriptions given in the Achievement Chart for this course.

The percentage grade will represent the quality of the student's overall achievement of the expectations for this course and the corresponding level of achievement as described in the Achievement Chart.

The following chart details the types of assessment and evaluation techniques and instruments that will be used in this course.

<b>Strategy</b>	<b>Purpose</b>	<b>Who</b>	<b>Assessment Tool</b>
Exam	Assessment of Learning	Teacher	Marking Scheme
Test	Assessment of Learning	Teacher	Marking Scheme
Mini-Test	Assessment as Learning	Teacher	Marking Scheme
	Assessment of Learning		
Quiz	Assessment for Learning	Student / Peer / Teacher	Marking Scheme
	Assessment as Learning		
Project / Assignment	Assessment for Learning	Student / Peer / Teacher	Rubric / Marking Scheme
	Assessment as Learning		
	Assessment of Learning		
Analysis of student work, reasoning, homework	Assessment for Learning	Teacher	Anecdotal / Checklist / Marking Scheme
	Assessment as Learning		
	Assessment of Learning		

## **The Final Grade:**

The evaluation for this course is based on the student's achievement of curriculum expectations and the demonstrated skills required for effective learning.

The percentage grade represents the quality of the student's overall achievement of the expectations for the course and reflects the corresponding level of achievement as described in the achievement chart for the discipline.

A credit is granted and recorded for this course if the student's grade is 50% or higher. The final grade for this course will be determined as follows:

- A. 70% of the grade will be based upon evaluations conducted throughout the course. This portion of the grade will reflect the student's most consistent level of achievement throughout the course, although special consideration will be given to more recent evidence of achievement.
  
- B. 30% of the grade will be based on a final examination administered at the end of the course. This examination will be based on an evaluation of achievement from all four categories of the Achievement Chart for the course and of expectations from all units of the course.

The final mark will be determined in the following manner:

### **June Report**

	<b>Unit Test</b>	<b>Mini Test</b>	<b>Projects</b>	<b>Presentation of Reasoning</b>	<b>Final Exam</b>	<b>Total</b>
<b>Total</b>	<b>30%</b>	<b>20%</b>	<b>10%</b>	<b>10%</b>	<b>30%</b>	<b>100%</b>
	<b>70% Cumulative In-Class Mark</b>				<b>30% Summative End of Year Mark</b>	

The report card will focus on two distinct but related aspects of student achievement; the achievement of curriculum expectations and the development of learning skills. The report card will contain separate sections for the reporting of these two aspects.