Leading MATH Success

TIPS4RM Targeted Implementation and Planning Supports for Revised Mathematics

Grade 10 Applied

REVISED

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Grade 10 Applied: Content and Reporting Targets

Explore the Grade 10 Applied mathematics program and connect to school, work, and home contexts and to possible Grade 11 and 12 pathways. This is an opportunity to help students develop pride in their chosen pathway and to recognize various Grade 11 opportunities they can choose from and prepare for.

Unit 1 – Similar Triangles	Unit 2 – Trigonometry	Unit 3 – Equations of Lines
Measurement and Trigonometry • Similar Triangles	**Measurement and Trigonometry** • Trigonometry of Right Triangles	**Modelling Linear Relations** • Equations of Lines
Rationale		
Positioning similar triangles first: • Similar triangles activities provide the opportunity for authentic tasks that appeal to kinaesthetic learners, appropriate at the beginning of the Grade 10 Applied program. • This unit extends the 'proportional relationships' and 'proportional reasoning' sub-groupings from earlier grades. • Teachers can observe students' reasoning, representing, and problem-solving skills in contexts that can be illustrated with concrete materials and visual representations. • Segue from constant ratios of corresponding sides in similar triangles to the primary trigonometric ratios.	**Positioning trigonometry of right triangles after similar triangles:** • Students make and use clinometers in doing authentic tasks. • Students formalize trigonometric vocabulary. • Segue to Unit 3 – The tangent ratio for a triangle drawn on the plane is the slope of the line segment drawn on the plane.	**Progression from Grade 9 and setting the stage for Unit 4:** • Students gather data that can be represented as a linear relation and data that can be represented as a quadratic relation. • Students contrast the tables of values and the constant differences for linear and quadratic relations. • Students briefly revisit Grade 9 models for linear relationships to see the need to compare and analyse lines using m and b. • Move from context-connected to abstract examples of a line, then go back to contexts when introducing systems of lines. • Graphing lines from their equations leads to graphical solutions for systems of linear equations in Unit 4.

Unit 4 – Linear Systems	Unit 5 – Introduction to Quadratic Relations	Unit 6 – Quadratic Relations of the Form $y = ax^2 + bx + c$	Unit 7 – Surface Area and Volume
Modelling Linear Relations • Solving Systems of Linear Equations Algebraically	**Quadratic Relations** • Graphical Models of Quadratic Relationships **Modelling Linear Relations** • Solving Systems of Linear Equations Graphically	**Quadratic Relations** • Algebraic Models of Quadratic Relationships • Applications of Quadratics	**Measurement and Trigonometry** • Surface Area and Volume
Rationale			
Positioning systems of linear equations here: • Algebraic methods are introduced as a means of finding exact solutions to linear systems. • This is another opportunity for students to develop concepts and skills connected to linear functions. In sequencing two more units after this one, time is available for providing remediation for students who have not yet mastered essential linear concepts and skills.	**Considering linear and quadratic relations together:** • Some experiments will result in linear relations; others quadratic. • Constant differences in tables of values can be contrasted. **Solving graphically before algebraically** • Graphical solutions appeal to visual learners. • Students will be able to return to graphical methods to verify algebraic work in Units 5 and 7.	**Positioning quadratic relations here:** • Further work on quadratic functions and other non-linear functions will be done in Grades 11 and 12.	**Positioning surface area and volume here:** • Investigations and problem-solving activities in this unit provide the opportunity for authentic tasks that appeal to kinaesthetic learners.

Assessment and Evaluation

The primary purpose of assessment and evaluation is to improve student learning. Information gathered through assessment helps teachers to determine students' strengths and weaknesses in their achievement of the curriculum expectations in each subject/course in each grade. This information also serves to guide teachers in adapting curriculum and instructional approaches to students' needs and in assessing the overall effectiveness of the programs and classroom practices.

Assessment is the process of gathering information from a variety of sources (including assignments, day-to-day observations, conversations or conferences, demonstrations, projects, performances, and tests) that accurately reflects how well a student is achieving the curriculum expectations in a subject/course. As part of assessment, teachers provide students with descriptive feedback that guides their efforts towards improvement. Evaluation refers to the process of judging the quality of student work on the basis of established criteria, and assigning a value to represent that quality. (Growing Success, Ministry of Education, 2008, page 1-i)

The eleven guiding principles in Growing Success ensure that assessment, evaluation, and reporting are **fair, reliable and focused on improving student learning**. They are the backbone of all assessment, evaluation, and reporting policy. (Growing Success, Ministry of Education, 2008, page 2-i)

Assessment must be based on the four categories of the achievement chart and include the mathematical processes. The following chart provides a connection between the two:

Connecting Achievement Chart and Mathematical Processes

Category	
Knowledge and Understanding	Procedural Knowledge Conceptual Understanding
Category	**Processes**
Thinking	Problem Solving Reflecting Reasoning and Proving
Communication	Communicating Representing
Application	Selecting Tools and Strategies Connecting

All curriculum expectations must be accounted for in instruction, but evaluation focuses on students' achievement of the overall expectations. A student's achievement of the overall expectations is evaluated on the basis of his or her achievement of related specific expectations. The overall expectations are broad in nature, and the specific expectations define the particular content or scope of the knowledge and skills referred to in the overall expectations. Teachers will use their professional judgement to determine which specific

expectations should be used to evaluate achievement of the overall expectations, and which ones will be covered in instruction and assessment (e.g., through direct observation) but not necessarily evaluated. (Growing Success, Ministry of Education, 2008, page 4-i)

Summative Evaluation

Students in applied level courses require evaluations that are varied and appeal to their learning style. A balance between pencil and paper and performance based evaluations provide students with opportunities to demonstrate their understanding of concepts. Performance based evaluations provide teachers with opportunities to assess the important concepts in the course through the mathematical processes.

Samples of pencil and paper and performance based evaluations are included in this resource. It is important for teachers to be aware at the beginning of the course of the skills and knowledge expected of the students on those evaluations, so that students are appropriately prepared for them by having similar opportunities during the course.

The units are sequenced such that a strand is covered on two consecutive units. The summative evaluation for units 1, 3 and 5 could focus on acquiring knowledge and applying concepts. The summative evaluations for units 2, 4 and 6 could be a performance based evaluation covering both units that focuses on the higher order thinking skills: thinking and communicating.

Manipulatives and Technology

Manipulatives are necessary tools for supporting the effective learning of mathematics by all students. These learning materials invite teachers and students to explore and represent abstract mathematical ideas in varied, concrete, tactile, and visually rich ways. (Leading Math Success, 2004, page 48)

Manipulatives allow students to concretely explore mathematical relationships that will later be translated into symbolic form. The key to the successful use of manipulatives lies in the bridge – which must be built by the teacher – between the artifact and the underlying mathematical concepts. The mathematics is in the connections, not the objects. (Leading Math Success, 2004, page 32)

In an effective mathematics program, students learn in the presence of technology. Technology should influence the mathematics content taught and how it is taught. Powerful assistive and enabling computer and handheld technologies should be used seamlessly in teaching, learning, and assessment. (Leading Math Success, 2004, page 47)

Technology can benefit all students, especially those at risk, by reducing the time spent on routine mathematical tasks and by creating opportunities for thinking and concept development. (Leading Math Success, 2004, page 57)

Cooperative Learning

Students in applied courses usually have kinaesthetic and interpersonal learning styles so cooperative learning strategies can make a strong contribution towards creating an enriched learning environment and provides opportunities to assess student learning skills.

Successful cooperative learning involves more than just putting students into groups. It is learning and working together towards a common goal. Deliberate and planned instruction in social skills is usually necessary in order for cooperation among group members to occur. Explicit instruction and continuing reinforcement is necessary for productive cooperative learning. Extensive research on cooperative grouping indicates that such groupings are likely to have positive effects on achievement and other social and psychological characteristics. (Leading Math Success, 2004, page 32)

Successful cooperative learning includes five elements: positive interdependence, face-to-face interaction, individual and group accountability, interpersonal and small-group skills, and group processing (Johnson & Johnson, 1994, as cited in Bennett & Rolheiser, 2001).

Social skills – such as encouraging others, disagreeing in an agreeable way, taking turns, including all participants, active listening, and summarizing – play a valuable role in mathematics learning. Using these social skills, students can clarify their thinking, make connections, and recall specific mathematics skills, strategies, or concepts. (Leading Math Success, 2004, page 43)

Lesson Planning (Match Template)

The lessons and assessments have been created using the MATCH template from the TIPS4RM resource. The acronym MATCH is organized around a three part lesson, paying attention to:
Minds on…getting students mentally engaged in the first few minutes of class
Action! the main portion of the lesson where students investigate new concepts
Consolidate/Debrief ideas for 'pulling out the math', and checking for understanding

Meaningful and appropriate follow-up to the lesson is provided in the Home Activity section.
The time allocation in the upper left corner suggests how much time should be devoted to each of the three parts of the lesson.
The materials section in the upper right corner identifies resources needed for the class.
The right hand column offers suggestions for teachers such as instructional strategies, references to resources, literacy strategies used, and explanations.
The narrow column to the left of this suggests opportunities for assessment.
For further details about this organizers go to http://www.curriculcum.org/lms/

Grade 10 Applied Year Outline – Planning Tool

P Number of planned lessons (including instruction, diagnostic and formative assessments, summative assessments other than included performance tasks)
J Number of jazz days
SP Summative task
T Total number of days (other than included performance tasks)

Unit	Cluster of Curriculum Expectation	Overall Expectations	P	J	T	SP
1	**Similar Triangles**	MTV.01 • use their knowledge of ratio and proportion to investigate similar triangles and solve problems related to similarity; LRV.01 • manipulate and solve algebraic equations, as needed to solve problems.	9	1	10	
2	**Trigonometry**	MTV.02 • solve problems involving right triangles, using the primary trigonometric ratios and the Pythagorean theorem; LRV.01 • manipulate and solve algebraic equations, as needed to solve problems.	9	1	10	
3	**Equations of Lines**	LRV.02 • graph a line and write the equation of a line from given information; LRV.01 • manipulate and solve algebraic equations, as needed to solve problems.	12	1	13	
4	**Linear Systems**	LRV.03 • solve systems of two linear equations, and solve related problems that arise from realistic situations.	10	1	11	
5	**Introduction to Quadratic Relations**	QRV.02 • identify characteristics of quadratic relations; QRV.03 • solve problems by interpreting graphs of quadratic relations; LRV.03 • solve systems of two linear equations, and solve related problems that arise from realistic situations.	6	1	7	
6	**Quadratic Relations of the Form** $y = ax^2 + bx + c$	QRV.01 • manipulate algebraic expressions, as needed to understand quadratic relations; QRV.02 • identify characteristics of quadratic relations; QRV.03 • solve problems by interpreting graphs of quadratic relations.	12	1	13	
7	**Surface Area and Volume**	MTV.03 • solve problems involving the surface areas and volumes of three-dimensional figures, and use the imperial and metric systems of measurement; LRV.01 • manipulate and solve algebraic equations, as needed to solve problems.	17	1	18	
	Final Summative Task			3	7	4
	Total Number of Days		**75**	**10**	**89**	**4**

The number of prepared lessons represents the lessons that could be planned ahead based on the range of student readiness, interests, and learning profiles that can be expected in a class. The extra time available for "instructional jazz" can be taken a few minutes at a time within a pre-planned lesson or taken a whole class at a time, as informed by teachers' observations of student needs.