Year-at-a-Glance and Unit Outlines
MCT4C: Mathematics for College Technology

DRAFT

Including Rationale for Clusters of Expectations and Sequences of Units

NOTE: Expectation numbers will change from what they are in this draft which is based on an earlier draft of the curriculum expectations

Mathematics for College Technology: Content and Reporting Targets

Mathematical Processes across all strands and terms:
Problem Solving, Reasoning and Proving, Reflecting, Selecting Tools and Computational Strategies, Connecting, Representing, and Communicating.

Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6
• **Exponential Functions** • Graphing and solving exponential equations using graphs • Solve problems involving exponential equations algebraically using common bases and logarithms • Logarithms: base 10, using technology, rewriting exponential equations • Solve problems involving real-world applications appropriate to college technology •	**Polynomial Functions** (Focus on graphing) • Describe key features of graphs • Solve problems using graphs arising from a variety of applications • Make connections between numeric, graphical and algebraic representations of polynomial functions • Consider domain and range in context	**Polynomial Equations** (focus on applications and formulae that are appropriate to college technology courses) • Factor polynomial expressions in one variable and connect to intercepts • Expand and simplify polynomial functions • Solve polynomial equations • Solve problems involving polynomial functions algebraically (including real-world applications) • Work with formulae: make connections to linear, quadratic, exponential functions (present formulae that are appropriate to college technology)	**Trigonometric Functions** • Determine primary trig ratios for angles less than 360° • Make connections between the sine/cosine ratios and the sine/cosine functions • Sketch graphs of the sine/cosine functions and apply transformations • Represent sinusoidal functions with an equation given its graph or its properties	**Applications of Trig Ratios and Vectors** • Solving real-world problems using right triangles, sine law and cosine law (Focus on problems appropriate to college technology) • Represent vectors, add, subtract vectors, solve problems	**Solving Problems Involving Geometry** • Determine circle properties and solve related problems • Solve problems involving 2-D and 3-D shapes in context

Rationale

Starting with Exponential Functions

- Students coming to this course from Grade 11 University Preparation and Grade 11 University/College Preparation have different prior experiences with exponential functions; this is an opportunity to level the playing field and present logarithms which is new material for all of the students

Focus on Functions

- Units 1, 2 and 4 focus on functions and their graphs, this enables students to make connections and compare characteristics of exponential, polynomial and trigonometric functions
- A focus on functions early in the course ensures that students have the foundation for future mathematics courses in college or further high school preparation in advance functions

Separating the Polynomial Functions Strand into two units

- Unit 2 maintains the focus on functions and their graphs
- Unit 3 connects the graphical representation to the algebraic representation and allows some time for students to develop procedural fluency with algebra
- Each unit allows for a focus on real-world applications that prepare students for college technology content

Separating the Trigonometric Functions Strand into two units

- Unit 4 maintains a focus on functions and their graphs which allows students to connect and compare characteristics to functions in the first two units
- Unit 5 applies the sine law and cosine law to application problems and to vectors

Placing Applications of Geometry at the end

- This unit is designed to be more or less independent and is very focussed on applications which allow students to end this course with an applied mathematics experience

Precision Decision

- Real-world applications, contexts for applications and problems should come from situations that reflect the college technology courses that these students will be taking

Note:

Students don't have experience with inverse functions so exponents and logarithms should be dealt with undo operations not as inverses – also consider reflection in the line y = x. and some students may have experience with logarithms from chemistry

- There is a need to teach some estimation strategies for solving $3^x = 10$
- Examine graphs as a starting point with some practical applications

Mathematics for College Technology Year Outline – Planning Tool

P Number of pre-planned lessons (including instruction, diagnostic and formative assessments, summative assessments other than summative performance tasks)

J Number of jazz days of time (instructional or assessment)

T Total number of days

SP Summative performance task (see Assessment – Grade 9 Applied)

Unit	Cluster of Curriculum Expectations	Overall and Specific Expectations	P	J	T	SP
1	Graph exponential functions and solve exponential equations graphically and numerically Investigate patterns of exponential functions with different integral bases Explore and define logarithms with different bases Connect logarithms and exponents Solve problems arising from real-world contexts and college technology applications involving logarithms and exponents	B1 solve problems involving exponential equations graphically, including problems arising from real-world contexts B2 solve problems involving exponential equations algebraically using common bases and logarithms, including problems arising from real-world applications	10	2	13	
2	Describe key features of graphs of cubic and quartic functions Solve problems using graphs of cubic and quartic functions arising from a variety of applications Connect domain and range to contexts in problems Make connections between numeric, graphical and algebraic representations of polynomial functions	A1A recognize and evaluate polynomial functions, describe key features of their graphs, and solve problems using graphs of polynomial functions A1 make connections between the numeric, graphical, and algebraic representations of polynomial functions A2 solve polynomial equations by factoring, make connections between polynomial equations and formulae, and solve problems involving polynomial expressions arising from a variety of applications	10	2	13	

Unit	Cluster of Curriculum Expectations	Overall and Specific Expectations	P	J	T	SP
3	Focus on applications that are appropriate to college technology Solve equations up to degree 4 by factoring Develop facility in working with formulae appropriate to college technology	A1A recognize and evaluate polynomial functions, describe key features of their graphs, and solve problems using graphs of polynomial functions A1 make connections between the numeric, graphical, and algebraic representations of polynomial functions A2 solve polynomial equations by factoring, make connections between polynomial equations and formulae, and solve problems involving polynomial expressions arising from a variety of applications	9	2	11	
4	Connect sine/cosine ratios to sine/cosine functions Investigate and describe roles of the parameters in the graphs of y = asin(k(x-d))=c or y = acos (k(x-d))=c Sketch the graphs of y=sinx and y=cosx and apply transformations to these graphs Identify and discuss amplitude, period, phase shift, domain and range with respect to sinusoidal functions Represent sinusoidal functions algebraically given its graph or its properties	D1 make connections between numeric, graphical, and algebraic representations of sinusoidal functions D2 demonstrate an understanding that sinusoidal functions can be used to model some periodic phenomena, and solve related problems, including those arising from real-world applications	16	3	19	

Unit	Cluster of Curriculum Expectations	Overall and Specific Expectations	P	J	T	SP
5	Solve problems arising from real-world applications using primary trig ratios, the sine law and the cosine law in acute triangles Investigate conditions leading to the ambiguous case and solve problem involving oblique triangles Represent geometric vectors and add and subtract them Solve vector problems arising from real-world applications	C1 determine the values of the trigonometric ratios for angles less than 360º, and solve problems using the primary trigonometric ratios, the sine law, and the cosine law C2 represent vectors, add, subtract vectors, and solve problems using vector models, including those arising from real-world applications D1 make connections between numeric, graphical, and algebraic representations of sinusoidal functions	12	2	14	
6		C2A solve problems involving two-dimensional shapes and three-dimensional figures and arising from real-world applications C3 determine circle properties and solve related problems, including those that arise from real-world applications	10	2		
	Summative Performance Tasks				5	
	Total Days		**67**	**13**	**85**	

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.

The reference numbers are intended to indicate which lessons are planned to precede and follow each other. Actual day numbers for particular lessons and separations between terms will need to be adjusted by teachers.