Talenta Academy

Outlines of Course of Study

Course Title/Grade/Type: *Functions, Grade 11, University Preparation,*

Ministry Course Code: MCR3U

Credit Value: *1.0*

Department :   Mathematics

Department Head: *Mr. Kauden*

Course Developed by & Date: Mr. Mahalingam, June 2017

Course Revised by & Date: Mr. Mahalingam, June 2018

Prerequisite: Principles of Mathematics, Grade 10, Academic

Policy Document: The Ontario Curriculum, Grades 11 and 12, Mathematics, (Revised 2007)

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

Course Description:

This course introduces the mathematical concept of the function by extending students' experiences with linear and quadratic relations. Students will investigate properties of discrete and continuous functions, including trigonometric and exponential functions; represent functions numerically, algebraically, and graphically; solve problems involving applications of functions; investigate inverse functions; and develop facility in determining equivalent algebraic expressions. Students will reason mathematically and communicate their thinking as they solve multi-step problems.

OVERALL CURRICULUM EXPECTATIONS

A. Characteristic of Functions

By the end of this course, students will:
1. demonstrate an understanding of functions, their representations, and their inverses, and make connections between the algebraic and graphical representations of functions using transformations;
2. determine the zeros and the maximum or minimum of a quadratic function, and solve problems involving quadratic functions, including problems arising from real-world applications;
3. demonstrate an understanding of equivalence as it relates to simplifying polynomial, radical, and rational expressions.

B. Exponential Functions

By the end of this course, students will:
1. evaluate powers with rational exponents, simplify expressions containing exponents, and describe properties of exponential functions represented in a variety of ways;
2. make connections between the numeric, graphical, and algebraic representations of exponential functions;
3. identify and represent exponential functions, and solve problems involving exponential functions, including problems arising from real-world applications.

C. Discrete Functions

By the end of this course, students will:
1. demonstrate an understanding of recursive sequences, represent recursive sequences in a variety of ways, and make connections to Pascal's triangle;
2. demonstrate an understanding of the relationships involved in arithmetic and geometric sequences and series, and solve related problems;
3. make connections between sequences, series, and financial applications, and solve problems involving compound interest and ordinary annuities.

D. Trigonometric Functions

By the end of this course, students will:
1. determine the values of the trigonometric ratios for angles less than 360º; prove simple trigonometric identities; and solve problems using the primary trigonometric ratios, the sine law, and the cosine law;
2. demonstrate an understanding of periodic relationships and sinusoidal functions, and make connections between the numeric, graphical, and algebraic representations of sinusoidal functions;
3. identify and represent sinusoidal functions, and solve problems involving sinusoidal functions, including problems arising from real-world applications.

OUTLINE OF COURSE CONTENT

UNITS	TITLES	TIME
Unit 1	Characteristic of Function: Functions, Quadratic Function, Algebraic Expressions	30 hours
Unit 2	Exponential Functions	20 hours
Unit 3	Trigonometry and Trigonometric Functions	27 hours
Unit 4	Discrete Functions: Sequences and Series, Financial Applications	27 hours
	Final Assessment	6 hours
	Total Hours	**110 hours**

TEACHING AND LEARNING STRATEGIES

Students will follow a similar pattern of instructions in all units. To begin students will be involved in the exploration of an investigation of a concept. Then they will apply what they have learned in several real life scenarios or applications of the concept. Students will see solutions to applications after they try to solve them for themselves. Then students will complete assignments where no solutions are provided and submit these for assessment. Finally the unit ends with a test. Since the over-riding aim of this course is to help students use the language of mathematics 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.

A variety of teaching/learning strategies and delivery methods will be used to suit the varying learning styles. These will include (but not be limited to):

- Teacher-led discussion
- Direct Instruction
- demonstration
- Brainstorming
- Group discussion
- Small group activities

- Graphing Applications
- Peer analysis
- Math presentation
- Critical pedagogies
- One-on-one tutoring
- Real-world problem solving

Seven mathematical processes will form the heart of the teaching and learning strategies used. The mathematical processes are to be integrated into student learning in all areas of this course.

Throughout this course, students will:

Problem Solving	develop, select, apply, compare, and adapt a variety of problem-solving strategies as they pose and solve problems and conduct investigations, to help deepen their mathematical understanding;
Reasoning and	develop and apply reasoning skills (e.g., use of inductive reasoning, deductive

Proving	reasoning, and counter-examples; construction of proofs) to make mathematical conjectures, assess conjectures, and justify conclusions, and plan and construct organized mathematical arguments;
Reflecting	demonstrate that they are reflecting on and monitoring their thinking to help clarify their understanding as they complete an investigation or solve a problem (e.g., by assessing the effectiveness of strategies and processes used, by proposing alternative approaches, by judging the reasonableness of results, by verifying solutions);
Selecting Tools and Computational Strategies	select and use a variety of concrete, visual, and electronic learning tools and appropriate computational strategies to investigate mathematical ideas and to solve problems;
Connecting	make connections among mathematical concepts and procedures, and relate mathematical ideas to situations or phenomena drawn from other contexts (e.g., other curriculum areas, daily life, current events, art and culture, sports);
Representing	create a variety of representations of mathematical ideas (e.g., numeric, geometric, algebraic, graphical, pictorial representations; onscreen dynamic representations), connect and compare them, and select and apply the appropriate representations to solve problems;
Communicating	communicate mathematical thinking orally, visually, and in writing, using precise mathematical vocabulary and a variety of appropriate representations, and observing mathematical conventions.

ASSESSMENT AND EVALUATION STRATEGIES

Assessment *for* and Assessment *as* Learning Strategies

Assessment of the learning skills will be done on an ongoing basis throughout the academic year by observations of students at work, checklists and interviews. A variety of assessment strategies to address students' needs will be used during the school year.

Assessment *of* Learning (Evaluation) Strategies

Evaluation will be implemented at or near the end of a period of learning, and may be used to inform further instruction. It is mainly used by the teacher to summarize learning at a given point in time. This summary is used to make judgements about the quality of student learning on the basis of established criteria, to assign a value to represent that quality, and to support the communication of information about achievement to students themselves, parents, teachers, and others.

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.

The tools highlighted will be used for the three different types of assessments:

Assessment as Learning	Assessment for Learning	Assessment of Learning
Student Product	**Student Product**	**Student Product**
☐ Journals/Letters/Emails (checklist)	☐ **Assignment**	☐ **Assignment**
☐ Learning Logs (anecdotal)	☐ Journals/Letters/Emails (checklist)	☐ Journals/Letters/Emails (checklist)
☐ Entrance tickets	☐ **Pre-tests (scale/rubric)**	☐ **Tests (scale/rubric)**
☐ **Exit tickets**	☐ **Quizzes (scale/rubric)**	☐ **Unit Tests**
☐ **Homework(checklist)**	☐ Rough drafts (rubric)	☐ **Exam**
☐ **Completed work(checklist)**	☐ Portfolios (rubric)	☐ Rough drafts (rubric)
	☐ Posters (rubric/scale)	☐ Portfolio (rubric)
	☐ **Graphic organizers (scale)**	☐ Posters (rubric/scale)
	☐ **Peer feedback (anecdotal/checklist)**	☐ Graphic organizers (scale)
	☐ Reports (rubric)	☐ Reports (rubric)
	☐ Essays (rubric)	☐ Essays (rubric)
	☐ Webbing/Mapping (rubric/scale)	☐ Visual Thinking Networks (rubric)
	☐ Entrance ticket	☐ ISU (scale/rubric)
	☐ Vocabulary notebooks (anecdotal)	
	☐ Visual Thinking Networks (rubric)	
Observation	**Observation**	**Observation**
☐ **Whole class discussions (anecdotal)**	☐ **Class discussions (anecdotal)**	☐ **Debate (rubric)**
☐ Self-proofreading (checklist)	☐ Debate (rubric)	☐ PowerPoint presentations (rubric)
☐ **Interviews** (checklist)	☐ **PowerPoint presentations (rubric)**	☐ **Performance tasks (anecdotal/scale)**
☐ **Seeking assistance**	☐ Performance tasks (anecdotal/scale)	
	☐ **In Class work** (checklist)	
Conversation	**Conversation**	**Conversation**
☐ **Student teacher conferences (checklist)**	☐ **Student teacher conferences (checklist)**	☐ Student teacher conferences (checklist)
☐ **Small Group Discussions (checklist)**	☐ **Small group discussions (checklist)**	☐ **Question and Answer Session (checklist)**
☐ **Pair work (checklist)**	☐ **Pair work (anecdotal)**	☐ Oral tests (scale/rubric)
☐ **Debate (rubric)**	☐ **Peer-feedback (anecdotal)**	
	☐ Peer-editing (anecdotal)	
	☐ **Oral pre-tests (scale/rubric)**	
	☐ **Oral quizzes (scale/rubric)**	

THE FINAL GRADE

A final grade is recorded for every course, and a credit is granted for every course in which the student's final mark is 50% or higher. The final grade for this course will be determined as follows:

Percentage of Final Mark	Categories of Mark Breakdown
Term Work: 70%	Assessment of Learning conducted throughout the Term. 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.
Final Evaluation: 30%	Final Examination 30% This final evaluation will be based on an evaluation of achievement from all four categories for the course and of over all expectations from all units of the course.

The balance of the weighting of the categories of the achievement chart throughout the course is:

Knowledge and Understanding	25%	Application	25%
Thinking and Inquiry	25%	Communication	25%

CONSIDERATION FOR PROGRAM PLANNING

All students can succeed. Some students are able, with certain accommodations, to participate in the regular course curriculum and to demonstrate learning independently. Accommodations allow access to the course without any changes to the knowledge and skills the student is expected to demonstrate. The accommodations required to facilitate the student's learning must be identified. Classroom teachers are the key educators of students who have special education needs. They have a responsibility to help all students learn, and differentiated instruction focuses on the provision of accommodations to meet the diverse needs of learners. The areas of concern to all teachers include the following:

Teaching Approaches

To make learning accessible to students, teachers must draw upon the prior knowledge and skills possessed by students. Students must have a solid conceptual foundation in mathematics. Students must be provided with the opportunity to learn the expectations of their mathematical

curriculum in diverse ways. Teachers should make use of manipulatives in their teaching of mathematics which allow students to represent abstract ideas of math in concrete ways. Teachers will provide a rich math curriculum which will allow students to investigate and identify thus gaining experience with applications of the new math curriculum. Teachers need to promote attitudes conducive to the learning of math by showing students multiple ways of solving problems so that they gain confidence in problem solving.

English as A Second Language

Students whose first language is not English will be allowed to use dictionaries during assessments for and as learning. Furthermore, they will be encouraged to speak English in class through pair/group work, and small class presentations. As well, students will enhance their knowledge of mathematical vocabulary

Attendance (Absences)

Regular class attendance is critical for students' learning, achievement of course expectations, and successful completion of the course. Where, in the principal's judgment, a student's frequent absences from school are jeopardizing his or her successful completion of a course, school staff will meet with the student and parents to explain the potential consequences of the absences, including failure to gain credits, and to discuss steps that could be taken to improve student attendance.

Students are responsible for acquiring the work missed due to absence before the following class. Students will be accommodated with a make-up class if necessary. The teacher will use his/her professional judgment to determine alternate methods of evaluating students who are absent for a test or presentation, given the appropriate documentation.

The Role of Technology in the Curriculum

The use of technology has given students access to additional and powerful resources. Students can access internet resources and online versions of texts and simulation technology where applicable. Students will use graphing calculator/software to investigate the nature and behavior of functions in this course. Email can be a valuable communication device. Media and powerpoint presentations will use a variety of technical applications. Word processing is expected for all written submissions.

Career Education

The knowledge and skills that students acquire in mathematics are useful in preparation for a variety of fields in post-secondary education. References are made throughout the course to applications in engineering, business, computer related areas and mathematics. Students are made aware of these options and are encouraged to investigate areas of interest to them.

GENERAL SCHOOL POLICY, AND EXPECTATIONS OF STUDENT BEHAVIOUR

Necessary Materials for Classroom

Students should come to class with the required books and equipment. This includes three ring binder, notebook, textbook, pen, pencil, graph paper, ruler and calculator. There is not point being here unless you are prepared. Items not required for class should not be in evidence. These include other books, newspapers, magazines, food, drinks, cell phones, and all other electronic devices.

Tests and Exams

Attendance for tests and exams is a **must**. If the absence is for a valid reason and can be documented (e.g. a medical certificate) a makeup test may be arranged with the teacher. A note from a parent may be accepted at the discretion of the teacher or principal.

Homework

Homework will be assigned regularly. Students are expected to complete all assigned work, on a regular basis, without exception, because it is only through consistent practice that skills and concepts are retained. Students can expect to spend approximately 2-4 hours per week on any one subject for homework or assignments. Completing homework is also a reflection of a positive attitude.

Late and Missed Assignments Policy

Students will be given ample time and opportunities to submit their work. It will be made clear to students early in the school year that they are responsible not only for their behaviour in the classroom and the school but also for providing evidence of their achievement of the overall expectations within the time frame specified by the teacher, and in a form approved by the teacher. Students will be understood that there will be consequences for not completing assignments for evaluation or for submitting those assignments late. Where in the teacher's professional judgement it is appropriate to do so, a number of strategies may be used to help prevent and/or address late and missed assignments as listed in the School's course calendar.

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Plagiarism

Students are reminded to become familiar with the Talenta Academy's policy concerning plagiarism. Any work submitted for one course may not be submitted for another course without the permission of the teachers of both courses. The creation of original work is a celebration of your intellectual curiosity. The unacknowledged use of another person's writing or ideas is a serious academic offence that will result in a zero for the assignment. If unsure about plagiarism, then consult with the teacher.

RESOURCES:

- Functions 11, Kirkpatrick, Chris. (2007). Toronto, Ontario: Nelson Education Ltd.
- Functions 11, Meisel, R, Petro, D, Speijer, J, (2009). Toronto, Ontario: McGraw-Hill Ryerson Ltd
- Functions 11 workbook and worksheets
- Calculator, Graphing calculator
- Computers with sketchpad
- Smart phones with graphical apps
- Web sites and Multimedia applications