Canterbury High School

Ottawa-Carleton District School Board
Mathematics Department
Semester I/II – 2014 / 15 – Course Outline

Course Title: Principles of Mathematics	**Grade Level: 9**
Course Code: MPM1D	**Credit Value: 1.0**
Prerequisite: Grade 8 Mathematics	

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Course Overview 110 hours

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.

Strands:
Course Expectations

As students work through the course they will develop a set of skills that will support lifelong learning in mathematics. These skills are a set of seven mathematical processes that are embedded throughout all of the course expectations; they are, problem-solving, reasoning and proving, reflecting, selecting tools and computational strategies, connecting, representing, and communicating. This course will provide students with rich problem-solving opportunities that will help the student develop and apply these processes.

A. Number Sense and Algebra

By the end of this course, students will:
1. demonstrate an understanding of the exponent rules of multiplication and division, and apply them to simplify;
2. manipulate numerical and polynomial expressions, and solve first-degree equations.

<u>B. Linear Relations</u>

By the end of this course, students will:
1. apply data-management techniques to investigate relationships between two variables;
2. demonstrate an understanding of the characteristics of a linear relation;
3. connect various representations of a linear relation.

<u>C. Analytic Geometry</u>

By the end of this course, students will:
1. determine the relationship between the form of an equation and the shape of its graph with respect to linearity and non-linearity;
2. determine, through investigation, the properties of the slope and y-intercept of a linear relation;
3. solve problems involving linear relations.

<u>D. Measurement and Geometry</u>

By the end of this course, students will:
1. determine, through investigation, the optimal values of various measurements;
2. solve problems involving the measurements of two-dimensional shapes and the surface areas and volumes of three-dimensional figures;
3. verify through investigation facilitated by dynamic geometry software, geometric properties and relationships involving two-dimensional shapes, and apply the results to solving problems.

Units of Study

1. <u>Mathematical Processes</u> (~1 week)
   Problem solving skills are developed in conjunction with communicating, connecting and representation skills. Computational strategies, selecting tools, reasoning, proving and reflecting are applied to a variety of mathematical processes.
2. <u>Relations</u> (~2 weeks)
   Hypothesis, sources of data and sampling principles are investigated. Scatter plots are used to analyse data which are further examined for trends and used to estimate via interpolation and extrapolation. Linear and non-linear relations are graphed and interpreted as well as applied to motion.
3. <u>Polynomials</u> (~3 weeks)
   Algebraic models are developed using concrete materials. Powers and exponent laws are examined and solved with algebraic terms. Algebraic expressions are used to communicate and evaluate a variety of problems. Recognising and collecting like terms of polynomials. Mathematical operations such as adding and subtracting and the distributive property as applied to polynomials.

4. <u>Equations</u> (~2 weeks)
   Simple, fractional and multi-step algebra equations are solved. Modelling is performed with formulas and algebra.
5. <u>Modelling with Graphs</u> (~2 weeks)
   Direct and partial variation relationships are examined and interpreted. Slope is determined and examined as a rate of change. Recognise and apply how variation, slope, and first differences are connected.
6. <u>Analyse Linear Relations</u> (~2 weeks)
   Different forms of the equation of a line in slope y-intercept form and standard form are determined and connected to graphing. The equation of a line is determined using the slope and a point and using two points. Slopes of parallel and perpendicular lines and linear systems are examined.
7. <u>Geometric Relationships</u> (~2 weeks)
   Angle relationships in triangles, quadrilaterals and polygons are examined. The properties of line segments that divide triangles and sides and diagonals of quadrilaterals are determined.
8. <u>Measurement Relationships</u> (~2 weeks)
   The Pythagorean Theorem is applied to geometric figures. The perimeter and area of composite figures, surface area and volume of prisms, pyramids, cones and spheres are determined and evaluated.
9. <u>Optimizing Measurements</u> (~2 weeks)
   Measurement concepts are investigated and applied to perimeter and area relationships of a rectangle. Minimized surface areas of square-based prisms and cylinders, as well as, maximized volumes of square-based prisms and surface areas of cylinders are analyzed.

Teaching Strategies

Students will have the opportunity to learn in a variety of ways; individually, cooperatively, investigative, teacher directed class discussion and notes, visual aids and manipulatives (e.g., linking cubes, straws, algebra tiles).

Assessment and Evaluation Strategies

Student achievement will be monitored through the use of formative assessments in the form of quizzes, assignments, observations. Feedback on these assessments will provide the student with information to determine their level of understanding of the concepts. Student achievement will be recorded through the use of quizzes, tests, assignments/tasks. The percentage grade will represent the quality of the student's overall achievement of the expectations for the course and reflect the corresponding level of achievement as described in the achievement chart.

Evaluation Summary

Term Evaluation (70%) comprised of:
a)   <u>Knowledge and Understanding</u>   - 24.5%
        (understand the concepts and computational
        skills of specific expectations)
b)   <u>Application</u>   - 24.5%
        (knowing when and how to use appropriate tools and
        concepts to solve problems)
c)   <u>Thinking</u>   - 10.5%
        (being able to use critical and creative thinking skills
        to solve problems, connect ideas from other strands)
d)   <u>Communication</u>   - 10.5%
        (reflect and express through writing a mathematical
        solution or concept)

Summative Evaluation (30%) comprised of:
a)   <u>Summative Task</u> (problems using a variety of tools)   - 10%
b)   <u>Examination</u>   - 20%

References

www.edu.gov.on.ca/eng/curriculum/secondary/math math910curr.pdf

Student Resources / Texts

1.   <u>Principles of Mathematics 9</u>, McGraw-Hill Ryerson, 2006