M3 Core Mathematics

Course Syllabus - 2026 Term 2

Teacher: David Ryder

Department: Mathematics **Subject Code**: MA23102

Periods per week: 4 **Credits**: 2.0

Course Description

This course will be an extension of the M2 Core Mathematics course. Students will focus on the fundamental skills within each topic in their Core Mathematics lessons and then learn how to apply those skills to real world situations in their Additional Mathematics lessons.

The course covers three main disciplines: algebra, probability and statistics, and geometry. Students will begin with algebra by learning about systems of equations and the various methods to solving systems. They will then learn how to simplify rational expressions and solve rational equations. The course will then transition into probability and statistics. Students will learn about counting principles to count the number of outcomes. They will explore simple probability and learn how to make informed decisions. Students will then expand their knowledge of statistics that they learned in M1 and M2 as they learn more advanced methods for data analysis, including measures of center and measures of variation. They will also add to their existing knowledge of data representation. Finally, students will further study geometry as they explore properties of circles. They will end the course writing geometric proofs about lines and angles as well as triangles and quadrilaterals.

This course will split students into groups based on their ability. There will be a support group, a standard group and an advanced group. All students will study the same topics, however students that need more support will spend more time covering the fundamental skills in order for them to succeed in the Core Mathematics class as well as be able to engage with the real world application problems. Students with more advanced math skills will also work on the standard problems presented in class in addition to getting introduced to a more challenging set of problems so they may achieve full potential in their mathematics classes.

Course Content

1. **Systems of Equations**
   - 1.1. Graphing
   - 1.2. Substitution
   - 1.3. Elimination
   - 1.4. Identities and contradictions

2. **Rational Equations**
   - 2.1. Simplifying rational expressions
   - 2.2. Rational equations
   - 2.3. Formulae
   - 2.4. Graphing rational functions
   - 2.5. Equations containing rational expressions

3. **Probability and Counting**
   - 3.1. Counting principles
   - 3.2. Probability
   - 3.3. Probability distributions

4. **Statistics II: Data Analysis**
   - 4.1. Measures of center
   - 4.2. Measures of variation and position
   - 4.3. Data representation
   - 4.4. Data distributions

5. **Circle Properties**
   - 5.1. Parts of a circle
   - 5.2. Angles and arcs
   - 5.3. Chords
   - 5.4. Tangent and secant lines
   - 5.5. Regular polygons

6. **Geometric Proofs**
   - 6.1. Writing proofs
   - 6.2. Segments, angles and parallel lines
   - 6.3. Triangles and quadrilaterals

Learning Outcomes

Systems of Equations

- Students will use graphs to identify the possible number of solutions of a system of linear equations.
- Students will draw the graphs of linear equations in a system to solve the system of equations.
- Students will solve a system of linear equations using substitution.
- Students will solve a system of linear equations when:
    - multiplication is not required.
    - when one of the equations must be multiplied by a constant.
    - both equations must be multiplied by a constant.

- Students will use elimination and substitution to show:
    - a system results in an identity and has an infinite number of solutions.
    - a system results in a contradiction and has no solutions.

Rational Equations

- Students will simplify rational expressions by canceling common terms in the numerator and denominator.
- Students will perform arithmetic operations on rational expressions (addition, subtraction, multiplication, division).
- Students will identify excluded values from a rational expression.
- Simplify complex fractions.
- Students will solve equations with rational expressions by using cross multiplication.
- Students will solve equations with rational expressions by multiplying by the LCD.
- Students will chang e the subject of a formula involving rational expressions.
- Students will substitute values into a formula to find an unknown quantity.
- Students will identify excluded values from a rational function.
- Students will graph a rational function given in the form y=ax-h+k.
- Students will identify the horizontal and vertical asymptotes of a rational function given in the form y=ax-h+k.
- Students will solve equations which include rational expressions using the following methods:
    - Cross-multiplication
    - multiplying by the LCD.
    - by making all denominators equal and setting numerators equal to each other.

- Students will identify extraneous solutions to an equation containing rational expressions.
- Students will use rational equations to solve real world problems including work, cost and sales, and distance-speed problems.

Probability and Counting

- Students will use the multiplication principle to find the number of possible outcomes.
- Students will use the addition principle to find the number of possible outcomes.
- Students will calculate the factorial of a number.
- Students will find the number of permutations when selecting r objects from a set of n objects.
- Students will find the number of combinations when selecting r objects from a set of n objects.
- Students will list all possible outcomes in a sample space.
- Students will find the probability of a single event.
- Students will calculate the probability of an event's complement.
- Students will calculate the probability of mutually exclusive events.
- Use tree diagrams to find the probability of independent events and dependent events.
- Students will identify if a random variable is discrete or continuous.
- Students will construct discrete and continuous probability distributions.
- Students will compare theoretical probability and results from an experiment.
- Students will calculate the expected value of a discrete random variable.
- Students will calculate the standard deviation of a probability distribution.

Statistics II

- Students will find the mean, median and mode of a set of data.
- Students will understand when to use different measures of center and choose the appropriate average for a set of data.
- Students will find the range and standard deviation of a set of data.
- Students will find quartiles of a set of data.
- Students will represent data in frequency tables.
- Students will represent data in histograms.
- Students will represent data in a box and whisker plot.
- Students will determine if a set of data is skewed or symmetric.
- Students will determine if a set of data is normally distributed.
- Students will use the normal curve to analyze a set of data that is normally distributed.

Circles

- Students will identify the radius, diameter and chords in a circle.
- Students will find the measure of the radius and diameter of a circle.
- Students will find the circumference of a circle.
- Students will find the degree measure of an arc given its central angle or its inscribed angle.
- Students will find the arc measure of an arc given its central angle and the radius of a circle.
- Students will find the measure of a central angle given the degree measure of its intercepted arc.
- Students will find the measure of an inscribed angle, given the degree measure of its intercepted arc.
- Students will find the measure of interior angles of a polygon inscribed in a circle.
- Students will find the lengths of chords given a circle's radius.
- Students will use Pythagoras' Theorem to find the length of a radius, given a chord and its length.
- Students will find the length of segments tangent to a circle.
- Students will use Pythagoras' Theorem to find missing sides of a triangle formed by a radius and a segment tangent to the circle.
- Students will find the measure of angles and arcs created by the intersection of tangent and secant lines that intersect inside the circle, on the circle or outside the circle.
- Students will find the measure of segments that intersect both inside and outside of a circle.
- Students will find the area of a regular polygon inscribed in a circle.
- Students will find the measure of interior angles of a regular polygon.

Geometric Proofs

- Students will use postulates, axioms and theorems to write paragraph proofs.
- Students will use postulates, axioms, theorems and properties of real numbers to write two-column proofs.
- Students will write proofs involving line segments and their relationships.
- Students will write proofs involving angles and their relationships.
- Students will write proofs involving parallel lines and the angles formed from the intersection of a transversal.
- Students will write proofs involving congruent triangles.
- Students will write proofs involving right triangles, equilateral triangles, and isosceles triangles.
- Students will write proofs involving parallelograms.

- Students will write proofs involving squares and rectangles.

Learning Resources

Cinch Learning Online (online textbook)

GeoGebra interactive algebra and geometry software

Khan Academy (online tutorial videos and practice sets)

ALEKS (Online personal learning)

Assessment Methods

Assignments and in class unit tests will be used to assess students' skills and understanding of basic concepts within each unit. Assignments will not be graded based on accuracy, but will instead be graded for completion, effort and submission by assigned deadlines. The unit tests will typically be short in duration and will be open-note in order to assess students' ability to complete basic problems without the need to memorize formulas or the steps required to finish problems.

Following the unit tests, the students complete a peer and self-evaluation sheet. This allows them to see other students' work and make a comparison with their own work. Further, it allows them to grade their own work against a clear set of guidelines. This enables them to see exactly where they need to improve in the next unit.

Formal final exams will include a wide range of problems. About half of each exam will consist of problems that will cover the fundamental skills within the unit(s). The remainder of the exam will consist of problems that will require a deeper understanding of each topic and will require students to combine skills from several topics and also apply those skills and concepts to real-world application problems. All problems on exams will be graded on both methodology and accuracy, and partial credit will be awarded for demonstrating an understanding of the concept being tested even if the answer is incorrect.

Homework Policy

Homework is M3 mathematics is kept to a minimum to avoid copying. For every teacher PowerPoint presentation, a worksheet follows with approximately 10 questions. A full 50 minutes is provided for students to complete this with the help of the teacher and their peers.

The teacher tries to keep the homework to just 1 hour per week for core and Add maths combined. This is normally in the form of 1 hour of ALEKS per week. Often, the teacher will also give class time to complete this hour of ALEKS or students that finish their worksheets in class can start their hour of ALEKS in class. It is therefore possible that for diligence, they will have no homework each week.

The only other homework that students might have is on their 2 projects per semester. If any specific tasks for a project are set one week, then the 1 hour of ALEKS will be waived for that week.

Of course students that do not use their class time wisely and regularly do not complete their worksheets in class, may find they have more homework than expected.

If a student misses a week of ALEKS, they can still make up that hour before the unit bookcheck as that is when the hours are counted and graded.

Project deadlines will be posted on Google classroom. Any work submitted after the deadline may only receive a 50% score.

Book check before exams: It is very important that students complete all the lessons and exercises in a unit before their exam. There is little advantage to completing work for a book check after an exam as this will not help the student perform well in their finals. For this reason, all books must be submitted the morning of their Core exam. Any late book will receive a maximum of 50%. If the book is submitted on their return to school after the exam period has finished, they will receive an automatic 0.

Evaluation Breakdown — Total — 100%

Assessment — 30%
- Unit Tests (20%)
- Quizzes and Online Activities (10%)

Student Work — 50%
- Notes (30%)
- Class Activities (10%)
- ALEKS (10%)

Final Exam — 20%

Thai National Curriculum Standards

STRAND 4: ALGEBRA

Standard M4.2: Ability to apply algebraic expressions, equations, inequalities, graphs and other mathematical models to represent various situations, as well as interpretation and application for problem-solving

M4.2 Gr. 9/4: Read and interpret meaning of systems of linear equations with two variables and other graphs.

M4.2 Gr. 9/5: Solve systems of linear equations with two variables which can be applied for problem-solving, as well as be aware of the validity of the answer.

STRAND 5: DATA ANALYSIS AND PROBABILITY

Standard M5.1: Understanding and ability to apply statistical methodology for data analysis

M5.1 Gr. 9/1: Determine an issue and write questions about various problems or situations, as well as set appropriate methods for study and for data collection.

M5.1 Gr. 9/2: Find arithmetic mean, median and mode of non-frequency distribution data, and make appropriate selection for utilization.

M5.1 Gr. 9/3: Present data in appropriate forms.

M5.1 Gr. 9/4: Read, interpret and analyse the data obtained from presentations.

STRAND 6: MATHEMATICAL SKILLS AND PROCESSES

Standard M6.1: Capacity for problem-solving, reasoning, and communication; communication and presentation of mathematical concepts; linking various bodies of mathematical knowledge and linking mathematics with other disciplines; and attaining ability for creative thinking

M6.1 Gr. 8/1: Apply diverse methods for problem-solving.

M6.1 Gr. 8/2: Appropriately apply mathematical and technological knowledge, skills and processes for problem-solving in various situations.

M6.1 Gr. 8/3: Suitably provide reasoning for decision-making and appropriately present the conclusions reached.

M6.1 Gr. 8/4: Accurately and succinctly use mathematical language and symbols for communication of concepts and presentation.

M6.1 Gr. 8/5: Link various bodies of mathematical knowledge, and link mathematical knowledge, principles and processes with those of other disciplines.

M6.1 Gr. 8/6: Attain ability for creative thinking.

[Total 12 indicators]