Grande Prairie Regional College
Department: Academic Upgrading

COURSE OUTLINE – Winter 2008

MA0130 5(6-0-0) HS - Mathematics Grade 12 Equivalent (Pure)

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Office Hours: Monday & Wednesday: 10:00 – 10:50 am

Tuesday & Thursday: 9:00 – 9:50 am or by appointment

Prerequisite:

MA0120 or equivalent, or equivalent math placement test score.

Required Text/Resource Materials:

Pure Math 30 Workbook, (Appleby, Letal, Ranieri) Absolute Value Publishers
Scientific calculator (graphing calculators are *not* permitted for tests) graph paper

Description:

This course explores transformations, exponents and logarithms, sequences, series, trigonometry
(including the unit circle, graphs, identities and equations), quadratic relations, conics,
permutations and combinations, probability and statistics.

Credit/Contact Hours:

5 credits; 6 contact hours per week

Delivery Mode:

Students are guided through the workbook/textbook. First, background concepts and rules are
reviewed; then investigative work is done leading to new concepts, laws and formulas. Students
are expected to participate as these new concepts are applied to class example problems. As
well, several related problems are assigned daily to reinforce new ideas and skills; in order to
succeed in this course, students must commit to a minimum of one hour of homework per day.

Objectives:

This course prepares the student for university transfer mathematics courses. The student will develop problem- solving skills and gain an appreciation of the mathematics of modern society.

Unit 1 Transformations:

- Solve polynomial, linear, quadratic, rational, absolute value, radical and cubic equations.
- Graph polynomial, linear, quadratic, rational, absolute value, radical and cubic functions.
- Understand function notation and write an inverse function.
- Given the graph of any function, be able to plot the graph of a related function using translations, stretches, and reflections.
- Identify transformation(s) from an equation.
- Write an equation to reflect a given translation, reflection, or stretch.
- Identify and perform combinations of transformations on functions.

Unit 2 Exponents and Logarithms:

- Use the laws of exponents to simplify expressions.
- Solve exponential & logarithmic equations.
- Plot graphs of exponential & logarithmic functions.
- Identify transformations of exponential & logarithmic functions.
- Define logarithmic relationships and be able to interconvert exponential and logarithmic relations.
- Evaluate logarithms to find exact values.
- Evaluate common and natural logarithms using a calculator.

Unit 3 Sequences and Series:

- Define **geometric sequence**, common ratio, and general term. Also, be able to identify a geometric sequence.
- Determine the general term as well as specific terms of a geometric sequence.
- Determine the sum of a given geometric sequence to a desired number of terms.
- Expand and evaluate expressions written in Sigma notation.
- Solve related problems.
- Develop a model for exponential growth or decay and solve related problems.
- Determine the doubling period, half-life or any other time period for exponential growth or decay and solve related problems.
- Solve problems based on logarithmic formulas, including Richter, decibel, and pH scales.

Unit 4 Trigonometry: Functions and Graphs

- Define radian measure of an angle; be able to convert radians to degrees and vice-versa.
- Define the primary and reciprocal trigonometric ratios of an angle.
- Given one trigonometric ratio of an angle, determine the other 5 ratios.
- Define principal and coterminal angles, and state relationship between them.
- Determine reference angle and apply the CAST rule.
- Determine exact values of trigonometric ratios for selected angles on the unit circle.

- Define period and amplitude of a periodic function.
- Plot graphs of the basic sine, cosine and tangent functions.
- Determine the period and the amplitude of a periodic function from a given graph, and be able to write the equation of a sinusoidal function given its graph.
- Use transformations to plot the graphs of more complex sine and cosine functions.
- Identify reciprocal trigonometric functions from their graphs.

Unit 5   Trigonometry: Equations, Identities and Modelling:

- Solve first and second degree trigonometric equations giving specific and general solutions.
- State mathematical relations between different trigonometric functions. (8 basic identities)
- Verify an identity is true for a specific value of the variable.
- Prove trigonometric identities for all defined values of the variable.
- Apply sum and differences identities as well as double angle identities.

Unit 6   Permutations and Combinations:
- Apply the fundamental counting principle to determine the number of different ways to perform multi-step operations.
- Define permutations of n objects, and factorials.
- Determine the number of linear permutations of n different objects when all, or part, are used at a time and solve related problems.
- Determine the number of permutations of n objects when some of them are alike.
- Define combinations of n objects.
- Determine the number of different combinations when r objects are selected from n different objects.
- Apply the principle of combinations to different situations, and solve related problems.
- Explain Pascal's triangle and how it is related to combinations and the Binomial Theorem.
- Use the Binomial Theorem to expand a binomial or to find a specific term in the expansion of a binomial where the exponent n is a natural number.

Unit 7   Statistics and Probability Distribution:

- Use permutations, combinations, or the fundamental counting principle to solve probability problems
- Define the measures of central tendency (mean, mode, median) and determine the value for each of them for a set of data and solve related problems.
- Define the measures of dispersion (range, standard deviation).
- Calculate standard deviation for a population.
- Apply standard deviation to analyse given data.
- Define and display a probability distribution.
- Determine the probability for a binomial experiment.
- Define z-score, and calculate z-score for a given set of data.
- Apply z-score to solve related problems.
- Explain normal distribution and standard normal curve.
- Use area under the standard normal curve and z-scores to solve related problems.

Unit 8   Conic Sections (Quadratic Relations):

- Identify the parts of a double-napped cone.
- Given information on how a plane intersects a cone, determine whether the conic formed is a circle, ellipse, parabola, hyperbola, or a degenerate of one of these.
- Explain how the values for A and C in the general form of the equation of a conic section determine the shape of the conic.
- Identify the appropriate conic section from an equation given in general form.
- Given an equation in standard form, identify the conic.
- Determine the series of transformations necessary to transform the graph of one conic to the graph of another or the equation of one conic to the equation of another.
- Determine the equation of a conic given an original equation and a series of transformations.
- Write an equation of a conic given specific characteristics.
- Given the equation of a parabola in standard form, determine the direction, vertex, domain and range, intercepts and sketch the graph.
- Given the equation of a circle, determine the centre, radius, domain and range and sketch the graph.
- Given the equation of an ellipse, determine the direction, centre, vertices, domain and range, lengths of major and minor axes, intercepts and sketch the graph.
- Given the equation of a hyperbola, determine the direction, centre, vertices, lengths of transverse and conjugate axes, domain and range, intercepts, slopes of asymptotes and sketch the graph.
- Convert a given equation of a conic section from general to standard form and vice-versa.

Grading Criteria:

Unit Tests	20%
Assignments	20%
Midterm	20%
Final Exam	40%

Grades will be assigned on the Letter Grading System.

Academic Upgrading Department

Grading Conversion Chart

Alpha Grade	4-point Equivalent	Percentage Guidelines	Designation
A$^+$	4	90 – 100	EXCELLENT
A	4	85 – 89	
A$^-$	3.7	80 – 84	FIRST CLASS STANDING
B$^+$	3.3	76 – 79	
B	3	73 – 75	GOOD
B$^-$	2.7	70 – 72	
C$^+$	2.3	67 – 69	SATISFACTORY
C	2	64 – 66	
C$^-$	1.7	60 – 63	
D$^+$	1.3	55 – 59	MINIMAL PASS
D	1	50 – 54	
F	0	0 – 49	FAIL

Approved by the department - May 25, 2004

UNIT DESCRIPTIONS with Corresponding Textbook Lessons and Timelines

1. **Transformations** (Lessons 1-10)
    - graphs of functions; horizontal and vertical translations; reflections in the *x*-axis, y-axis, and line *y = x;* stretches; combined transformations; applications

    9 days - Complete an assignment at the end of this unit worth 5% of the total grade.

2. **Exponential and Logarithmic Functions** (Lessons 1-7, 9)
    - laws and properties of exponents and logarithms; exponential and logarithmic functions; solving exponential and logarithmic equations; graphing exponential and logarithmic functions

    8 days - Write a test at the end of this unit worth 5% of the final grade

3. **Geometric Sequences and Series** (Lessons 1-6)
    - arithmetic and geometric sequences and series; terms and sums; summation notation and expanding a series; applications

    8 days - Complete a test at the end of this unit worth 5% of the total grade.

4. **Trigonometry - Functions and Graphs** (Lessons 1-10)
    - radian measure; exact values of the Unit Circle; trigonometric functions of an angle; graphing trigonometric functions including all parameters;

    10 days - Write an assignment at the end of this unit worth 5% of the total grade.

MIDTERM
☞ **Write a midterm exam worth 20% of the final grade.**

5.   **Trigonometry - Equations, Identities, and Modelling** (Lessons 1, 2, 4-9)
- first and second degree trigonometric equations; trigonometric identities, sum and difference identities, double and half angle identities; applications

7 days - Complete an assignment worth 5% of the total grade.

6.   **Permutations and Combinations** (Lessons 1-6 & 8)
- fundamental counting principle; permutations; combinations; Pascal's Triangle; Binomial Theorem; applications

7 days - Complete an assignment at the end of this unit worth 5% of the final grade.

7.   **Statistics and Probability Distributions** (Lessons 1-4)
- probability and sample space; classifying events; probability and combinatorics; conditional probability; binomial distribution; mean and standard deviation; z-scores; normal distribution; applications

6 days - Write a test at the end of this unit worth 5% of the final grade.

8.   **Conic Sections (Quadratic Relations)** (Lessons 1-6 & 8)
- circles; parabolas; ellipses; hyperbolas; equations and problem solving involving conic sections; general quadratic equation in two variables; graphing; applications

8 days - Write a test worth 5% of the total grade.

FINAL EXAM - Write a Final Exam worth 40% of the final grade.

Examinations:

There are eight units in this course. Each unit will have a test and/or an assignment which will count towards the final grade. Any student not attending class on a test date will receive a grade of zero for that test unless a phone call is made *prior* to the time of the test and an explanation of the absence satisfactory to the instructor is provided. As well, as per department policy, 10% will be deducted from the grade. There will be a mid-term exam after the first four units. There will be a final exam after the course is completed with emphasis on the last half of the course.

Assignments should be handed in on the specified dates. Late assignments will be decreased by 10% per day and will not be marked once assignments have been returned to the rest of the class.

Transferability:

This course is listed in the Alberta Transfer Guide. It is accepted at colleges and universities in Alberta as equivalent to Math 30 Pure.