



**Grande Prairie Regional College**  
**School of Business**  
**Department: Academic Upgrading**

COURSE OUTLINE – WINTER 2006

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

<b>Instructor</b>	Christine Frattini	<b>Phone</b>	Office 539-2010; Home 539-7465
<b>Office</b>	C416	<b>E-mail</b>	<a href="mailto:cfrattini@gprc.ab.ca">cfrattini@gprc.ab.ca</a>
<b>Office Hours</b>	Daily 2:30-3:20 PM		

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**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.

The following are the minimum objectives which must be achieved over the semester. Some changes to objectives may be introduced later as per the need.

**UNIT 1. REVIEW / TRANSFORMATIONS:** On completing this unit, you should be able to

- Factor a given polynomial, where possible (common factor, difference of squares, trinomials).
- Solve linear, quadratic and polynomial equations.
- Plot the graphs of linear, quadratic, and cubic functions. Also be able to plot rational, absolute value, and square root functions.
- Given the graph of any function, be able to plot the graph of a related function using stretches (about the x or y-axis), reflections (in x-axis, in y-axis, in line  $y=x$ ), and translations (horizontal and vertical).
- Identify invariant points.
- 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.
- Solve related problems.

**Complete an assignment at the end of this unit worth 5% of the total grade.**

**UNIT 2. EXPONENTS AND LOGARITHMS:** On completing this unit, you should be able to

- Use the laws of exponents to simplify expressions.
- Solve exponential equations.
- Plot graphs of exponential functions.
- Identify transformations of exponential 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.
- Plot graphs of logarithmic functions.
- Identify transformations of logarithmic functions.
- Solve logarithmic equations.
- 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.

**Write a test at the end of this unit worth 5% of the final grade.**

**UNIT 3. SEQUENCES AND SERIES:** On completing this unit, you should be able to

- Define **arithmetic sequence**, common difference, and general term. Also, be able to identify an arithmetic sequence.
- Determine the general term as well as specific terms of an arithmetic sequence.
- Determine the sum of a given arithmetic sequence to a desired number of terms.
- Solve related problems.
- Expand and evaluate expressions written in Sigma notation.
- 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.
- Solve related problems.

**Complete an assignment at the end of this unit worth 5% of the total grade.**

**UNIT 4. TRIGONOMETRY: FUNCTIONS AND GRAPHS** On completing this unit, you should be able to

- Define radian measure of an angle; be able to convert radians to degrees and vice-versa.
- Solve related problems.
- 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.

**Write a test at the end of this unit worth 5% of the total grade.**

**WRITE A MIDTERM EXAM WORTH 20% OF THE FINAL GRADE.**

**UNIT 5. TRIGONOMETRY: EQUATIONS, IDENTITIES AND MODELLING:** On completing this unit, you should be able to

- 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.

**Complete three short assignments worth 5% of the total grade.**

**UNIT 6. PERMUTATIONS AND COMBINATIONS:** On completing this unit, you should be able to

- Apply the fundamental counting principle to determine the number of different ways to perform multistep 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.
- Determine the number of permutations of  $n$  objects when some of them are alike.
- Solve related problems.
- 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.

**Complete an assignment at the end of this unit worth 5% of the final grade.**

**UNIT 7. STATISTICS and PROBABILITY DISTRIBUTION:** On completing this unit, you should be able to

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

**UNIT 8. CONIC SECTIONS (QUADRATIC RELATIONS):** On completing this unit, you should be able to

- 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.
- Solve related problems.

**Write a test worth 5% of the total grade.**

**WRITE A FINAL EXAM WORTH 40% OF THE FINAL GRADE.**

**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.

**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**

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

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  
**8 days**
- 2. Exponential and Logarithmic Functions** (Lessons 1-7,9)  
**Applications of Exponential and Logarithmic Functions** (Lessons 4 - 6)  
- laws and properties of exponents and logarithms; exponential and logarithmic functions; solving exponential and logarithmic equations; graphing exponential and logarithmic functions; applications  
**10 days**
- 3. Arithmetic Sequences and Series** (Handout)  
**Geometric Sequences and Series** (Lessons 1-3)  
- arithmetic and geometric sequences and series; terms and sums; summation notation and expanding a series; applications  
**6 days**
- 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; trigonometric identities and sum and difference identities; solving trigonometric equations; applications  
**10 days**  
  
**MIDTERM**
- 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  
**6 days**

6. **Permutations and Combinations** (Lessons 1-7)
  - fundamental counting principle; permutations; combinations; Pascal's Triangle; Binomial Theorem; applications**7 days**
  
7. **Permutations and Combinations** (lesson 8)  
**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**
  
8. **Conic Sections (Quadratic Relations)** (Lessons 1-9)
  - circles; parabolas; ellipses; hyperbolas; equations and problem solving involving conic sections; general quadratic equation in two variables; graphing; applications**9 days**

## **FINAL EXAM**

### **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.