

MATH 1533 CIN3: Mathematical Concepts I

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Syllabus

Course Overview

This course is one of a pair of courses designed for students who wish to become elementary school teachers. It's designed to fulfill the certification requirements of the Nova Scotia Department of Education. But that's not its only purpose. It is also designed to build your background with the material as well as to build your comfort level and confidence with teaching mathematics. And in fact that's my real goal. You don't need this particular course to fulfill certification requirements. Other math courses will do that. The reason for taking this particular course is to try to become a better, stronger, and more confident math teacher.

How are we going to do that? The main theme of this course is to study some of the material taught in elementary and middle school, and to go beyond that material a little more deeply. We won't always focus on basics, but instead will try to use the basic ideas in ways which I hope will help clarify them. So we will at times be going outside classroom material to consider further ideas. This means that even if you did well in math in high school, there will likely be some ideas introduced in the course that you have not seen before.

So regardless of why you've decided to take this course, I have assumed throughout that your intention is to go into teaching. It won't affect most of the course, but there will be some activities and material that looks at mathematics *in the classroom*, from a teacher or child perspective, rather than just at the mathematics itself. It also means that there will be significant emphasis on *understanding* the mathematics we see, and on putting it in perspective. In other words, we won't just look at *how* to do the math, but at *why*: why we use particular methods, and why they work. Unfortunately, when it comes to Mathematics as a subject, there is often a misunderstanding that treats it as if there is some set of rules or formulas we have to accept and use. That's not true. What *is* the case is that there are reasons for these various rules and formulas, and *understanding* these reasons can make the subject less confusing. So our focus will often be on understanding what we are doing.

Instructor

I have been teaching in the Math Department here at Acadia since 2001, and I am currently the Head of the Department. But I have also had a lot of previous teaching experience as well before coming here, including periods at the University of Windsor, McMaster University, the University of Waterloo, and the Universities of Cambridge and Durham in the UK. Math 1503 is a course I developed here and have been teaching for the last several years. I have also been actively involved in Nova Scotia's Math curriculum development, and have tried to integrate some of the ideas I've encountered into this course.



Contact Information:

Department of Math & Stats
Acadia University
Wolfville, Nova Scotia
CANADA B4P 2R6

Phone: (902) 585-1547

Fax: (902) 585-1074

E-mail: jeff.hooper@acadiau.ca

Course Materials

The Textbook for this course is:

A Problem Solving Approach to Mathematics for Elementary School Teachers, 13th edition (2020)

by Rick Billstein, Shlomo Libeskind, and Johnny W. Lott; published by Pearson.

ISBN-10: 013518388X

ISBN-13: 9780135183885

Optional - student solution guide ISBN: 9780321990563

See the [student handbook](#) for ordering information.

Our textbook is a big book, and is just full of stuff. In fact, there's a lot more in this book than we're going to get to this course. But I deliberately chose this book so that you will not only have the material we've covered from class available, but you'll have an easy to use resource once you get out into the classroom. For one thing, you're bound to run into topics or ideas once you're teaching that are unfamiliar, and you may find things that you have to refresh as you go. Not only that, but education departments routinely update their curricula, and as a teacher that means that you are almost certainly going to find material introduced into your classroom is new to you. Having a resource like this textbook will hopefully allow this kind of transition to be an easy one.

Module Structure and Evaluation

The heart of the course will be work you do in each module. The course is divided up into 7 modules, each divided into two sections. Each module corresponds roughly to one topic, and generally corresponds to material from one of the chapters of the textbook. So Module 1, for instance, covers material from Chapter 1. It is divided into two sections: 1A and 1B, in order to try to make the amount of material in each section less overwhelming.

Each section begins with a page called 'Introduction, Readings, and Resources' which introduces the topic, assigns a list of sections to read through in the textbook, a list of additional practice problems from the textbook, and suggests some web resources that may be helpful. Even if you don't use these web resources directly, it's not a bad idea to have a look at them, since they may be things you can come back to when you're actually teaching.

Alongside your readings, I have also provided one or more sets of slides that give an overview of that section's topics. These are intended to help summarize and clarify concepts, and are meant to supplement the reading, rather than replace the text material. These overview slideshows also include video examples and one or two checkpoint problems at the end, so you can test your understanding. The videos follow me as I work through examples and problems. Note that the Checkpoint problems from these slideshows can be optionally completed as part of your overall grade, and can be attempted multiple times. In Grading Scheme 1 below, these are worth 20% of your final grade. Scheme 2 omits these and alters the weights of the other assessments accordingly.

Each module section also has a set of solved practice problems. These practice problems do not get handed in, but are meant to give you some ideas of what to expect from the quizzes and assignments. I have provided extensive solutions for these. The optimal way to use these practice problems is to attempt the problems on your own, and then compare with my solutions to see how you've done. Note that these problems are generally connected to the actual quiz and assignment questions, so should serve as good practice before attempting any assessments.

Section Quizzes

Each Section of the course ends with a Quiz, which may be attempted multiple times. These quizzes are meant to provide formative assessment: in other words for you to self-assess and see how you are doing. Your highest grade will be recorded for these.

Written Assignments

Each Module finishes with a written assignment of 6-10 problems, with about half coming from each module section. These require written solutions and explanations to problems, and include problems which can't be easily done in a quiz format.

The assignments should be neat, easy to read, and organized, with problems done in order. As far as format, my preference is for you to write the assignment, rather than type it out. Typing tends in many cases to take you longer, and it can be harder to display answers. [If typing is really necessary for you, please let me know.] My preference is to receive files in PDF format; in many cases the simplest method is to write your assignment, scan the pages to PDF, and submit the PDF file. If this method is not workable for you, then please email me and we can try to find a format that works for both of us.

Written Assignments should be delivered to me via the assignment drop-boxes here in Acorn. Please remember to put your name, student number, course number, and assignment number on the assignment and keep a copy in the event the original is lost. The system will send me an email to let me know that you've submitted.

Final Assessment

The course will finish with a take-home final assessment. This is like a review assignment, and essentially involves you having a window of time (12 hours) in which to complete the assessment and submit.

Evaluation

Your grade in this course will be calculated using the following 2 schemes; you will receive the best of the two outcomes. The second scheme places higher weight on the final assessment in case you do better on this than on the quizzes and assignments as you go along.

Scheme 1		Scheme 2	
Checkpoints	20%	Checkpoints	0%
Section Quizzes	20%	Section Quizzes	25%
Written Assignments	20%	Written Assignments	25%
Final Assessment	40%	Final Assessment	50%

Course Schedule

You have 6 months to complete this course, though there is nothing wrong with moving through the material faster if you wish to. However, if you intend to complete the course more quickly (say in less than 3 months) then you should let me know so that we can arrange a schedule.

Please do not leave all of your course work until a few weeks before your completion date. Although I will make every effort to accommodate your schedule within reason, I need time to grade assignments and mark exams.

Recommended Schedule

The schedule listed here is only a recommendation. The course modules are not all equal in length or depth, so I assume that some of these will take longer than others to complete. They can also be completed in any order, though generally the ideas build from 1 through 7.

The schedule listed here will allow you to complete the modules in about 4 months, with time left at the end to prepare for the final exam. Previous students have found modules 2 and 7 to take a bit longer than the rest.

Quick Overview:

Suggested Schedule	
Weeks	Section and activities

Weeks 1-2	<p>Section 1A: Problem Solving</p> <p>Readings – Billstein et al, 13th ed :: Section 1-1 pp. 1-13</p> <p>Presentations –</p> <ul style="list-style-type: none"> • Intro to Problem Solving • Gauss's Problem and Generalizations <p>Practice Problems and Solutions</p> <p>Section 1A Quiz</p>
	<p>Section 1B: Exploring Patterns</p> <p>Readings – Billstein et al, 13th ed :: Section 1-2 pp. 16-31</p> <p>Presentations –</p> <ul style="list-style-type: none"> • Sequences and Patterns <p>Practice Problems and Solutions</p> <p>Section 1B Quiz</p>
	Written Assignment 1
Weeks 3-4	<p>Section 2A: Sets - Describing Sets</p> <p>Readings – Billstein et al, 13th ed :: Section 2-2 pp. 51-61.</p> <p>Presentations –</p> <ul style="list-style-type: none"> • Set Basics • Universes, Complements, and Subsets <p>Practice Problems and Solutions</p> <p>Section 2A Quiz</p>
	<p>Section 2B: Exploring Patterns</p> <p>Readings – Billstein et al, 13th ed :: Section 2-3 pp. 65-71.</p> <p>Presentations –</p> <ul style="list-style-type: none"> • Set Operations • Venn Diagrams <p>Practice Problems and Solutions</p> <p>Section 2B Quiz</p>
	Written Assignment 2

Weeks 5-6	<p>3A: Whole Numbers - Addition and Subtraction</p> <p>Readings – Billstein et al, 13th ed ::</p> <ul style="list-style-type: none"> • Section 3-1 pp. 83-94 • Section 3-2 pp. 98-111 (not including Addition in Bases Other than 10 and Mental Computation) • Section 3-3 pp. 124-133 (not including Subtraction in Bases Other than 10 and Mental Computation). <p>Presentations –</p> <ul style="list-style-type: none"> • Section 3-4 pp. 140-154 (not including Multiplication in Bases Other than 10 and Mental Computation and Estimation). • Section 3-5 pp. 162-172 (not including Division in Bases Other than 10 and Mental Computation and Estimation). • Addition and Subtraction of Whole Numbers II <p>Practice Problems and Solutions</p> <p>Section 3A Quiz</p>
	<p>3B: Whole Numbers - Multiplication and Division</p> <p>Readings – Billstein et al, 13th ed ::</p> <ul style="list-style-type: none"> • Section 3-4 pp. 140-154 (not including Multiplication in Bases Other than 10 and Mental Computation and Estimation). • Section 3-5 pp. 162-172 (not including Division in Bases Other than 10 and Mental Computation and Estimation). <p>Presentations –</p> <ul style="list-style-type: none"> • Multiplication and Division of Whole Numbers I • Multiplication and Division of Whole Numbers II <p>Practice Problems and Solutions</p> <p>Section 3B Quiz</p>
	Written Assignment 3
Weeks 7-8	<p>4A: Integers - Divisibility and Primes</p> <p>Readings – Billstein et al, 13th ed ::</p> <ul style="list-style-type: none"> • Section 4-1 pp. 185-195. • Section 4-2 pp. 199-200. <p>Presentations –</p> <ul style="list-style-type: none"> • Divisibility • Primes and Composites <p>Practice Problems and Solutions</p> <p>Section 4A Quiz</p>

Weeks 9-10	<p>4B: Integers - Prime Factorizations and GCDs</p> <p>Readings - Billstein et al, 13th ed ::</p> <ul style="list-style-type: none"> • Section 4-2 pp. 199-208. • Section 4-3 pp. 212-221. <p>Presentations -</p> <ul style="list-style-type: none"> • Prime Factorization • Greatest Common Divisor and Least Common Multiple <p>Practice Problems and Solutions</p> <p>Section 4B Quiz</p>
	Written Assignment 4
	<p>5A: Rational Numbers - Visualizing and Comparing</p> <p>Readings - Billstein et al, 13th ed :: Section 6-1 pp. 273-283.</p> <p>Presentations -</p> <ul style="list-style-type: none"> • Visualizing Rational Numbers • Equivalent Fractions and Common Denominators <p>Practice Problems and Solutions</p> <p>Section 5A Quiz</p>
	<p>5B: Rational Numbers - Operations and Proportional Reasoning</p> <p>Readings - Billstein et al, 13th ed ::</p> <ul style="list-style-type: none"> • Section 6-2 pp. 288-300. • Section 6-3 pp. 305-320. • Section 6-4 pp. 326-336. <p>Presentations -</p> <ul style="list-style-type: none"> • Operations on Rational Numbers • Ratios and Proportional Reasoning <p>Practice Problems and Solutions</p> <p>Section 5B Quiz</p>
	Written Assignment 5

Weeks 11-12	<p>6A: Decimals and Operations</p> <p>Readings – Billstein et al, 13th ed ::</p> <ul style="list-style-type: none"> • Section 7-1 pp. 348-360. • Section 7-2 pp. 362-375. • Section 7-3 pp. 380-387. <p>Presentations –</p> <ul style="list-style-type: none"> • Decimals and Operations • Nonterminating Decimals <p>Practice Problems and Solutions</p> <p>Section 6A Quiz</p>
	<p>6B: Percents and Real Numbers</p> <p>Readings – Billstein et al, 13th ed ::</p> <ul style="list-style-type: none"> • Section 7-4 pp. 391-402 (not the material on Interest). • Section 7-5 pp. 410-420. <p>Presentations –</p> <ul style="list-style-type: none"> • Percents • Real Numbers <p>Practice Problems and Solutions</p> <p>Section 6B Quiz</p>
	Written Assignment 6
Weeks 13-14	<p>7A: Variables and Equations</p> <p>Readings – Billstein et al, 13th ed ::</p> <ul style="list-style-type: none"> • Section 8-1 pp. 430-436. • Section 8-2 pp. 441-449. <p>Presentations –</p> <ul style="list-style-type: none"> • Variables • Equations <p>Practice Problems and Solutions</p> <p>Section 7A Quiz</p>
	<p>7B: Functions</p> <p>Readings – Billstein et al, 13th ed :: Section 8-3 pp. 453-463.</p> <p>Presentations –</p> <ul style="list-style-type: none"> • Functions <p>Practice Problems and Solutions</p> <p>Section 7B Quiz</p>
	Written Assignment 7

Final Assessment -

When you get to the end of the coursework (or even a little before) you should touch base with me to discuss setting up the final assessment. It does not need a lot of lead time, but you can't set this up yourself.

Student Handbook

You are responsible for becoming familiar with the contents of the Student Handbook. It contains important information about scheduling examinations (if applicable), applying for extensions, withdrawing from your course, ordering books, and computer and library services available to you. If you have questions about the policies outlined in the handbook (<https://courseware.acadiau.ca/openacadia/studenthandbook.html>), contact:

Open Acadia

- 21 University Avenue (Rhodes Hall)
- Wolfville, NS B4P 2R6
- Phone: 1-800-565-6568
- Fax: 1-902-585-1068
- Email: openacadia@acadiau.ca

Academic Integrity

Academic integrity demands responsible use of the work of other scholars. It is compromised by academic dishonesty such as cheating and plagiarism. A student who is uncertain whether or not a course of action might constitute cheating or plagiarism should seek in advance the advice of the instructor involved.

- Cheating is copying or the use of unauthorized aids or the intentional falsification or invention of information in any academic exercise
- Plagiarism is the act of presenting the ideas or words of another as one's own. Students are required to acknowledge and document the sources of ideas that they use in their written work.
- Self plagiarism is also a form of plagiarism. It is the presentation of the same work in more than one course without the permission of the instructors involved.
- A student who knowingly helps another to commit an act of academic dishonesty is equally guilty.
- Penalties are levied in relation to the degree of the relevant infraction. They range from requiring the student to re-do the piece of work, through failure on that piece of work, to failure in the course, and to dismissal from the university.

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