MATH 160A: Higher Arithmetic
3 Credits, 3 hours lecture

This course is restricted to students of Elementary Education. It will provide them with an elementary introduction to Logic, Sets, Number Theory, Representations of Numbers, Number Systems, and Probability Theory.

Prerequisites: MATH 30-1 or MATH 30-2 or permission of the Program Chair

Instructor

Instructor Name: Matthew Morin
Office location: S211E
Phone number: 780-791-4831
matthew.morin@keyano.ca

Office Hours

Tuesday   15:00 – 15:50
Wednesday   14:00 – 15:50
Thursday   15:00 – 15:50
Friday   15:00 – 15:50

Hours of Instruction

Monday   10:30 – 11:50 (S205)
Wednesday   10:30 – 11:50 (S205)

Required Resources
    Textbook: *On the Consideration of n+1=n+1: Exploring Depth in Basic Arithmetic*
    (Keyano Bookstore only; Print-on-Demand)

Course Outcomes

At the completion of the course, students will be able to:

- Compute arithmetical expressions of numbers using the correct order of operations.
- Evaluate arithmetical operations in the context of sets, logic, and other areas.
- Explain the difference between exact division and division with remainders.
- Use divisibility rules to determine whether a large number is divisible by certain small factors (such as 2, 3, 4, 5, 6, 8, 9, 10, 12).
- Utilize the arithmetic of remainders (modular arithmetic) to answer questions about divisibility.
- Demonstrate how to find the greatest common divisor of a pair of numbers by comparing factors, using prime factorizations, and by using the Euclidean algorithm.
- Compute prime factorizations and use these to answer problems regarding divisibility, such as finding greatest common divisors and least common multiples.
- Perform basic arithmetic of numbers using alternative numeration systems.

Evaluation

Assignments	20%
Midterm Exam	30%
Final Exam	50%
Total	100%

A grade of C- is required for progression or transfer.

Lectures:

All course contact hours will be delivered live using Zoom at the scheduled times. A link to the zoom meeting can always be found through our course's Moodle page. Lectures will not be recorded by the instructor, nor are they to be recorded by students. Missed Zoom lectures will not be available at a later date, so it is important that you are technologically prepared to attend each Zoom lecture at the scheduled time.

During the majority of lecture time, students are expected to have their video feed off and microphone muted. However, students are meant to (and are implored to) switch their microphone on at any time to ask/answer questions or seek more clarification. Each of your questions and thoughts are important to the learning process.

Please Note: It is possible that in-person delivery may begin part-way through the school year.

Office Hours:

During the scheduled office hours, the instructor will be available for questions. If you send the instructor a message during office hours (or pre-schedule a meeting), then a link to a Zoom meeting will be sent out. (As sometimes there may be a delay in email servers, you may wish to send a message using Microsoft Teams as well if there seems to be a delay in an office hour request. However, a delay may also mean that the instructor is currently meeting with another student.)

Assignments:

In any mathematics course the best way "to learn" is "to do." The instructor can teach you about the course ideas and demonstrate the mechanics of solving the problems—and can make it look very easy—but growing adept at solving these problems will take a lot of practice and can be a struggle. Although the assignments do not count for a large part of your final grade they are essential in preparing you for the types of problems you will be solving on the exams.

Assignment completion is a requirement of the course*.* Failure to complete all the assignments may result in a failing grade for the course.

Assignment will be posted and collected through our course's Moodle page. You will download the problems, write out solutions, and upload them for grading. A cover page is not required, but the assignment number, the course number, and your name should be clearly written on the front page. Homework problems should be presented in the order that they were listed. **It is the student's responsibility to compile their written assignment into a single pdf file for upload onto Moodle by the posted due date** (if you have hand written solutions on paper, then there are apps on phones that can scan papers into a pdf format, for instance). A late assignment may be accepted, or may incur a penalty depending on the circumstances. Once marked assignments are returned to the class, no further late assignments can be submitted.

Although you are permitted to work with other students while completing assignments**, it is essential that the work you present is your own**—see the section on Academic Misconduct later in this outline for more information. Presenting other students' solutions as your own may result in serious academic penalties. If you are working together with other students on a problem, it is vital that at the end of the process YOU know how to solve the problem and that YOU write out your own solution in

your own way. If there is suspicion of academic misconduct, you will be required to defend the work you have submitted.

It is recommended that you attempt the assignments yourself before talking over problems with your classmates. If you need help with a problem you can make use of office hours, Keyano's Skill Center, and (yes) talk to your classmates. However, this does not mean looking through a classmate's solution. Rather, it is best if you talk about the problem. If you do not understand what the problem is asking for, then it could be useful to read through the relevant sections of the textbook and the course notes.

Note: Before any written course work will be accepted, each student needs to complete the online plagiarism course found at ilearn.keyano.ca.

Tests:

All tests will be distributed and collected using Moodle. Test files will be released, students will write out their answers, convert to a pdf, and then digitally upload. Tests are to be closed-book and no calculators are allowed. Your tests are to be written by you alone: you cannot consult with other people or look online for assistance.

The dates of most tests will be announced in-class with specific details posted on Moodle well in advance of the test date. The topics covered by each test and a sample test will usually be provided. These tests are meant to test how well you have "mastered" the subject matter. Satisfactory completion of the relevant assignment problems, reading the relevant textbook sections, and studying the course notes is the very minimum amount of work that should prepare you for the types of problems that could appear on a test. However, as the larger tests are cumulative in nature, you may be solving problems that require ideas that bridge across several sections of the course.

Please Note: It is possible that testing will be in-person, rather than online.

Grading System

Descriptor	Alpha Grade	4.0 Scale	Percent	Rubric for Letter Grades
	A+	4.0	> 92.9	Work shows in-depth and critical analysis, well developed ideas, creativity, excellent writing, clarity and proper format.
Excellent	A	4.0	85 – 92.9	
	A-	3.7	80 – 84.9	
	B+	3.3	77 – 79.9	Work is generally of high quality, well developed, well written, has clarity, and uses proper format.
Good	B	3.0	74 – 76.9	
	B-	2.7	70 – 73.9	
	C+	2.3	67 – 69.9	Work has some developed ideas but needs more attention to clarity, style and formatting.
Satisfactory **Progression**	C	2.0	64 – 66.9	
	C-	1.7	60 – 63.9	
Poor **Minimum Pass**	D+	1.3	55 – 59.9	Work is completed in a general way with minimal support, or is poorly written or did not use proper format.
	D	1.0	50 – 54.9	
Failure	F	0.0	< 50	Responses fail to demonstrate appropriate understanding or are fundamentally incomplete.

Proposed Schedule of Topics

Week	Dates	Topic	Chapter Sections
1	Aug. 31 - Sept. 4 (**No classes Aug. 31**)	Set Theory	Chapter 1
2	Sept. 7 - Sept. 11 (**No classes Sept. 7**)	Set Theory	Chapter 1
3	Sept. 14 - Sept. 18	General Arithmetic, Operations and Properties	Chapter 2
4	Sept. 21 - Sept. 25	More Properties of Arithmetic	Chapter 2
5	Sept. 28 - Oct. 2	Divisibility, Divisibility Rules	Chapter 3
6	Oct. 5 - Oct. 9	Greatest Common Divisor, Euclidean Algorithm	Chapter 3
7	Oct. 12 - Oct. 16 (**No classes Oct. 12th**)	Prime Numbers, Fundamental Theorem of Arithmetic	Chapter 3
8	Oct. 19 - Oct. 23	**Midterm (Monday, Oct. 19)** Applications of Primes	Chapter 3
9	Oct. 26 - Oct.30	Word Problems, Extended Euclidean Algorithm	Chapter 4
10	Nov. 2 – Nov. 6	Extended Euclidean Algorithm (cont.), Diophantine Equations	Chapter 4
11	Nov. 9 – Nov. 13 (**No classes Nov. 11th**) (**No classes Nov. 12, 13**)	Remainders, Congruence	Chapter 5
12	Nov. 16 – Nov. 20	Congruence Classes, Inverses	Chapter 5
13	Nov. 23 – Nov. 27	Divisibility Rules, Arithmetic in Positional Systems	Chapter 5, Chapter 6
14	Nov. 30 – Dec. 4 (**No classes Dec. 3, 4th**)	Converting Between Bases	Chapter 6
	Dec. 7 – Dec. 18	**Exam Period**	

Please Note:

Date and time allotted to each topic is subject to change.

Performance Requirements

Student Responsibilities
It is your responsibility as a student to contact the Office of the Registrar to complete the forms for Withdrawal or Change of Registration, and any other forms. Please refer to the list of important dates as noted in the Academic Schedule in the Keyano College credit calendar. The Keyano College credit calendar also has information about Student Rights and Code of Conduct. It is the responsibility of each student to be aware of the guidelines outlined in the Student Rights and Code of Conduct Policies.

Student Attendance
Class attendance is useful for two reasons. First, class attendance maximizes a student's learning experience. Second, attending class is a good way to keep informed of matters relating to the administration of the course (e.g., the timing of assignments and exams). Ultimately, you are responsible for your own learning and performance in this course.

It is the responsibility of each student to be prepared for all classes. Students who miss classes are responsible for the material covered in those classes and for ensuring that they are prepared for the next class, including the completion of any assignments and notes that may be due.

Academic Misconduct

Students are considered to be responsible adults and should adhere to principles of intellectual integrity. Intellectual dishonesty may take many forms, such as:

- Plagiarism or the submission of another person's work as one's own;
- The use of unauthorized aids in assignments or examinations (cheating);
- Collusion or the unauthorized collaboration with others in preparing work;
- The deliberate misrepresentation of qualifications;
- The willful distortion of results or data;
- Substitution in an examination by another person;
- Handing in the same unchanged work as submitted for another assignment; and
- Breach of confidentiality.

The consequences for academic misconduct range from a verbal reprimand to expulsion from the College. More specific descriptions and details are found in the Student Rights and Code of Conduct section of the Keyano College credit calendar. It is the responsibility of each student to be aware of the guidelines outlined in the Student Rights and Code of Conduct Policies.

In order to ensure your understanding of the concept of plagiarism, you must successfully complete the online tutorial found on ilearn.keyano.ca. Then print the certificate, sign it, and show it to each of your instructors. Your course work may not be graded until you show this signed certificate.

Specialized Supports

The Student Services department is committed to Keyano students and their academic success. There are a variety of student supports available at Keyano College. Due to the continuing situation with the Covid-19 pandemic, the offered support services will be implemented differently this semester by being provided mostly virtually. In-person service can be requested as needed. All Alberta Health Services guidelines will be followed for in-person appointments—wear a mask, maintain two meters of physical distance, use hand sanitizer, and stay home if you are unwell.

All student services are available during Keyano business hours: Monday to Friday, 8h30-16h30. The Library has evening and weekend hours. Please check keyano.ca/library for current hours.

Accessibility Services: provides accommodations for students with disabilities. Students with documented disabilities, or who suspect a disability, can meet with a Learning Strategist to discuss their current learning barriers and possible accommodations. Students who have accessed accommodations in the past are encouraged to contact us to request them for the semester. Please note that requesting accommodations is a process and requires time to arrange. Contact us as soon as you know you may require accommodations. For accessibility services supports and to book a virtual appointment, please contact accessibility.services@keyano.ca.

Accessibility Services also provides individual and group learning strategy instruction for all students, as well as technology training and supports to enhance learning. Meet with a Learning Strategist to learn studying and test-taking strategies for online classes. Schedule an appointment with the Assistive Technology Specialist to explore technology tools for learning. Book an appointment today by emailing accessibility.services@keyano.ca

Academic Success Coaching: offers you support and access to resources for your academic success to help you to find the Keys to your Success. The Academic Success Coach will work with you to develop an academic success plan, develop your study and time management skills, and connect you with the right resources here at Keyano. Academic.success@keyano.ca is the best way to access resources during virtual service delivery.

Wellness Services: offers a caring, inclusive, and respectful environment where students can access free group and individual support to meet academic and life challenges. Mental Health Coordinators offer a safe and confidential environment to seek help with personal concerns. All individual appointments will continue virtually.

Wellness Services welcomes students to participate in any of the virtual group sessions offered throughout the academic year addressing topics including mindfulness and test anxiety.

Individual virtual appointments can be made by emailing wellness.services@keyano.ca.

Library Services: provides students with research and information supports as they engage in their studies. Library staff are available to support you both virtually and in person during the fall semester. For library service supports and inquiries, please email askthelibrary@keyano.ca.

Individual support with the Information Librarian will be provided virtually. Appointments can be requested by email or by placing a Book a Librarian request using the online form found here.

Research and Subject Guides are helpful resources when conducting research or addressing your information needs. To view a subject or course specific guide, use the following Subject Guides link

To access additional research resources, including Citation Guides (APA, MLA, Chicago, or IEEE), go to the Research Help Library page.

Skill Centre: provides academic support services to students registered in credit programs at Keyano College in the form of tutoring, writing support groups, facilitated study groups, workshops and study space. Tutoring services are **free** to Keyano students. Tutoring is available for Math, Writing, English, and Science subject areas.

While most courses are being offered online, the Skill Center will be offering mostly virtual tutoring services and in-person sessions as requested. Please email Skill.centre@keyano.ca to get in contact with our tutoring staff.

For the most up to date information on how to book a tutoring session, please view the Keyano Skill Centre homepage.

E-Learning

Technology and internet will impact your online learning experience. It's important that you are able to watch an online video and other course materials, take online quizzes, and participant in a live class with your instructor and other students.

Keyano College operates in a Windows based environment and having the correct tools for online learning is important. Here's a list of recommended system requirements for Fall 2020.

Internet Speed

Minimum Internet speeds of 5 Mbps.
Recommended Internet speeds of 25 Mbps (especially if you are sharing your internet at home).
Check your internet speed with Fast.com.

System requirements:

Microsoft Windows	Apple
Minimum Requirements: A Windows 10 **computer/laptop** · Minimum 4GB of RAM. · 10GB+ available hard drive storage. · Enough available hard drive space to install the Microsoft Office suite (approximately 3GB). Microsoft Office software is free to all Keyano students and employees. · Microphone, webcam and speakers. A headset with a microphone is recommended. · System updates must be regularly installed. · Anti-Virus / Anti-Malware software	**Minimum Requirements:** A Macintosh (V10.14 and above) **computer/laptop** · Minimum 4GB of RAM. · 10GB+ available hard drive storage. · Enough available hard drive space to install the Microsoft Office suite (approximately 3GB). Microsoft Office software is free to all Keyano students and employees. · Microphone, webcam and speakers. A headset with a microphone is recommended. · System updates must be regularly installed. · Anti-Virus / Anti-Malware software.
Recommended Requirements · 8GB of RAM · A method of backing up/synchronizing to local or cloud-based storage such as OneDrive is highly recommended. This is included if you complete the setup of KeyanoMail and download MS Office using your Keyano email for free.	**Recommended Requirements** · 8GB of RAM · A method of backing up/synchronizing to local or cloud-based storage such as OneDrive is highly recommended. This is included if you complete the setup of KeyanoMail and download MS Office using your Keyano email for free.

Chromebooks are **not** recommended as they are not compatible with testing lockdown browsers.

A Microsoft Surface or iPad or iPad Pro may be possible alternatives in some program areas.

Specific department requirements:

Business and OA programs require Windows 10.

Other programs may utilize Windows based tools as well.

Computer Software
Students will be able to get access to Microsoft Office 365 for Free using Keyano Credentials by clicking here.

Recording of lectures and Intellectual Property
Students may only record a lecture if explicit permission is provided by the instructor or by Accessibility Services. Even if students have permission to record a lecture or lecture materials, students may not publish any of the lectures or lecture materials, this includes any recordings, slides, instructor notes, etc. on any platform. Thus no student is allowed to publish or sell instructor notes without formal written permission. It is important to recognize that the Canadian Copyright Act contains provisions for intellectual property.

ITS Helpdesk
If you are having issues with your student account, you can contact the ITS Helpdesk by emailing its.helpdesk@keyano.ca or calling 780-791-4965.

Please watch your Keyano email for workshop announcements from our Student Services team.