Foundations of Advanced Math MWF 1PM Spring 2023 SH 305

Instructor:	Jonathan White, jwhite@coe.edu
Chair:	Jonathan White, jwhite@coe.edu (or contact Angela Ziskowski, Acting Provost)
Web Page:	public.coe.edu/~jwhite
Office:	Stuart 311
Office Hours:	(Zoom link on web page) 8:30-9:15am M-F and by appointment
Office Phone:	319-399-8280
Text:	*Foundations of Advanced Mathematics, 0.14th Edition*, Jon White (available via Jon's Central Page) and *Weapons of Math Destruction*, Cathy O'Neil
Participation:	Day-to-day class participation, presentations, and snap quizzes will be a prominent aspect of this class, and together worth 200 points. Typically each problem presented or snap quiz is worth 5 points.
Problem Sets:	There will be problem sets due most weeks of the semester, together worth 200 points.
Math Culture Points:	Math Culture Points will constitute 200 points. These will be earned through participation in various activities outside of class, as detailed on the third page of this syllabus.
Exams:	There will be four small in-class examlets administered during class time. The dates of these are indicated in the schedule on the back side of this sheet. These examlets will be worth 50 points each. The final exam will be held during finals week at the date and time indicated on the back side of this sheet and worth 200 points.
Grading:	Grading will approximately follow a $[92.0\%, \infty) \mapsto$ A, $[90\%, 92\%) \mapsto$ A–, $[87\%, 90\%) \mapsto$ B+, $[82\%, 87\%) \mapsto$ B, $[80\%, 82\%) \mapsto$ B–, $[77\%, 80\%) \mapsto$ C+, $[72\%, 77\%) \mapsto$ C, $[70\%, 72\%) \mapsto$ C–, $[67\%, 70\%) \mapsto$ D+, $[62\%, 67\%) \mapsto$ D, $[60\%, 62\%) \mapsto$ D–, $(-\infty, 60\%) \mapsto$ F scale. Current grade information will be available online through Moodle at all times.
Makeups:	For fairness to those who follow the schedule, makeups for exams will be allowed only in extenuating circumstances, with documentation and advance notice when humanly possible. Late problem sets will be penalized 20% of points possible for each day late, and only accepted until others are returned.

This class is intended to achieve several goals, but primary among them is to give some accurate idea of what mathematics actually is. The specific content of the course is secondary, but my hope is to give a good exposure to many topics which are helpful or necessary to further study in mathematics and related fields. These include, but are not limited to, the basics of number theory, set theory, functions, logic, and combinatorics.

This course will be profoundly different, both in subject matter and in daily conduct, than what most of you are accustomed to in a math class. Please understand that it's different on purpose, with very clear reasons in mind. It is extremely important that you come to class each day prepared to do several of the upcoming problems. You will probably have to find different ways to learn things in this class than in any math class you've taken before. Don't let that be overwhelming, and remember that I'm around to help.

> "Doubt everything at least once, even the proposition that two times two equals four."
> –Georg Christoph Lichtenberg (1742-1799)

Foundations of Advanced Math MWF 1PM Spring 2023 SH 305

Tentative Schedule

	1/11 Parity	1/13 Beyond Parity
1/16 No Class – MLK Day	1/18 Divisibility	1/20 Modular Arithmetic
1/23 Basic Logic	1/25 Quantification	1/27 Proof Techniques: Contradiction
1/30 Proof Techniques: Induction	2/1 Proof Techniques: Cases	**2/3** **Examlet 1**
2/6 Sets	2/8 Operations on Sets	2/10 Arbitrary ∪ and ∩
2/13 Inequalities	2/15 Real Intervals	2/17 Absolute Values
2/20 Cartesian Products	2/22 Russell's Paradox	**2/24** **Examlet 2**
2/27 Functions	3/1 Operations on Functions	3/3 Composition
3/6 Injectivity and Surjectivity	3/8 Inverses	3/10 Countability
Spring Break		
3/20 Uncountability	3/22 The Continuum Hypothesis	**3/24** **Examlet 3**
3/27 Relations	3/29 Properties of Relations	3/31 Equivalence Relations
4/3 Relations as Sets	4/5 Functions as Relations	4/7 Graphs
4/10 Directed Graphs	4/12 **Student Research Symposium**	**4/14** **Examlet 4**
4/17 Combinatorics	4/19 Probability	4/21 The Peano Axioms
4/24 The Peano Axioms	4/26 The Peano Axioms	4/28 The Peano Axioms
Final Exam – 11am on Wednesday 5/3		

Any students with disabilities which might affect their performance in this class should contact me as soon as possible to arrange accommodations.

Coe's faculty has adopted an academic integrity policy. It is your responsibility to understand and follow it.

Diversity, in all its forms, is valuable.

Math Culture Points

A portion of the grade for this course will take the form of Math Culture Points. These will be earned through activities outside of class including, but not necessarily limited to, those listed below:

Activity	Points	Max #
Colloquium Attendance	10	–
Colloquium Presentation	10-30	2

Conference Attendance
    Nebraska Conference for Undergraduate Women in Mathematics
    Midwest Undergraduate Mathematics Symposium (MUMS) – 4/15/23
	10-30
	30
	30
		2

Mathematics Competition Participation Iowa Collegiate Mathematics Competition – Saturday 4/1/23	30	2

Math Culture Reading
    Specific readings will be posted, typically around 6 each semester
    Any article from Math Horizons
    With approval, any relevant article from Math Magazine, CMJ, etc.
	10	
		–
		5
		3

Math Club Activities (when appropriate) Movies, Speakers, Workshops, etc.	10	–

Other Appropriate Coe or Outreach Activities
    Chess Club Meeting
    Job Shadowing in any relevant field
    Other Volunteer Outreach (Garfield, McKinnley, etc. – talk to Jon for information!)
	
	10
	20
	10
		
		4
		1
		5

You should plan to spread your participation throughout the semester. In each case above, credit assumes both full participation and posting a brief summary/response on Moodle **in a timely manner**. These reflections should generally be between 100 and 300 words, and include both a brief summary and your personal thoughts on the event, and **must be submitted within two weeks of the event**, or within the specified time window for other activities. Up to three units of credit may be submitted after normal deadlines in the "Math Culture – Late" category on Moodle, but otherwise exceptions will not be made without serious extenuating circumstances.

Learning Outcomes

Course Objectives: By the end of the course, students should have practiced...

- writing mathematical proofs
- verbally communicating mathematical ideas
- critiquing others' arguments
- other life skills that are more impactful for students to ponder than to enumerate here

The Provost has mandated that the material below this line appear on all syllabi:

Mission Statement:

Coe College is a national, residential liberal arts college offering a broad array of programs in the arts, sciences, and professions. Our mission is to prepare students for meaningful lives and fulfilling careers in a diverse, interconnected world. Coe's success will be judged by the success of our graduates.

Academic Integrity

At Coe College, we expect academic integrity of all members of our community. Academic integrity assumes honesty about the nature of one's work in all situations. Such honesty is at the heart of the educational enterprise and is a precondition for intellectual growth. Academic dishonesty is the willful attempt to misrepresent one's work, cheat, plagiarize, or impede other students' academic progress. Academic dishonesty interferes with the mission of the College and will be treated with the utmost seriousness as a violation of community standards. Please refer to the Coe College Academic Catalog for complete information regarding Academic Integrity: www.coe.edu/academics/academic-resources/provosts-office/academic-integrity-policy

FERPA

Students should be aware of their rights regarding the privacy of their educational records. Detailed information about your rights can be found under the FERPA (Family Educational Rights and Privacy Act of 1974) section in the Academic Catalog and online here: https://www.coe.edu/academics/academic-resources/registrar/ferpa In line with FERPA restrictions, students should be aware that an instructor cannot publicly post grades by student name, institutional student identification number, or social security number without first having obtained students' written permission.

The Definition of a Course Credit & Expected Workload

One course credit at Coe College constitutes 180 hours' worth of student work over the course of the term. "The Department of Education has defined one hour to be 50 minutes, so 150 60-minute hours is equivalent to 180 50-minute hours." This figure includes both the time spent in class and out of class completing course work. In other words, students are expected to devote a considerable amount of time outside of class to this course. For courses that meet in a standard MWF or T-Th slot, students should be expected to work seven hours a week outside of the three hours in class.

Requesting Academic Accommodations

Coe College is committed to creating a learning environment that meets the needs of its diverse student body. If you anticipate or experience any barriers to learning in this course, please visit my office hours to discuss these concerns with me. If you have a medical, physical, psychological, or learning need documented by a healthcare provider, or experience an unforeseen obstacle during the semester, you can make an appointment with Laura Hayes, Accessibility Services Coordinator, to request an official accommodation under the Americans with Disabilities Act. You can find more information about the Accessibility Services Office by visiting the Learning Commons website or by emailing accessibility@coe.edu. If you have already been approved for accommodations through Accessibility Services, please meet with me so we can develop a plan for your success together.

Reporting of Sexual Assault or Misconduct

As an instructor, one of my responsibilities is to help create a safe learning environment on our campus. I also have a mandatory reporting responsibility related to my role as a faculty member. It is my goal that you feel able to share information related to your life experiences in classroom discussions, in your written work, and in any one-on-one meetings. I will keep the information you share with me private to the greatest extent possible. However, I am required to share information regarding sexual misconduct or students who may be in danger to themselves or to others. Students may speak to someone confidentially by contacting Student Life at 319-399-8843 or emailing titleix@coe.edu, Safety, and Security at 319-399-8888, Emily Barnard (college counselor) at 319-399-8843, or visit Coe's Title IX website for more information.