Instructor: Kent Herron

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Office: Stuart 318

Office Hours: MWF 10:00-11:00am, TTh 11:00-12:00, and by appointment

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Text: The main text will be notes distributed as the semester proceeds.

Problem Sets: There will be problem sets due most weeks of the semester. Together these will be worth 200 points.

Participation: Day-to-day class participation, presentations, and snap quizzes will be a prominent aspect of this class, and together worth 200 points.

Math Culture Points: Math Culture Points will constitute 200 points. These are earned by participating in various activities outside of class, as detailed on page 3 of this syllabus.

Examlets: 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. The final will be worth 200 points.

Makeups: For the sake of fairness to those who follow the schedule, makeups for examlets will be allowed only under extenuating circumstances, with documentation and advance notice when humanly possible. Late problem sets will generally not be accepted, and if accepted due to extenuating circumstances will generally be subject to a penalty of 20% of the possible points for each day past due.

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)

Tentative Schedule

Monday 1/12 Parity	Wednesday 1/14 Beyond Parity	Friday 1/16 Divisibility
Monday 1/20 **No Class – MLK Day**	Wednesday 1/21 Modular Arithmetic	Friday 1/23 Basic Logic
Monday 1/26 Quantification	Wednesday 1/28 Proof Techniques: Contradiction	Friday 1/30 Proof Techniques: Induction
Monday 2/2 Proof Techniques: Cases	Wednesday 2/4 Proof Techniques	Friday 2/6 **Examlet 1**
Monday 2/9 Sets	Wednesday 2/11 Operations on Sets	Friday 2/13 Arbitrary $\cup$ and $\cap$
Monday 2/16 Inequalities	Wednesday 2/18 Real Intervals	Friday 2/20 Absolute Values
Monday 2/23 Cartesian Products	Wednesday 2/25 Russell's Paradox	Friday 2/27 **Examlet 2**
Monday 3/2 Functions	Wednesday 3/4 Operations on Functions	Friday 3/6 Composition
Spring Break		
Monday 3/16 Injectivity and Surjectivity	Wednesday 3/18 Inverses	Friday 3/20 Countability
Monday 3/23 Uncountability	Wednesday 3/25 The Continuum Hypothesis	Friday 3/27 **Examlet 3**
Monday 3/30 Relations	Wednesday 4/1 Properties of Relations	Friday 4/3 Equivalence Relations
Monday 4/6 No Class – Mystery Holiday	Wednesday 4/8 Relations as Sets	Friday 4/10 Relations as Graphs
Monday 4/13 Graphs	Wednesday 4/15 Directed Graphs	Friday 4/18 **Examlet 4**
Monday 4/20 Combinatorics	Wednesday 4/22 Probability	Friday 4/24 The Peano Axioms
Monday 4/27 The Peano Axioms	Wednesday 4/29 The Peano Axioms	
Final Exam – 2pm on Monday 5/4		

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.

One of the profound puzzles inherent in teaching mathematics is the question of how to teach students to actually do math. That doesn't mean just carrying out algorithms – the routine procedures that solve routine problems are readily taught by demonstration and practice. But doing math means far more than performing those routine rituals, and unfortunately involves tasks that are not so readily learned by demonstration. For instance, mathematicians are able to read math books – something notoriously difficult for math students, and something with which observation provides little help. Mathematicians are also able to do problems of types they have never seen before – a task for which drill work provides only very limited help.

> *"The true function of the teacher is to create the most favorable conditions for selflearning. True teaching is not that which gives knowledge, but that which stimulates pupils to gain it. One might say that he teaches best who teaches least."*
>
> – John Milton Gregory, 1884

Math Culture Points

A significant 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. Note that none of these is mandatory – there are more than enough opportunities than necessary to earn full credit. You should be able to select activities the are particularly relevant to you.

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

Meeting Attendance
   Nebraska Conference for Undergraduate Women in Mathematics (January 23 – 25)
   SIGCSE Technical Symposium (March 4 – 7)
   University of Iowa Computing Conference (early March?)
   Midwest Undergraduate Mathematics Symposium (April 10 – 11)
	
	30
	20
	20
	20-30
		2

Mathematics Competition Participation
   Mathematical Contest in Modeling (February 5 – February 9)
   Iowa Collegiate Mathematics Competition (February 21)
	20	2

Math Culture Reading
   Some weeks specific readings will be posted on the course web page
   Articles from *Math Horizons*
   With approval, columns on maa.org, articles from *Math. Magazine*, *The College Math. Journal*, etc.
	10	
		–
		5
		5

Math Club Activities (when appropriate) Winter Break Book, Movies, Pi Day celebration, Speakers, Workshops, etc.	10-20	5

Other Appropriate Coe or Outreach Activities
   Contemporary Issues Forum (February 3)
   Attending a Quantitative Research Symposium Presentation
   Job Shadowing in any relevant field
   Working with students at McKinley Middle School, etc.
	
	10
	10
	20
	10
		
		–
		3
		1
		3

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.