



**Gifted LearningLinks Program
Course Syllabus**

Instructor name: TJ Leone

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Course Title: Mathematical Puzzling in Python

Session Date: Monthly Enrollment, 2011-2012

Course Description:

Inspired by online puzzle collections like [Project Euler](#), this course will examine solving mathematical puzzles through computer programming. There are tons of questions, which though easy to frame mathematically, aren't especially amenable to traditional, pencil-and-paper methods of solution. Computers and high-level programming languages have a lot to offer here. We're going to be exploring a wide range of exciting mathematics using Python, a prominent, high-level programming language.

This course requires no background in computer science and a basic comfort with algebra.

Outcomes: Upon successful completion of this course, students will:

- a. Know Python's syntax and the broad strokes of the landscape of mathematical ideas underlying combinatorics, mathematical induction, and number theory.
- b. Understand the basics of control flow and function definition.
- c. Be able to take a well-posed combinatorial or number theoretic problem, reformulate it in a computational form.

Resources and Materials:

- a. For reference material, including required text, see <http://tjleone.com/mathematical-puzzling-in-python-references.htm>.
- b. Students should have computers of their own. See <http://tjleone.com/mathematical-puzzling-in-python.htm> for information on downloading and installing Python.

CTD Statement on Third-Party Web Sites

Instructors are required to thoroughly review any third-party web sites they intend to use in their courses for inappropriate content. However, because web content continuously changes, CTD disclaims any responsibility for any of the content contained on third-party web sites used in course materials. If you become aware of anything that may be inappropriate, please notify CTD staff immediately.

Schedule:

SEMESTER ONE

	Topic/Focus	Activities & Reading Assignments	What do I need to post to the Discussion Board?	What do I need to turn in?
Week 1	Getting started/ Getting acquainted with Python	+ Install Python + Videos and exercises: Introduction, Strings and Variables	+ questions + discoveries	+ survey results + answers to exercises
Week 2	Getting acquainted with Python	+ Videos and exercises: Decision Control, Adding Functions	+ questions + discoveries	+ reflections + answers to exercises
Week 3	What is a function?	+ Ch. 1 of <i>Investigations in Algebra</i>	+ questions + discoveries	+ reflections + answers to exercises
Week 4	Equal functions	+ Ch. 2 of <i>Investigations in Algebra</i>	+ questions + discoveries	+ reflections + answers to exercises
Week 5	Functions that extend tables	+ Ch. 3 of <i>Investigations in Algebra</i>	+ questions + discoveries	+ reflections + answers to exercises
Week 6	A function whose existence depends on the state of the art	+ Ch. 4 of <i>Investigations in Algebra</i>	+ questions + discoveries	+ reflections + answers to exercises
Week 7	Mathematical Induction	+ Ch. 5 of <i>Investigations in Algebra</i>	+ questions + discoveries	+ reflections + answers to exercises
Week 8	The Tower of Hanoi and Related Curiosities	+ Ch. 6 of <i>Investigations in Algebra</i>	+ questions + discoveries	+ reflections + answers to exercises
Week 9	Counting Subsets	+ Ch. 7 of <i>Investigations in Algebra</i>	+ questions + discoveries	+ reflections + answers to exercises
Week 10	The Binomial Theorem	+ Ch. 8 of <i>Investigations in Algebra</i>	+ questions + discoveries	+ reflections + answers to exercises
Week 11	Application 3: Locks and Partitions	+ Ch. 9 of <i>Investigations in Algebra</i>	+ questions + discoveries	+ reflections + answers to exercises
Week 12	Primes and divisors	+ Ch. 10 of <i>Investigations in Algebra</i>	+ questions + discoveries	+ reflections + answers to exercises
Week 13	GCD and the Fundamental Theorem of Arithmetic	+ Ch. 11 of <i>Investigations in Algebra</i>	+ questions + discoveries	+ reflections + answers to exercises

SEMESTER ONE				
	Topic/Focus	Activities & Reading Assignments	What do I need to post to the Discussion Board?	What do I need to turn in?
Week 14	Applications of the Fundamental Theorem	+ Ch. 12 of <i>Investigations in Algebra</i>	+ questions + discoveries	+ reflections + answers to exercises
Week 15	Descendants and Ancestors of ONE and ID	+ Ch. 13 of <i>Investigations in Algebra</i>	+ questions + discoveries	+ reflections + answers to exercises
Week 16	Modular Arithmetic	+ Ch. 14 of <i>Investigations in Algebra</i>	+ questions + discoveries	+ reflections + answers to exercises
Week 17	Some Applications of Modular Arithmetic	+ Ch. 15 of <i>Investigations in Algebra</i>	+ questions + discoveries	+ reflections + answers to exercises
Week 18	Finishing up	+ Project Euler	+ questions + discoveries	+ reflections + five project euler attempts

Student Evaluation and Grading Policies for Credit Courses Only:

a. CTD Grading scale

A+ 97-100	B+ 87-89	C+ 77-79	D+ 67-69	F Below 60
A 93-96	B 83-86	C 73-76	D 63-66	
A- 90-92	B- 80-82	C- 70-72	D- 60-62	

- a. Breakdown of final grade: 20% explanations, 50% documented puzzle solving, 20% design reviews, 10% feedback/journaling

Instructor Biography:

TJ Leone has taught over twenty math and computer science courses at CTD since. He currently tutors K-14 students in math and computer science. He has also worked as a teacher at Chiaravalle Montessori School and an educational software developer at Northwestern University. He has a BA in Math and an MS in Computer Science from the City College of New York and an M.Ed. in Montessori Elementary Education from Loyola College in Maryland, as well as graduate work in Computer Science and Learning Sciences at Northwestern. He holds a Montessori teacher certification from the Association Montessori Internationale and is a Sun certified Java programmer.

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