

PREVIEW SYLLABUS
(Subject to change and update in the online format)

Course Description

This course will focus on furthering a broad and deep understanding of number together with providing opportunities to

- Use and discuss the roles of experimentation, conjecture, and logical reasoning in developing mathematical understanding
- Appreciate the value of algebraic notation in problem solving by comparing solutions done both with and without algebra,
- Engage in mathematical speaking and writing with discussion of (a) how to evaluate accurate vs. inaccurate statements, (b) what level of detail is appropriate in an answer given the point of the problem, (c) what ways of presenting solutions are suitable for various audiences
- Discuss the distinction between “how” a mathematical strategy works and “why” it works, and articulate the pedagogical value of knowing the “why.”

The following are the specific mathematical topics included in the course:

- *Numbers and their Representations:* Integers and rational numbers; base 10 representation of numbers; the number line; equivalent fractions and percent
- *Addition and Subtraction in the Various Number Systems:* The meaning of addition and subtraction in the various number systems; analysis of a variety of computational algorithms; discussion of special issues that arise in connection with percent; the associative and commutative properties of addition and the role of these properties in mental arithmetic; writing a sequence of equations to represent a line of reasoning; meaning of the equal sign
- *Multiplication and Division in the Various Number Systems:* The meaning of multiplication (not simply repeated addition); the associative, commutative, and distributive properties of multiplication and applications to mental arithmetic; the meaning of division; analysis of various algorithms for multiplication and division; multiplication of negative numbers; scientific notation
- *Nonterminating Decimals:* The need for nonterminating decimals and their locations on the number line; the relation between rational numbers and terminating and repeating decimals; special issues in connection with $0.99999\dots$; the existence of irrational numbers; proof of the irrationality of the square root of 2
- *Number Theory:* Definitions of even and odd integers and justifications for their properties; applications to the analysis of graphical networks; meaning of “divisible by,” “multiple of,” “factor,” and “divisor”; properties of divisibility and justifications; fundamental theorem of arithmetic and applications; greatest common divisor and least common multiple; prime numbers and the proof that there is no largest prime number; division with remainder and applications
- *Solving Equations:* Using a letter to use as a placeholder for an unknown and then working with it as if it were known; geometric models (tape diagrams) for equation solving; logical issues
- *Modular Arithmetic:* Exploration of systems of modular arithmetic and an introduction to cryptography for middle school students (if time allows)

- *Recurrent themes:* Links to middle school mathematics textbooks; discussion of the reasoning behind student mistakes; use of variables in mathematical reasoning; the logic of mathematical discourse; discussion of appropriate and inappropriate uses of technology - how to choose among paper-and-pencil, calculator, mental calculation, and computer (e.g., for Internet activities).

Course Website: <https://oll.depaul.edu/>

Required Text: *Mathematics for Elementary Teachers*, 2nd ed., and the accompanying *Activities Manual*, Sybilla Beckmann, Pearson Education, 2008

Additional Reference Materials

1. [NCTM Curriculum Focal Points for Grades 6-8](http://www.nctm.org/standards/focalpoints.aspx?id=298). (http://www.nctm.org/standards/focalpoints.aspx?id=298)
2. Group Activities from :*Get It Together*, *United We Solve*, and *We All Solve Problems*
3. Mathematics textbooks currently in use in Chicago-area schools
4. Archives of [MATHCOUNTS](http://mathcounts.org) (the national mathematics competition for middle school students). (http://mathcounts.org)
5. Journal articles, including
 - “Focal Points – Grades 5 and 6” by Sybilla Beckmann and Karen C. Fuson (*Teaching Children Mathematics*, May 2008)
 - “What Do Students Need to Learn about Division of Fractions?” by Yeping Li (*Mathematics Teaching in the Middle School*, May 2008)
 - “[Knowing and Teaching Elementary Mathematics](#)” by Richard Askey (*American Educator*, Fall 1999. (http://www.aft.org/pubs-reports/american_educator/fall99/amed1.pdf)
 - “[The Language of Quantification in Mathematics Instruction](#)” by Susanna Epp. In *Developing Mathematical Reasoning in Grades K-12*. Lee V. Stiff, Ed. Reston, VA: NCTM Publications, 1999, 188-197. (http://condor.depaul.edu/~sepp/NCTM99Yrbk.pdf)

Use of Technology: Please make sure that you have access to a speedy connection to the Internet in order to obtain course materials and so that you have access to the increasing number of web sites with excellent materials that can be used in the middle school classroom. In addition, calculators will be used occasionally in class. If you are going to buy a new calculator for the course, please consult the program web site for recommendations and future course requirements.

Course Requirements and Assessment: Your grade will be based on your performance on homework and (possibly) occasional short quizzes on the homework, a midterm exam (tentatively scheduled for October 7), and a comprehensive final exam (on November 18). These will be weighted as follows:

Homework & Quizzes:	30%
Midterm Exam:	35%
Final Exam:	35%

DePaul University's Academic Integrity Policy: Students must abstain from any violations of academic integrity and set examples for each other by assuming full responsibility for their academic and personal development, including informing themselves about and following the

university's academic policy. To review the complete Academic Integrity Policy of the University, please go to <http://academicintegrity.depaul.edu/>.

Information for Students with Disabilities: Students who feel they may need an accommodation based on the impact of a disability should contact me privately to discuss their specific needs. All discussions will remain confidential. To ensure that you receive the most appropriate accommodation based on your needs, contact me as early as possible in the quarter (preferably within the first week of class), and make sure that you have contacted the PLS Program <http://studentaffairs.depaul.edu/plus/> (for LD, AD/HD), or The Office for Students with Disabilities <http://studentaffairs.depaul.edu/studentswithdisabilities/contactus.html> (for all other disabilities).