

M119 – Mathematics for Elementary School Teachers

Sample Syllabus

Class Number & Meeting Time:

Instructor:

Room:

Email:

Office Hours:

Overview:

How does a child's understanding of elementary mathematics develop over time? Why do the standard algorithms for addition, subtraction, multiplication and division work? How can we draw illustrations to show what is going on with fraction operations? These are the kinds of questions we will consider in this course, which is designed to develop prospective elementary teachers' understanding of number systems, operations, and foundational mathematical structures. Emphasis is placed on analyzing and justifying standard algorithms and procedures, using multiple representations to explain mathematical ideas, and making connections to early algebraic thinking. This is primarily a math class, not a methods class, but we will connect what we do in this course with your own future classroom practice. We will prioritize conceptual understanding so that you are prepared to support the development of mathematical thinking in young learners. To develop your own problem-solving skills and clear communication about mathematics, you will often spend class time working in groups and presenting ideas and solutions to problems. That means we are jointly responsible for the success of this class!

Learning Outcomes:

What skills will you gain through this course? Here is a broad overview:

1. Develop Conceptual Understanding of Number and Operations

- Demonstrate conceptual, procedural, and representational understanding of whole numbers, place value, and the base-ten system.
- Analyze and explain the properties of operations and how they justify standard algorithms.
- Model and justify meanings of the four operations (addition, subtraction, multiplication, division) using visual models, manipulatives, and real-world contexts.
- Apply algebraic reasoning to generalize numerical relationships and interpret the equal sign relationally.

2. Demonstrate Conceptual Understanding of Rational Numbers

- Represent fractions and decimals conceptually using area, length, and set models.
- Analyze equivalence, ordering, and operations with fractions and decimals using reasoning grounded in place value and multiplicative structure.

- Justify procedures for fraction and decimal operations using mathematical arguments and representations.
- Use models, equations, and mathematical arguments to demonstrate how fractions interpreted as division support the development of ratio reasoning and proportional relationship.

3. Communicate Mathematical Ideas Clearly and Precisely

- Use mathematical vocabulary, notation, and representations appropriate for childhood education.
- Write and present clear mathematical explanations suitable for elementary learners on why procedures and algorithms work.

Math 119 is also a Pathways MQR course and satisfies the following learning outcomes:

- **MQR 1:** Interpret and draw appropriate inferences from quantitative representations, such as formulas, graphs, or tables.
- **MQR 2:** Use algebraic, numerical, graphical, or statistical methods to draw accurate conclusions and solve mathematical problems.
- **MQR 3:** Represent quantitative problems expressed in natural language in a suitable mathematical format.
- **MQR 4:** Effectively communicate quantitative analysis or solutions to mathematical problems in written or oral form.
- **MQR 5:** Evaluate solutions to problems for reasonableness using a variety of means, including informed estimation.
- **MQR 6:** Apply mathematical methods to problems in other fields of study.

Textbook:

This class uses open educational resources or zero-textbook-cost materials, which means there are no required textbooks for purchase. All materials are freely available or will be provided by the instructor. The development of this course was funded in part by the CUNY OER Initiative.

As a supplemental resource, the book [Arithmetic](#) by Paul Lockhart is highly recommended and is available on Amazon. The free online textbook [Mathematics for Elementary Teachers](#) also has helpful examples and problems to try.

Attendance and Participation:

Attending and participating in every class is crucial to your success. Much of the learning will happen through in-class activities and discussions, and your contributions are needed! Please help us create a productive learning environment in class by silencing and storing your phones, earbuds, and other technology. Do not spend time surfing the internet, listening to music, sleeping, or holding conversations unrelated to the class, or you may be asked to leave.

Participation is worth 10% of your final grade and will be based on your engagement and completion of activities in class. Participation can take a variety of forms: listening closely, asking questions, helping your group communicate well, presenting work at the board, and coming to class prepared. If you miss a class, you will not receive participation credit for that day, although you can miss up to two classes without penalty.

Homework:

In addition to attending class, you must set aside time outside of class to think deeply about homework assignments. Learning is often accompanied by struggle and even failure, so don't get discouraged if the homework feels difficult! You should expect to spend 2-4 hours a week outside of class completing homework and reviewing class material.

Each learning objective will have one homework set, consisting of two parts: *Warmups* and *Exercises*. *Warmups* are short review problems that will help you build proficiency in basic skills. *Exercises* are a bit longer, based on applications of ideas we discuss in class, and may involve open-ended problem solving. Write up your work neatly on your own paper and submit it in class on the day it is due. Homework will be graded based on completion and the accuracy of 3-4 selected problems on each assignment. It is better to turn in a partial assignment than nothing at all! Because doing the homework also helps you prepare for exams, you should complete assignments even if you have missed the submission deadline.

Teaching Demonstrations:

You will work in pairs to develop a mini lesson plan and 10-minute demonstration in class, teaching how to use a particular algorithm to add, subtract, multiply, or divide. Teaching demonstrations will take place throughout the second half of the semester, and a written lesson plan must be submitted before you give your demonstration. A sign-up sheet and a list of algorithms to choose from will be provided.

Exams:

There will be one in-class midterm exam and one departmental final exam, given during finals week. The final exam is cumulative. All exams are closed book/notes, and calculators are not allowed.

Course Grade:

Your grade will be made up of the following categories:

Participation	10%
Homework	30%
Teaching Demonstration	10%
Mid-Term Exam:	20%
Final Exam:	<u>30%</u>
Total.....	100%

Grades are computed using the standard scale:

<i>97%, 93% and 90%</i>	<i>for grades of A+, A, and A-</i>
<i>87%, 83%, and 80%</i>	<i>for grades of B+, B, and B-</i>
<i>77%, 73%, and 70%</i>	<i>for grades of C+, C, and C-</i>
<i>67% and 60%</i>	<i>for grades of D+ and D</i>
<i>Below 60%</i>	<i>is an F</i>

Missed Assignments:

I understand that challenges can come up that affect your ability to meet deadlines. Homework will only be accepted on the day it is due, with no exceptions, but one homework grade will be dropped at the end of the semester. You need to be present in class on presentation and exam days unless there is clear documentation of an emergency. You will receive a zero if you miss an exam or presentation without appropriate documentation.

Help Outside of Class:

Learning takes time! You need to make time in your schedule to review your notes, complete homework assignments, and prepare for presentations and exams. Your first level of support should come from your peers. I encourage you to work together by forming study groups. In addition to finding help from your classmates and coming to office hours, you can visit the [Math Lab](#) in Kiely Hall 331 or the [Learning Commons](#) in Kiely Hall 131 for free tutoring.

Academic Honesty:

Your work in this class must be your own! Copying someone else's problem set or exam, consulting a cellphone or other technology during exams, or copying your homework responses directly from AI are all examples of academic dishonesty. You may form study groups to collaborate on homework and study for exams, but the work submitted must be yours individually. The [CUNY Policy on Academic Integrity](#) states that academic dishonesty is punishable by penalties including failing grades, suspension, and expulsion. I take cheating very seriously and will report it. It is the fastest way to lose my respect for you as a student and to receive a zero on an assignment.

Accommodations for Students with Disabilities:

The Office of Special Services (SPSV) is committed to supporting students with qualifying disabilities under the Americans with Disabilities Act (ADA) by providing reasonable accommodations to ensure equal access. If you have previously received accommodations due to a disability, believe you may have a disability, or have a temporary disability, please visit the office's website (<https://www.qc.cuny.edu/sp/>) for further information on the assistance they can offer you. Accommodations are not retroactive, so you are encouraged to get registered sooner rather than later. You may also contact their office at qc.spsv@qc.cuny.edu or call [718-997-5870](tel:718-997-5870) during office hours for assistance as well.

Statement on Student Wellness:

As a student, you may experience a range of challenges that can interfere with learning, such as strained relationships, increased anxiety, substance use, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may diminish your academic performance and/or reduce your ability to participate in daily activities. QC services are available free of charge. You can learn more about confidential mental health services available on campus at: [Counseling Services Department](#).

Technical Support:

The [ITS Help Desk](#) provides technical support for students who need help with Queens College email, CUNY portal, Brightspace, and CUNYFirst. You may submit a ticket online or email support@qc.cuny.edu.

Math 119 Class Schedule

Day	Topics	Assignments
1	Introduction, Problem Solving	
2	Problem Solving, Patterns, and Algebraic Thinking	
3	Problem Solving, Patterns, and Algebraic Thinking	
4	Definitions (Even and Odd Numbers)	Homework 1 due
5	Definitions (Prime and Composite Numbers)	
6	Place Value	Homework 2 due
7	Place Value	
8	Addition and Subtraction	Homework 3 due
9	Addition and Subtraction	
10	Multiplication	Homework 4 due
11	Multiplication	
12	Division	Homework 5 due
13	Division	
14	Factors and Multiples	Homework 6 due
15	Factors and Multiples	
16	Review/Teaching Demonstrations	Homework 7 due
17	Midterm Exam	
18	Fraction Models	
19	Fraction Models	
20	Fraction Addition and Subtraction	Homework 8 due
21	Fraction Addition and Subtraction	
22	Fraction Multiplication and Division	Homework 9 due
23	Fraction Multiplication and Division	
24	Fractions, Decimals, and Proportions	Homework 10 due
25	Fractions, Decimals, and Proportions	
26	Teaching Demonstrations	Homework 11 due
27	Teaching Demonstrations	
28	Review for Final Exam	

M119 Learning Objectives

Objective 1: Problem Solving, Patterns, and Algebraic Thinking

- I can apply appropriate strategies for problem solving, including recognizing patterns and relationships between numbers and relating them to general algebraic rules.
- I can use mathematical arguments to present a solution to a problem and explain why my method works.
- I can write numerical and variable expressions to represent a specific context described in words.
- I can interpret numerical and variable expressions by describing them in words and mapping their components to a specific context.
- I can use the equal sign in a relational way to compare equivalent amounts or expressions.

Objective 2: Definitions

- I can use definitions appropriately in mathematical arguments.
- I can explain and critique popular definitions of even and odd numbers and prime and composite numbers.
- I can apply equivalent definitions of even and odd numbers or prime and composite numbers in ways that are appropriate to the context.

Objective 3: Place Value

- I can order and count with numbers in another base and compare this process to base-ten numbers.
- I can explain the difference between numbers, numerals, and digits.
- I can explain the structure of the Egyptian, Roman, Mayan, and Hindu-Arabic number systems.
- I can identify how the base-ten place value system relies on bundling in groups of ten and use representations such as manipulatives, drawings, and numerical expressions to reveal base-ten structure.

Objective 4: Addition and Subtraction

- I can add and subtract numbers in another base and compare this process to base-ten numbers.
- I can describe what it means for an operation to be commutative and associative and explain why these properties hold for addition.
- I can distinguish between the “take-away” and “difference” concepts of subtraction and apply each concept to appropriate subtraction problems and strategies.
- I can describe and use various invented strategies for addition and subtraction.

- I can explain how efficient computation methods for addition and subtraction rely on decomposing numbers into the base-ten units represented by their digits and applying the commutative and associative properties.
- I can use manipulatives to represent addition and subtraction in base ten and to justify the standard algorithms for these operations.

Objective 5: Multiplication

- I can represent multiplication using manipulatives and the set, array, and area models.
- I can justify the associative, commutative, and distributive properties of multiplication.
- I can explain how computation methods for multiplication rely on decomposing numbers and applying the associative, commutative, and distributive properties.
- I can represent partial products and decomposition using an area model.
- I can use manipulatives and decomposition to justify the standard algorithm for multiplication.

Objective 6: Division

- I can represent division using manipulatives or a model and describe its connection to multiplication.
- I can distinguish between the partitive and quotative concepts of division and apply each concept to appropriate division problems.
- I can justify the distributive property of division and explain why division by 0 is not defined.
- I can explain how computation methods for division rely on decomposing numbers and applying the properties of operations.
- I can represent partial quotients using an area model.
- I can use manipulatives and partial quotients to justify the long division algorithm.

Objective 7: Factors and Multiples

- I can define factors and multiples and use these concepts to reason well about divisibility.
- I can apply divisibility tests for whether a number is divisible by 2, 3, 5, 6, or 9 and explain why they work.
- I can list the factors of a number and use factor trees to find the prime factorization of a number.
- I can use prime factorization to find the greatest common factor and the least common multiple of two or three numbers.

Objective 8: Fraction Models

- I can represent fractions using set, area, and length models and on a number line.

- I can partition (divide into equal-sized parts) and iterate (count equal-sized parts) with sets and shapes and explain these skills using fractions.
- I can define a fraction a/b as a parts, each of size $1/b$. I can attend closely to the whole while solving problems and explaining solutions.
- I can explain the rationale for defining and representing equivalent fractions.
- I can compare fractions using models and a variety of numerical strategies, such as comparing denominators or comparing to a benchmark fraction.
- I can write mixed numbers as improper fractions and vice versa.
- I can address common misconceptions about fractions.

Objective 9: Fraction Addition and Subtraction

- I can use area and length models to illustrate addition and subtraction of fractions and to justify why a common denominator is needed.
- I can add and subtract mixed numbers.
- I can address common errors in adding and subtracting fractions.
- I can create story contexts for adding and subtracting fractions and represent a story problem with fraction addition and subtraction.

Objective 10: Fraction Multiplication and Division

- I can use area and length models to illustrate multiplication and division of fractions and to justify the common method of multiplying fractions.
- I can apply the partitive and quotative concepts of division to appropriate fraction division problems.
- I can justify why dividing by a fraction is equivalent to multiplying by its reciprocal.
- I can address common errors in multiplying and dividing fractions.
- I can create story contexts for multiplying and dividing fractions and represent a story problem with fraction multiplication or division.

Objective 11: Fractions, Decimals, and Proportions

- I can explain the equivalence between decimals and fractions and connect familiar fractions with their equivalent decimal representations.
- I can use area and length models, including a number line, to represent decimals and their corresponding fractions.
- I can extend the base-ten system to decimals and explain the rationale for decimal computation methods.
- I can explain the connection between fractions and division, $a/b = a \div b$, and how fractions, ratios, and rates are connected via unit rates.
- I can distinguish proportional relationships from other relationships and reason about how quantities vary together in a proportional relationship.
- I can use unit rates to solve problems and to formulate equations for proportional relationships.