

BOROUGH OF MANHATTAN COMMUNITY COLLEGE

City University of New York

Department of Mathematics

**Mathematics for Elementary Education
with Algebra**

MAT 214.5

Semester:

Credits: 4

Class hours: 8

Instructor Information

Name:

Email:

Phone:

Office:

Course Description

This course covers mathematics recommended by the National Council of Teachers of Mathematics (NCTM) for prospective elementary school teachers, including problem solving, numeration, computation, real numbers, and number theory with an additional 60 hours focusing on intermediate algebra concepts. MAT 214.5 focuses on a learner-oriented approach to teaching mathematics. Emphasis is placed on mathematical concepts and skills, as well as techniques of inquiry and critical thinking. The course includes a survey of elementary mathematical concepts with appropriate materials to assist teachers in the classroom setting. MAT 214.5 meets the mathematics requirement for students who plan to teach on the elementary school level. In addition, the course will cover topics from MAT 56, Intermediate Algebra, including such topics as properties of real numbers, polynomials and factoring, equations and inequalities in one and two variables, systems of linear equations and inequalities, rational expressions and functions, rational exponents and roots, quadratic functions, exponential and logarithmic functions, and an introduction to trigonometry.

This course will consist of:

1. Numeration Systems
2. Alternate Algorithms and Methods of Computation
3. Number Theory and Types of Numbers
4. Rational and Irrational Numbers, Measurement
5. Problem Solving and Patterns
6. Sets and Logic

Algebra Topic will be infused throughout the course (see end of this syllabus for more detail).

The topics correspond with the NCTM strands of Number and Number Sense, including developing early number concepts and number sense, developing whole-number place-value concepts, developing meanings and strategies for the operations, developing fraction concepts and strategies for fraction computation, developing concepts of decimals and percents, patterns and algebra, including developing algebraic thinking: generalizations, patterns, and functions, and measurement, including developing measurement concepts.

Prerequisites: Students must have passed or be exempt from MAT 51 or MAT 12. Students who have passed MAT 56, MAT 56.5, MAT 206.5 or MAT 214 cannot take MAT 214.5

MAT 214.5 Course Designation

MAT 214.5 is considered an accelerated course that integrates Intermediate Algebra and Trigonometry (MAT 56) with Mathematics for Elementary Education I (MAT 214).

Students who have an overall course average of less than 60% can choose to take the MAT 56 departmental final examination. If they pass this exam with a 70% or better they will be eligible to take MAT 214 the following semester.

Required Texts: Charles McKeague, *Algebra with Trigonometry for College Students*, 5th edition. Cengage, 2002 and *College Mathematics for Elementary Education: Patterns through Play and Exploration*, K. Offenholley, 2016, This textbook is available for free online. **Or** *Mathematical Ideas* (11th Edition), Miller, Heeren and Hornsby; HarperCollins Publishers, New York, 2008, which is an older edition and so can be purchased inexpensively. Students should **check with their instructor before purchasing to see which option is correct for their class.**

Use of Technology: A scientific calculator is required.

Websites: the common core standards for New York State are available at <https://www.engageny.org/>, and for the nation are <http://www.corestandards.org/>

Other Resources: **Tutoring is available in the Math Lab (Room S535, main building).** The Math Lab is located in S535. It is dedicated to helping students improve their understanding of mathematics at any level. You will need a valid BMCC student ID to visit the Math Lab. Tutors are available in the Math Lab for free to all BMCC students. The Math Lab has worksheets with practice problems in stock, as well as computer- and video-based tutoring. Your instructor can require you to attend to tutoring in the Math Lab and can also track how often you visit it and for how long. The Math Lab is typically open any day of the week when BMCC has classes in session; for current hours and more information about the Math Lab, see the webpage at <http://www.bmcc.cuny.edu/mathlab/>.

Evaluation

Evaluation in this course may include homework, projects, quizzes and tests. Instructors will inform students of the weights for each category.

Academic Adjustments/Students with Disabilities

Students with disabilities who require reasonable accommodations or academic adjustments for this course must contact the Office of Accessibility (Room N324; 220-8180). BMCC is committed to providing equal access to all programs and curricula to all students.

BMCC Policy on Plagiarism and Academic Integrity Statement

Plagiarism is the presentation of someone else's ideas, words or artistic, scientific, or technical work as one's own creation. Using the idea or work of another is permissible only when the original author is identified. Paraphrasing and summarizing, as well as direct quotations, require citations to the original source. Plagiarism may be intentional or unintentional. Lack of dishonest intent does not necessarily absolve a student of responsibility for plagiarism.

Students who are unsure how and when to provide documentation are advised to consult with their instructors. The library has guides designed to help students to appropriately identify a cited work. The full policy can be found on BMCC's web site, www.bmcc.cuny.edu.

College Attendance Policy

1. Absences

At BMCC, the maximum number of absences is limited to one more hour than the number of hours a class meets in one week. For this course, you are allowed seven hours of absence (not seven days). In the case of excessive absence, the instructor has the option of assigning an "R" grade. In the case where a student stops attending at any time, the instructor has the option of assigning a "WU" grade.

2. Lateness

Classes begin promptly at the times indicated in the Schedule of Classes. Arrival in classes after the scheduled starting time constitutes a lateness. Latecomers may, at the discretion of the instructor, incur an official absence.

Outline of Algebra Topics**Pages in Text**

(For specific problem types and difficulty level, instructors should refer to the instructor MAT 56 addendum.)

Chapter R -Basic Properties and Definitions	
Exponents and Scientific Notation	38
Polynomials, Sums, Differences and Products	49
Factoring	61
Special Factoring	70
Chapter 1 -Equations and Inequalities in One Variable	
Linear and Quadratic Equations in One Variable	101
Formulas	112
Applications	126
Linear Inequalities in One Variable	143
Equations with Absolute Value	154
Inequalities Involving Absolute Value	
Chapter 2 -Equations and Inequalities in Two Variables	
Paired Data and the Rectangular Coordinate System	178
The Slope of a Line	192
The Equation of a Line	202
Chapter 3 -Systems of Linear Equations and Inequalities	
Systems of Linear Equations in Two Variables	276
Applications	312
Chapter 4 -Rational Expressions and Rational Functions	
Basic Properties and Reducing to lowest terms	347
Division of Polynomials	360
Multiplication and Division of Rational Expressions	371
Addition and Subtraction of Rational Expressions	380
Chapter 5 -Rational Exponents and Roots	
Rational Exponents	426
More Expressions Involving Rational Exponents	438
Simplified Form for Radicals	445
Addition and Subtraction of Radical Expressions	457
Multiplication and Division of Radical Expressions	461
Chapter 6 – Quadratic Functions	
The Quadratic Formula	505
Chapter 7 -Exponential and Logarithmic Functions	
Exponential Functions	567
Logarithms Are Exponents	588
Properties of Logarithms	597
Chapter 10 -Introductions to Trigonometry	
Degrees, Radians, and Special Triangles	714
Trigonometric Functions and Calculators	731
Chapter 12 –Triangles	
Right Triangle Trigonometry	838

General Education Outcomes and Assessment:

General Education Learning Outcomes	Measurements
Communication Skills- Students will be able to write, read, listen and speak critically and effectively.	Homework, quizzes, tests and projects
Quantitative Reasoning- Students will be able to use quantitative skills and the concepts and methods of mathematics to solve problems.	Homework, quizzes, tests and projects
Information & Technology Literacy- Students will be able to collect, evaluate and interpret information and effectively use information technologies.	Homework, quizzes, tests and projects

Student Learning Outcomes and Assessment:

Course Student Learning Outcomes	Measurements
<p>Algebra Topics: <i>Exponents and Scientific Notation, Exponential Functions</i></p> <p>1. Numeration Systems Students will:</p> <ul style="list-style-type: none"> Understand different types of numbers systems and how these number systems relate to our system and to base ten. These systems may include Chinese, Egyptian, Traditional Chinese, Babylonian, and Mayan, and representing numbers on an abacus. Be able to convert into different bases and understand the relationship to base ten, base ten manipulatives (such as base ten blocks), and place value. <p>Optional: multiplying in different bases</p>	<p>1. Homework, quizzes, tests and projects</p>
<p>Algebra Topics: <i>Polynomials, Sums, Differences and Products, Factoring, Special Factoring</i></p> <p>2. Alternate Algorithms and Methods of Computation Students will:</p> <ul style="list-style-type: none"> Be able to demonstrate addition and subtraction using trading in base ten (such as with Egyptian or Hindu Arabic) and in other bases and will understand the connection to “carrying” and “borrowing.” Be able to use alternate methods of addition, subtraction, multiplication and division, such as the Lattice Method, Duplation and Mediation and Scaffold Division, and be able to distinguish advantages and disadvantages of various methods. Understand multiplication as both area and distributive property. 	<p>2. Homework, quizzes, tests and projects</p>
<p>3. Number Theory and Types of Numbers Students will:</p> <ul style="list-style-type: none"> Be able to identify and apply divisibility rules and patterns. Be able to determine whether the commutative property and identity hold. Understand and be able to apply the definitions of prime and composite numbers in number theory, as with the Sieve of Eratosthenes, and Goldbach’s Conjecture. Be able to find the prime decomposition of numbers. 	<p>3. Homework, quizzes, tests and projects</p>

<ul style="list-style-type: none"> • Be able to find the least common multiple (LCM) and greatest common factor (GCF). <p>Optional: Perfect Numbers</p>	
<p>Algebra Topics: <i>Linear and Quadratic Equations in One Variable, Linear Inequalities in One Variable, Paired Data and the Rectangular Coordinate System, The Slope of a Line, The Equation of a Line, Systems of Linear Equations in Two Variables</i></p> <p>4. Problem Solving and Patterns Students will:</p> <ul style="list-style-type: none"> • Understand patterns and formulas for Figurate Numbers. • Understand Gauss' method for adding the numbers from 1 to 100. • Be able to find patterns in Pascal's Triangle and in Fibonacci Numbers, including the Golden Ratio. • Be able to find successive differences and apply them to arithmetic sequences and to generate algebraic formulas. 	<p>4. Homework, quizzes, tests and projects</p>
<p>Algebra Topics: <i>Rational Expressions and Rational Functions, Basic Properties and Reducing to lowest terms, Multiplication of Rational Expressions, Addition and Subtraction of Rational Expressions, Complex Fractions, Rational Exponents, Simplified Form for Radicals, Complex Numbers, Completing the Square, The Quadratic Formula, Pythagorean Triples, Right Triangle Trigonometry</i></p> <p>5. Rational and Irrational Numbers, Measurement Students will:</p> <ul style="list-style-type: none"> • Understand equivalent fractions through measurement, pictures and other representations. • Be able to write terminating and repeating decimals as fractions. • Understand adding, subtracting, multiplying and dividing fractions using models, including the area model for multiplying. • Understand the difference between irrational and rational numbers. <p>Optional: Babylonian Fractions</p>	<p>5. Homework, quizzes, tests and projects</p>
<p>6. Sets and Logic Students will:</p> <ul style="list-style-type: none"> • Understand and be able to apply set terminology, including using Venn Diagrams, subsets, intersection and union. • Be able to apply DeMorgan's Laws. • Be able to use Euler Diagrams to model "All", "Some" and "None" statements. • Understand the conjunction and disjunction. • Be able to use basic truth tables. • Be able to identify valid arguments. • Be able to use the conditional and the contrapositive. <p>Optional: Venn Diagrams as organizers and to find common multiples.</p>	<p>6. Homework, quizzes, tests and projects</p>