

MATH 225 — Algebra and Number Concepts for Middle School Teachers Course Content Outline

Current Textbook: Papick, I. J. (2007). *Algebra Connections: Mathematics for Middle School Teachers*. Upper Saddle River, NJ: Pearson Prentice Hall.
ISBN: 978-0-131-44928-2

NOTE: The course activities should encourage a growth mindset and reflect the Common Core Standards for Mathematical Practice. Hands-on explorations are frequent and technology is used when appropriate. Explicit discussion of a variety of pedagogical strategies is a key component of this course.

A. Algebra concepts *throughout the course*

- Grouping symbols and order of operations
- Slope and rate of change
- Meaning of the equal sign
- Precise notation

B. Explicit and recursive patterns (sections 1.1, 1.2) *2.5 weeks*

- Growing patterns
- Different ways of seeing patterns
- Extending a pattern
- Finding the n th term
- Writing a rule
- Equivalent expressions
- Linear, quadratic, and exponential functions (contexts, graphs, properties)

C. Arithmetic and geometric sequences (sections 1.3, 1.4, 1.5, 1.6, 1.7) *2.5 weeks*

- Connections to patterns
- Distinguishing between arithmetic and geometric sequences
- Finding a common difference or common ratio
- Finding the n th term of an arithmetic or geometric sequence
- Finding the number of terms between particular values in an arithmetic or geometric sequence
- Finding the sum of a finite arithmetic or geometric sequence
- Gauss' strategy for sum of a finite arithmetic sequence
- Solving contextual problems

D. Counting Principles and Binomial Theorem (sections 1.9, 1.10) *2 weeks*

- Pascal's Triangle
- Tree Diagram
- Fundamental Counting Principle
- Combinations
- Permutations
- Binomial expansion

E. Number Theory (sections 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 4.1, 4.2) *4 weeks*

- Multiples, factors
- Primes, composites, relatively prime
- Greatest common factor
- Least common multiple
- Fundamental Theorem of Arithmetic, prime factorization

- Divisibility tests

F. Integers (sections 3.1, 3.2, 3.5) *2 weeks*

- Concepts (meanings, models)
- Operations (use models and meanings to make sense of rules, properties)
- Integer theorems
- Division algorithm

G. Polynomials (sections 6.1, 6.2, 6.3, 6.4) *2 weeks*

- Operating on polynomials (addition, subtraction, multiplying, dividing, factoring with models)
- Completing the square (with models)
- Systems of equations and inequalities (contexts)

NOTE: Other topics may be included if time permits.

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