Pacing Guide for 7-12 Curriculum

Course Title: Discrete Math Length of Course: 1 year

Developed August 2012

Week Number	Chapter & Lesson	COS and Common Core	Objectives
Week 1	Rules and Procedures Chapter 2 lessons 1 – 2	#11 Solve application based logic problems using **Venn diagrams**, truth tables, and matrices	The Nature of Sets and Subsets and Set Operations
Week 2	Chapter 2 lessons 3 – 4	#11 Solve application based logic problems using **Venn diagrams**, truth tables, and matrices	Using Venn Diagrams to Study Set Operations and Using Sets to Solve Problems
Week 3	Chapter 2 lessons 5 Review and Test Chapter 2	#11 Solve application based logic problems using **Venn diagrams**, truth tables, and matrices	Infinite Sets
Week 4	Chapter 3 lessons 1 – 3	#11 Solve application based logic problems using Venn diagrams, **truth tables**, and matrices	Statements and Quantifiers, Truth Tables, Types of Statements
Week 5	Chapter 3 lessons 4 – 5	#11 Solve application based logic problems using Venn diagrams, **truth tables**, and matrices	Logical Arguments, Euler Circles
Week 6	Review and Test Chapter 3 Chapter 4 lessons 1 – 2	#11 Solve application based logic problems using Venn diagrams, **truth tables**, and matrices #4 Convert between base ten and other bases	Early and Modern Numeration Systems, Tools and Algorithms in Arithmetic
Week 7	Chapter 4 lessons 3 – 4	#4 Convert between base ten and other bases	Base Number Systems, Operation in Base Numbers Systems

Week 8	FALL BREAK Pullouts on using base number systems in the real world	#4 Convert between base ten and other bases	Using base number systems in the real world
Week 9	Review and Test Chapter 4 Chapter 5 lesson 1	#4 Convert between base ten and other bases #1 Analyze topics from elementary number theory, including perfect numbers, and **prime numbers**, to determine properties of integers	Natural Numbers
Week 10	Chapter 5 lessons 2 – 5	#1 Analyze topics from elementary number theory, including perfect numbers, and prime numbers, to determine properties of integers	Integers, Rational and Irrational Numbers, Real Numbers
Week 11	Pullouts on perfect numbers, triangular and pentagonal numbers	#1 Analyze topics from elementary number theory, including **perfect numbers**, and prime numbers, to determine properties of integers #2 Determine characteristics of sequences, including the Fibonacci sequence, the **triangular number**, and **pentagonal numbers**. Example: Write a sequence of the first 10 triangular numbers and hypothesize a formula to find the nth triangular number. #3 Use the recursive process and difference equations to create fractals, population growth models, **sequences**, **series**, and compound interest models C.C. F-IF.3. Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. For example, the Fibonacci sequence is defined recursively by $f(0) = f(1) = 1$, $f(n+1) = f(n) + f(n-1)$ for $n \geq 1$. C.C. F-BF.1. Write a function that describes a relationship between two quantities.★ Determine an explicit expression, a recursive process, or steps for calculation from a context. Combine standard function types using arithmetic operations. For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model. (+) Compose functions. For example, if T(y) is the temperature in the atmosphere as a function of height, and h(t) is the height of a	Perfect Numbers, Triangular Numbers, Pentagonal Numbers

		weather balloon as a function of time, then T(h(t)) is the temperature at the location of the weather balloon as a function of time. C.C. F-BF.2. Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.★	
Week 12	Chapter 5 lessons 6 – 7	#2 Determine characteristics of sequences, including the **Fibonacci sequence**, the triangular number, and pentagonal numbers. Example: Write a sequence of the first 10 #3 Use the recursive process and difference equations to create fractals, population growth models, **sequences**, **series**, and compound interest models C.C. F-IF.3. Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. For example, the Fibonacci sequence is defined recursively by f(0) = f(1) = 1, f(n+1) = f(n) + f(n-1) for n ≥ 1. C.C. F-BF.1. Write a function that describes a relationship between two quantities.★ Determine an explicit expression, a recursive process, or steps for calculation from a context. Combine standard function types using arithmetic operations. For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model. (+) Compose functions. For example, if T(y) is the temperature in the atmosphere as a function of height, and h(t) is the height of a weather balloon as a function of time, then T(h(t)) is the temperature at the location of the weather balloon as a function of time. C.C. F-BF.2. Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.★	Exponents and Scientific Notation, Arithmetic and Geometric Sequences Summary

Week 13	Review and Test Chapter 5 Chapter 6 lessons 1 - 3	#1 Analyze topics from elementary number theory, including perfect numbers, and prime numbers, to determine properties of integers #2 Determine characteristics of sequences, including the Fibonacci sequence, the triangular number, and pentagonal numbers. Example: Write a sequence of the first 10 triangular numbers and hypothesize a formula to find the nth triangular number. #3 Use the recursive process and difference equations to create fractals, population growth models, sequences, series, and compound interest models C.C. F-IF.3. Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. For example, the Fibonacci sequence is defined recursively by $f(0) = f(1) = 1$, $f(n+1) = f(n) + f(n-1)$ for $n \geq 1$. C.C. F-BF.1. Write a function that describes a relationship between two quantities.★ Determine an explicit expression, a recursive process, or steps for calculation from a context. Combine standard function types using arithmetic operations. For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model. (+) Compose functions. For example, if T(y) is the temperature in the atmosphere as a function of height, and h(t) is the height of a weather balloon as a function of time, then T(h(t)) is the temperature at the location of the weather balloon as a function of time. C.C. F-BF.2. Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.★	
Week 14	THANKSGIVING BREAK Chapter 6 lesson 4		Ratio, Proportion

Week 15	Chapter 6 lessons 5 - 6 Review and Test Chapter 6		Variation, Solving Linear Inequalities, Solving Quadratic Equations
Week 16	Chapter 7 lessons 1 – 2		The Rectangular Coordinate System and Linear Equations in Two Variables, Systems of Linear Equations
Week 17	Chapter 7 lesson 3 Review for Semester Exams	#6 Analyze determinates and inverses of 2 x 2, 3 x 3, and larger matrices to determine the nature of the solution set of the corresponding system of equations, including solving systems of equations in three variables by echelon row reduction and matrix inverse. #11 Solve application based logic problems using Venn diagrams, truth tables, and **matrices** C.C. N-VM.9. (+) Understand that, unlike multiplication of numbers, matrix multiplication for square matrices is not a commutative operation, but still satisfies the associative and distributive properties. C.C. N-VM.10. (+) Understand that the zero and identity matrices play a role in matrix addition and multiplication similar to the role of 0 and 1 in the real numbers. The determinant of a square matrix is nonzero if and only if the matrix has a multiplicative inverse. C.C. A-REI.9. (+) Find the inverse of a matrix if it exists and use it to solve systems of linear equations (using technology for matrices of dimension 3 × 3 or greater).	Solving Systems of Linear Equations Using Matrices
Week 18	SEMESTER EXAMS		
Week 19	Review Chapter 7 lesson 3	#6 Analyze determinates and inverses of 2 x 2, 3 x 3, and larger matrices to determine the nature of the solution set of the corresponding system of equations, including solving systems of equations in three variables by echelon row reduction and matrix inverse. #11 Solve application based logic problems using Venn diagrams, truth tables, and **matrices**	Solving Systems of Linear Equations Using Matrices

		C.C. N-VM.9. (+) Understand that, unlike multiplication of numbers, matrix multiplication for square matrices is not a commutative operation, but still satisfies the associative and distributive properties. C.C. N-VM.10. (+) Understand that the zero and identity matrices play a role in matrix addition and multiplication similar to the role of 0 and 1 in the real numbers. The determinant of a square matrix is nonzero if and only if the matrix has a multiplicative inverse. C.C. A-REI.9. (+) Find the inverse of a matrix if it exists and use it to solve systems of linear equations (using technology for matrices of dimension 3 × 3 or greater).	
Week 20	Pullout on Matrices	#5 Determine results of operations upon 3 x 3 and larger matrices, including matrix addition and multiplication of a matrix by a matrix, vector, or scalar #11 Solve application based logic problems using Venn diagrams, truth tables, and **matrices** C.C N-VM.7. (+) Multiply matrices by scalars to produce new matrices, e.g., as when all of the payoffs in a game are doubled. C.C. N-VM.8. (+) Add, subtract, and multiply matrices of appropriate dimensions. C.C. N-VM.9. (+) Understand that, unlike multiplication of numbers, matrix multiplication for square matrices is not a commutative operation, but still satisfies the associative and distributive properties. C.C. N-VM.10. (+) Understand that the zero and identity matrices play a role in matrix addition and multiplication similar to the role of 0 and 1 in the real numbers. The determinant of a square matrix is nonzero if and only if the matrix has a multiplicative inverse. C.C. N-VM.11. (+) Multiply a vector (regarded as a matrix with one column) by a matrix of suitable dimensions to produce another vector. Work with matrices as transformations of vectors.	Operations on Matrices

		C.C. A-REI.9. (+) Find the inverse of a matrix if it exists and use it to solve systems of linear equations (using technology for matrices of dimension 3 × 3 or greater).	
Week 21	Chapter 7 lessons 4 - 5	#7 A Develop optimal solutions of application-based problems using existing and student-created algorithms #9: Determine a minimum project time using algorithms to schedule tasks in order, including critical path analysis, the list processing algorithm, and student-created algorithms	Linear Inequalities, Linear Programming
Week 22	Pullout Baker's Choice	#7 A Develop optimal solutions of application-based problems using existing and student-created algorithms #9: Determine a minimum project time using algorithms to schedule tasks in order, including critical path analysis, the list processing algorithm, and student-created algorithms	Linear Programming
Week 23	Review and Test Chapter 7 Chapter 8 lessons 1 – 2	#3 Use the recursive process and difference equations to create fractals, population growth models, sequences, series, and **compound interest models**	Percents, Simple Interest
Week 24	Chapter 8 lessons 3 – 4	#3 Use the recursive process and difference equations to create fractals, population growth models, sequences, series, and **compound interest models**	Compound Interest, Installment Buying
Week 25	Chapter 8 lesson 5	#3 Use the recursive process and difference equations to create fractals, population growth models, sequences, series, and **compound interest models**	Home Ownership
Week 26	Chapter 8 lesson 6 Review and Test Chapter 8	#3 Use the recursive process and difference equations to create fractals, population growth models, sequences, series, and **compound interest models**	Stocks and Bonds
Week 27	Chapter 10 lesson 7 Pullout on Fractals	#3 Use the recursive process and difference equations **to create fractals**, population growth models, sequences, series, and compound interest models	Fractals
Week 28	Chapter 11 lessons 1 – 3	#12 Use combinatorial reasoning and counting techniques to solve application-based problems.	The Fundamental Counting Principle and Permutations, Combinations, Basic Concepts of Probability
Week 29	Chapter 11 lessons 4 - 7	#12 Use combinatorial reasoning and counting techniques to solve application-based problems.	Tree Diagrams, Tables, and Sample Spaces, Probability Using Permutations and Combinations, Odds and Expectation, The addition Rules for Probability

Week 30	Chapter 11 lessons 8 – 9 Review and Test Chapter 11	#12 Use combinatorial reasoning and counting techniques to solve application-based problems.	The Multiplication Rules and Conditional Probability, The Binomial Distribution
Week 31	Chapter 14 lessons 1 – 2	#13 Analyze election data to compare election methods and voting apportionment, including determining strength within specific groups	Preference Tables and the Plurality Method, The Borda Count Method and The Plurality-with-Elimination Method
Week 32	AHSGE Chapter 14 lessons 3 – 4	#13 Analyze election data to compare election methods and voting apportionment, including determining strength within specific groups	The Pairwise Comparison Method and Approval Voting, Apportionment
Week 33	Chapter 14 lesson5 Review and Test Chapter 14	#13 Analyze election data to compare election methods and voting apportionment, including determining strength within specific groups	Apportionment Flaws
Week 34	Chapter 15 lessons 1 – 2	#7 Solve problems through investigation and application of existence and nonexistence of Euler paths, Euler circuits, Hamilton paths, and Hamilton circuits #8 Apply algorithms, including Kruskal's and Prim's, relating to minimum weight spanning trees, networks, flows, and Steiner trees (a) Use shortest path techniques to find optimal shipping routes	Basic concepts of Graph Theory, Euler's Theorem
Week 35	Chapter 15 lessons 3 – 4	#7 Solve problems through investigation and application of existence and nonexistence of Euler paths, Euler circuits, Hamilton paths, and Hamilton circuits #8 Apply algorithms, including Kruskal's and Prim's, relating to minimum weight spanning trees, networks, flows, and Steiner trees (a) Use shortest path techniques to find optimal shipping routes	Hamilton Paths and Circuits, Trees
Week 36	Pullout Vertex-Coloring Techniques Review and Test Chapter 15	#7 Solve problems through investigation and application of existence and nonexistence of Euler paths, Euler circuits, Hamilton paths, and Hamilton circuits #8 Apply algorithms, including Kruskal's and Prim's, relating to minimum weight spanning trees, networks, flows, and Steiner trees (a) Use shortest path techniques to find optimal shipping routes #10 Use vertex-coloring techniques and matching techniques to solve application-based problems.	Vertex-Coloring Techniques
Week 37	SENIOR FINAL EXAMS		
Week 38	FINAL EXAMS		