West Deptford Township Schools
Discrete Mathematics Curriculum

West Deptford Township High School
1600 Old Crown Point Road, West Deptford, NJ 08093
wdeptford.k12.nj.us
(856) 848-6110
Developed under the Supervision of: Kelly A. Saia, AP for Curriculum & Instruction

Created by: Kathleen Yeager

Unit- Linear Programming	Duration-4 weeks

Standards	Transfer Goals	Concepts		Critical Knowledge and Skills
		Essential Questions	Understandings	
MA.9-12.G-CO.D.12 Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). MA.9-12.N-Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. MA.9-12.A-REI.C.6 Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables. MA.9-12.A-CED.A.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.	Students will be able to independently use their learning to find optimal solutions for minimizing cost and maximizing profit for real world problems. **CRP *** CRP1 CRP2 CRP4 CRP5 CRP6 CRP8 CRP12	How would you apply what you have learned in systems of inequalities to linear programming? What are some real-world situations that can be solved using linear programming? What is the feasible region, and how does it contribute to identifying solutions to a problem? What methods can be used to solve systems of equations and inequalities? What process would you use to optimize the objective function?	Systems of equations and/or inequalities are used to model and solve real-world problems involving two or more variables.	Knowledge ❏ How to graph a linear equation ❏ How to graph a linear inequality ❏ How to maximize profit and/or minimize cost ❏ How to solve linear inequalities graphically ❏ How to solve systems of linear equations algebraically and graphically Skills: ❏ Evaluate the profit or cost function at each corner point to determine the optimal solution. ❏ Graph a system of inequalities, shade the feasible region, and determine any points of intersection. ❏ Read an optimization problem and set up an appropriate table from which constraints can be derived.

MA.9-12.A-REI.D.10 Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line). MA.9-12.A-REI.D.12 Graph the solutions to a linear inequality in two variables as a half plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes. MA.9-12.A-SSE.A.1a Interpret parts of an expression, such as terms, factors, and coefficients. MA.9-12.A-SSE.A.1b Interpret complicated expressions by viewing one or more of their parts as a single entity.				

School Formative Assessment Plan (Other Evidence)	School Summative Assessment Plan
• Classwork • Homework	Test Linear Programming

• Quizzes • IXL • Kahoot • Performance Assessment: Arrange students in groups of 4. Each group will be given a set of constraints. Work as a group to: Determine the x- and y-intercepts of the inequalities below. Determine how to number your x-axis and y-axis. Use the graph on this sheet to plan out your work. Graph and label each of the inequalities on the large graph paper. Shade the feasible region. List the corner points. Hang up your group's graph and this sheet showing your work. Groups then will be given a second set of constraints to graph, determine feasible region and corner points. They will then find the chart paper hanging around the room and find the problem that they completed. They will then determine whether they agree or disagree with posted solution. If they agree they will put a post-it note with a star on it. If they disagree, they will use their post-it notes to show where the mistake is and correct it.	
District / School Primary and Supplementary Resources	
Primary Resources	**Supplementary Resources**
For All Practical Purposes: Mathematical Literacy for Today's World (COMAP, 5th Edition, 2001)	Additional outside Resources: Video: "What is OR - the Movie?" http://www.learnaboutor.co.uk/flash/16_plus_movie.htm IXL • Teacher created resources

Technology Integration

TECH.8.2.12.B.1 Students will be exposed to simulation software.
TECH.8.1.12.A.3 Students will collaborate, communicate, and solve problems using Google Classroom.

Differentiated Instruction

Gifted Students (N.J.A.C.6A:8-3.1)

- ❑ Within each lesson, the Gifted Students are to be given the Advanced/Challenge Questions.
- ❑ These questions are to push the knowledge of each portion of the lesson. In the text, Advanced/Challenge questions are indicated by a square next to the problem number in the Exercises section.

English Language Learners (N.J.A.C.6A:15)

- ❑ Work with ELL Teacher to allow for all assignments to be completed with extra time.

At-Risk Students (N.J.A.C.6A:8-4.3c)

- ❑ Encourage student to seek extra help.
- ❑ Work with Guidance Counselor and I&RS Team to create an intervention plan.

Special Education Students (N.J.A.C.6A:8-3.1)

- ❑ Allow for extra time (if needed)
- ❑ Hard copy of notes
- ❑ Chunking of problems
- ❑ Preferential seating

Work with contact teacher to assist with additional accommodations noted in IEP/504 plans.

Interdisciplinary Connections****

Math	Science	ELA
	Students will use linear programming to determine the number of plants that should be planted in order	

	to fit in a given budget, maximize area and carbon dioxide rates.	
Fine Arts/ Performing Arts	**World Language**	**Applied Technology/Business**
		Students will solve production/manufacturing problems using Linear Programming – determine the number of each type of product to produce to satisfy given resource constraints.
Social Studies	**Health/Physical Education**	**Global Awareness**
		Discuss how operations research is used to address global issues such as manufacturing, government, transportation, supply chains, sport, and as a career.

Learning Plan

Week 1
What is Operational Research?
Create and present Venn Diagrams of OR information
Graph Linear equations using x- and y-intercepts
Graph linear equations in slope-intercept form
Solving systems of equations by graphing

Week 2
Solve systems of equations graphically and algebraically
Review - IXL, Kahoot, Putting It All Together
Quiz

Week 3
Graph linear inequalities
Google Poll – Feasible Regions

Graph constraints and corner points
Use objective functions to maximize or minimize functions
Linear programming group activity
Quiz

Week 4
Linear Programming - writing constraints
Review
Test

Unit 2-Voting & Social Choice **Duration-2.5 weeks**

Standards	**Transfer Goals**	**Concepts**		**Critical Knowledge and Skills**
		Essential Questions	**Understandings**	
MA.9-12.N-VM.C.6 Use matrices to represent and manipulate data, e.g., to represent payoffs or incidence relationships in a network. MA.9-12.N-Q.A.2 Define appropriate quantities for the purpose of descriptive modeling. MA.9-12.N-Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.	Students will be able to combine individual opinions so as to best reflect the "will of the group." **CRP *** CRP1 CRP4 CRP5 CRP8 CRP9 CRP12	How does the method chosen to count votes in an election impact the outcome of the election?	The method used to count votes may change the outcome of an election.	Knowledge ❑ Insincere Voting ❑ Preference Schedule ❑ The Borda Method ❑ The Condorcet Method ❑ The Method of Averages ❑ The Plurality Method ❑ The Run-Off Method ❑ The Sequential Run-Off Method ❑ Arrow's Impossibility Theorem Skills: ❑ Show that the method used to count votes often changes the outcome of an election.

School Formative Assessment Plan (Other Evidence)	School Summative Assessment Plan
• Classwork • Homework • Quizzes • Kahoot • Ordinal Ballot Activity: Students will choose a survey topic with 3 choices. Students will survey a minimum of 20 students and display the results of survey in a preference schedule table. The table should include the number of results for each option. Students will summarize the results of your survey including the number of first place votes for each choice as well as the percentage of votes received. Students will state the Plurality winner as well as whether or not he/she agrees with the result and why or why not. • Voting Methods Flip Book: Students will create a flip-book to summarize voting election procedures. Flip book may be used on assessment.	Test Voting & Social Choice – students may use their Flip Book on their assessment

District / School Primary and Supplementary Resources	
Primary Resources	**Supplementary Resources**
For All Practical Purposes: Mathematical Literacy for Today's World (COMAP, 5th Edition, 2001)	Additional outside Resources: Is Democracy Fair? (Key Curriculum Press, 1996) Resources from Rutgers DIMACS Conference Teacher created resources

Technology Integration

TECH 8.1.12.A.2	Students will use google applications to create an ordinal ballot as well as create a document in which they analyze the results of their survey results.
TECH.8.1.12.A.3	Students will collaborate, communicate, and solve problems using Google Classroom.

Differentiated Instruction

Gifted Students (N.J.A.C.6A:8-3.1)

- ❑ Within each lesson, the Gifted Students are to be given the Advanced/Challenge Questions.
- ❑ These questions are to push the knowledge of each portion of the lesson. In the text, Advanced/Challenge questions are indicated by a square next to the problem number in the Exercises section.

English Language Learners (N.J.A.C.6A:15)

- ❑ Work with ELL Teacher to allow for all assignments to be completed with extra time.

At-Risk Students (N.J.A.C.6A:8-4.3c)

- ❑ Encourage student to seek extra help.
- ❑ Work with Guidance Counselor and I&RS Team to create an intervention plan.

Special Education Students (N.J.A.C.6A:8-3.1)

- ❑ Allow for extra time (if needed)
- ❑ Hard copy of notes
- ❑ Chunking of problems
- ❑ Preferential seating
- ❑ Work with contact teacher to assist with additional accommodations noted in IEP/504 plans.

Interdisciplinary Connections****

Math	Science	ELA
Fine Arts/ Performing Arts	**World Language**	**Applied Technology/Business**

		Students use Google Docs to display results of Ordinal Ballot activity.
Social Studies	**Health/Physical Education**	**Global Awareness**
The method used to count votes may change the outcome of an election.		Discuss how different voting methods are used around the world.

Learning Plan

Week 1
Apply Plurality decision making procedure
Compare standard and ordinal ballots
Ordinal Ballot Activity - students will design an ordinal ballot for a survey on a topic of your choice. Your ballot should give voters 3 choices. Collect responses from 20 or more people. Summarize the results of your survey. Save the ballots for use in a later activity.

Week 2
Run-Off election procedure
Sequential Run-Off election procedure
Method of Averages
Condorcet Method

Week 3
Discuss Fairness Criteria and Arrow's Impossibility Theorem
Create Voting Methods flip book - to be used on Assessment
Review
Voting & Social Choice Assessment - students may use Flip Book on assessment

Unit 3-Paths, Circuits, and Networks			Duration-5 weeks
Standards	**Transfer Goals**	**Concepts**	**Critical Knowledge and Skills**
		Essential Questions / **Understandings**	

Standards	Transfer Goals	Essential Questions	Understandings	Critical Knowledge and Skills
MA.9-12.G-MG.A.1 Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). MA.9-12.G-MG.A.3 Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios). MA.9-12.N-Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.	Students will be able to independent-ly use their learning to use Euler Circuits and Hamiltonian Circuits to model everyday situations and provide solutions to problems. **CRP *** CRP2 CRP4 CRP8 CRP12	Can all circuits be Eulerized? Explain. What is the difference between Euler Circuits & Hamiltonian Circuits? What situations can be best modeled using an Euler Circuit? A Hamiltonian Circuit? A minimum cost spanning tree? Is there an algorithm that will always yield an optimal solution to a Hamiltonian Circuit? Explain.	Euler Circuits trace each edge exactly once and start and end at the same vertex. Hamiltonian Circuits visit each vertex exactly once and start and end at the same vertex. No algorithm will yield an optimal solution for a Hamiltonian Circuit.	Knowledge ❑ Graph ❑ Vertex ❑ Edge ❑ Path ❑ Circuit ❑ Complete ❑ Connected ❑ Digraph ❑ Valence/Degree ❑ Euler Circuits ❑ Fundamental Principle of Counting ❑ Hamiltonian Circuits ❑ Brute Force Algorithm ❑ Nearest Neighbor Algorithm ❑ Sorted Edges Algorithm ❑ Minimum Cost Spanning Tree ❑ Kruskal's Algorithm Skills: ❑ Eulerize a graph and complete an Euler circuit ❑ Complete a Hamiltonian circuit using the Nearest Neighbor and Sorted Edges Algorithms ❑ Complete a Minimum Cost spanning tree

School Formative Assessment Plan (Other Evidence)	School Summative Assessment Plan
• Classwork • Homework • Quizzes • Kahoot Review • Interactive Euler Circuit Review: smart notebook document • Euler Circuit Letter Writing Project: Write a letter to anyone in charge of devising routes in which you suggest that management science techniques, like the ones we studied in class, be used to plan routes. Assume that the person to whom you are writing is not extensively trained in mathematics, but is willing to read through some technical material, provided you make it seem worth the trouble. Include why the audience would want to use an Euler Circuit and how it will make their job more efficient. You must provide a graph of your proposed route that has been properly Eulerized. The letter must be typed, but the graph may be drawn by hand or computer generated, however it must be included with your document. • Salmon Cannon Video: https://www.youtube.com/watch?v=fn6_6N_KDYw - CBS video about Whoosh Technologies and the "Salmon Cannon." Discussed with students how this technology originally created to make apple picking industry more efficient was adapted to improve salmon spawning in the Pacific Northwest. • Video: Interview with Airline • Critical Path Group Activity: Each member of the group is to share their list of activities/hobbies and prerequisites. As a group, decide on the activity that your group will use to create an order requirement digraph. Once you have made your decision, get your idea approved by Mrs. Yeager. As a group, brainstorm a list of at least 6 tasks (no more than two tasks can have no prerequisite) which can be used to complete your activity. Be sure to include prerequisite tasks and appropriate task times. Get your list approved by Mrs. Yeager. Display your group's work on chart paper. Your display should include: Names of group members, the Activity you chose (ex. Creating a Survey, Constructing a Prefab House), task table with prerequisite tasks and task	Test Euler Circuits Test Hamiltonian Circuits

times, Order-Requirement Digraph, paths and their lengths, critical path, a question, and a solution to the problem in a complete sentence.	

District / School Primary and Supplementary Resources	
Primary Resources	**Supplementary Resources**
For All Practical Purposes: Mathematical Literacy for Today's World (COMAP, 5th Edition, 2001)	Additional outside Resources: COMAP Videos: Band on the Run and Interview with an Airline CBS Video: Salmon Cannon https://www.youtube.com/watch?v=fn6_6N_KDYw Teacher created resources

Technology Integration

TECH.8.1.12.A.3	Students will collaborate, communicate, and solve problems using Google Classroom.
TECH 8.2.12.B.5	Salmon Cannon video: Discuss with students how this technology originally created to make apple picking industry more efficient was adapted to improve salmon spawning in the Pacific Northwest.

Differentiated Instruction

Gifted Students (N.J.A.C.6A:8-3.1)

- ❑ Within each lesson, the Gifted Students are to be given the Advanced/Challenge Questions.
- ❑ These questions are to push the knowledge of each portion of the lesson. In the text, Advanced/Challenge questions are indicated by a square next to the problem number in the Exercises section.

English Language Learners (N.J.A.C.6A:15)

- ❑ Work with ELL Teacher to allow for all assignments to be completed with extra time.

At-Risk Students (N.J.A.C.6A:8-4.3c)

- ❑ Encourage student to seek extra help.
- ❑ Work with Guidance Counselor and I&RS Team to create an intervention plan.

Special Education Students (N.J.A.C.6A:8-3.1)

- ❑ Allow for extra time (if needed)
- ❑ Hard copy of notes
- ❑ Chunking of problems
- ❑ Preferential seating
- ❑ Work with contact teacher to assist with additional accommodations noted in IEP/504 plans.

Interdisciplinary Connections****

Math	Science	ELA
	After watching Salmon Cannon video, discuss with students how this technology originally created to make apple picking industry more efficient was adapted to improve salmon spawning in the Pacific Northwest.	Students will write a letter to anyone in charge of devising routes in which they suggest that management science techniques, like the ones we studied in class, can be used to plan routes.
Fine Arts/ Performing Arts	**World Language**	**Applied Technology/Business**
		Students use Euler Circuits to find efficient routes for trash collection, street sweeping, delivering mail, and other urban services. Students use Hamiltonian Circuits to find efficient routes for the Traveling Salesman problem. Students use Minimum-Cost Spanning Trees to find efficient networks for evacuation, snow removal, etc.

Social Studies	Health/Physical Education	Global Awareness
Through their study of The Konigsberg Bridge Problem, students learn about Leonard Euler. Euler was a Swiss mathematician who wrote the first paper ever on graph theory and thus became the originator of the theory of graphs as the rest of topology.		Students study the Konigsberg Bridge Problem, perhaps the best known example in graph theory.

Learning Plan

Euler Circuits
Week 1
Konigsberg Bridge Problem
Euler Circuits - graph, vertex, edge, valence, connected, path, circuit, Euler Circuit
Quiz

Week 2
Chinese Postman Problem
Eulerizing graphs
Euler Circuit Letter Writing Project
Test Euler Circuits

Hamiltonian Circuits
Week 3
Fundamental Principle of Counting
Traveling Salesman Problem
Compare and contrast Euler and Hamiltonian Circuits
COMAP Video: Band on the Run
Solving Hamiltonian Circuits by Nearest Neighbor and Sorted Edges algorithms

Week 4
Minimum-Cost Spanning Trees & Kruskal's Algorithm
Video: Salmon Cannon
Critical Paths and Order Requirement Digraphs
COMAP Video: Interview with an Airline
Critical Path Group Activity
Quiz

Week 5
Review for test
Test Hamiltonian Circuits

Unit 4-Planning, Scheduling, Bin Packing, & Vertex Coloring				**Duration-5 weeks**
Standards	**Transfer Goals**	**Concepts**		**Critical Knowledge and Skills**
		Essential Questions	**Understandings**	
MA.9-12.G-MG.A.1 Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). MA.9-12.G-MG.A.3	Algorithms for scheduling, bin packing, and vertex coloring can be utilized to optimize time and efficiency in planning.	Will increasing the number of processors decrease completion time? Explain. Will the decreasing time list algorithm guarantee an optimal solution?	Increasing the number of processors will not always decrease completion time. Sometimes it increases it. Decreasing time	Knowledge ❏ List Processing Algorithm ❏ Decreasing Time List Algorithm ❏ Critical Path Scheduling ❏ First-Fit, Next-Fit and Worst-Fit Bin Packing Algorithms ❏ Vertex Edge Graph ❏ Vertex Coloring Algorithm ❏ Chromatic Number

Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios). MA.9-12.N-Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. MA.K-12.4 Model with mathematics.	**CRP** ***	What situations can be best modeled using order-requirement digraphs? A machine scheduling problem? What is the maximum number of colors needed to color any map? How can the vertex coloring algorithm be applied to resolve conflict?	list algorithm does not guarantee and optimal solution. The maximum number of colors required to color any plane map is four.	Skills: ❏ Determine the critical path from an order-requirement digraph ❏ Use the list-processing algorithm and order-requirement digraphs to complete a machine scheduling problem ❏ Use the First-Fit, Next-Fit and Worst-Fit bin-packing algorithms to schedule independent tasks into a minimal number of bins ❏ Color regions of maps with minimal colors so that no two adjacent states have the same color. They should be able to employ Brooke's Theorem that says the maximum chromatic number is four. ❏ Take an existing vertex graph, create a priority coloring list based on descending order of vertex valences, use the vertex coloring algorithm to color the vertices and arrive at an optimal solution for compatibility. ❏ Read a conflict resolution problem, display the conflicts in a conflict chart and draw a vertex graph based on the information in the conflict chart.
CRP2 CRP4 CRP5 CRP6 CRP8 CRP12				

School Formative Assessment Plan (Other Evidence)	**School Summative Assessment Plan**
• Classwork • Homework • Quizzes • Four Color Problem Worksheet • Performance Tasks: Create and solve your own unique problem that can be solved using a conflict chart and the Vertex Coloring Algorithm. Your problem must include a minimum of six vertices, a matrix with different row and column labels, a conflict chart, a colored and labeled vertex graph, a priority list, and groups. • Spider Web Game (if time permits) • Two-Colorable Map Activity (if time permits)	Test Planning, Scheduling, & Bin Packing Test Vertex Coloring

District / School Primary and Supplementary Resources	
Primary Resources	**Supplementary Resources**
For All Practical Purposes: Mathematical Literacy for Today's World (COMAP, 5th Edition, 2001)	Additional outside Resources: COMAP VIDEO: Copies Quicker Teacher created resources

Technology Integration

TECH.8.1.12.A.3	Students will collaborate, communicate, and solve problems using Google Classroom.
TECH.8.2.12.E.1	Demonstrate an understanding of the problem-solving capacity of computers in our world; Students will learn how scheduling software works by solving problems using a more hands-on simplified approach of machine scheduling, bin packing and vertex coloring algorithms.

Differentiated Instruction

Gifted Students (N.J.A.C.6A:8-3.1)

- ❑ Within each lesson, the Gifted Students are to be given the Advanced/Challenge Questions.
- ❑ These questions are to push the knowledge of each portion of the lesson. In the text, Advanced/Challenge questions are indicated by a square next to the problem number in the Exercises section.

English Language Learners (N.J.A.C.6A:15)

- ❑ Work with ELL Teacher to allow for all assignments to be completed with extra time.

At-Risk Students (N.J.A.C.6A:8-4.3c)

- ❑ Encourage student to seek extra help.
- ❑ Work with Guidance Counselor and I&RS Team to create an intervention plan.

Special Education Students (N.J.A.C.6A:8-3.1)

- ❑ Allow for extra time (if needed)
- ❑ Hard copy of notes
- ❑ Chunking of problems
- ❑ Preferential seating
- ❑ Work with contact teacher to assist with additional accommodations noted in IEP/504 plans.

Interdisciplinary Connections****

Math	Science	ELA
Fine Arts/ Performing Arts	**World Language**	**Applied Technology/Business**
		Students use machine scheduling algorithms to determine the minimum number of processors/workers necessary to complete tasks efficiently. Students use bin packing to determine the most efficient ways to seat ticketholders, schedule advertising time, cut shelving for a wall unit.
Social Studies	**Health/Physical Education**	**Global Awareness**
The Four Color Problem discusses how mathematician and map-makers only need to use a maximum of four colors to color a map. Discuss history of the problem and well as the process of (dis)proving this theorem from the 1800's-2000's.		

Learning Plan

Planning, Scheduling, & Bin Packing
Week 1
Schedule independent tasks on two processors using First Come, First serve list-processing algorithm & Decreasing List algorithm
Review
Independent Tasks Quiz

Week 2
Schedule dependent tasks on two or three processors using First Come, First serve list-processing algorithm & Decreasing List algorithm
Schedule dependent tasks on processors using Critical Path Scheduling
Copies Quicker Video
Review
Dependent Tasks Quiz

Week 3
Use bin packing methods of Next-Fit, First-Fit, Worst-Fit, Next-Fit Decreasing, First-Fit Decreasing, and Worst-Fit Decreasing to solve problems
Review
Test Planning, Scheduling, and Bin Packing

Vertex Coloring & Conflict Resolution
Week 4
4 Color Theorem and its history
Applications of the Vertex Coloring Algorithm
Quiz Vertex Coloring

Week 5
Conflict Charts
Create your own problem which can be solved using a Conflict Chart and the Vertex Coloring Algorithm
Spider Web Coloring Game
Two-Colorable Map Activity
Test Vertex Coloring & Conflict Resolution

Unit 5-Number Systems	Duration-2.5 weeks

Standards	Transfer Goals	Concepts		Critical Knowledge and Skills
		Essential Questions	Understandings	
MA.9-12.F-BF.A Build a function that models a relationship between two quantities MA.9-12.F-BF.A.1c Compose functions. MA.9-12.N-Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities	Students will be able to independent-ly use their learning to convert between number bases. **CRP** *** CRP4 CRP6 CRP10	What is a specific example of a situation where binary numbers are used? What is a specific example of when hexadecimal numbers are used?	There are number systems other than base 10. Binary, Octal, and Hexadecimal number systems are the bases for writing computer code.	Knowledge ❏ Binary ❏ Decimal ❏ Hexadecimal ❏ Octal Skills: ❏ Convert between binary and decimal systems. ❏ Add, subtract, multiply, and divide numbers in binary form. ❏ Convert between octal-decimal and octal-binary. ❏ Convert between hexadecimal-decimal, hexadecimal-binary and hexadecimal-octal systems.

School Formative Assessment Plan (Other Evidence)	School Summative Assessment Plan
• Classwork • Homework • Quizzes • Cisco Binary Game • Kahoot on Binary-Decimal Conversion • A Quick Scan on Bar Codes article and questions	Test Number Systems – may use note card

District / School Primary and Supplementary Resources	
Primary Resources	**Supplementary Resources**
For All Practical Purposes: Mathematical Literacy for Today's World (COMAP,	Additional outside Resources:

5th Edition, 2001)	• Discovery Education videos: It's Electric and Digital Sound MATH BYTES VIDEO: Binary Numbers with Danica McKellar https://www.youtube.com/watch?v=TD6lcIIOeic Tutorial on how to convert between binary-decimal https://www.youtube.com/watch?v=tfKe8PPI2zs Cisco Binary Game - http://forums.cisco.com/CertCom/game/binary_game_page.htm Kahoot on Binary-Decimal Conversion https://play.kahoot.it/#/k/cde57f5c-5337-4933-bcbc-5e74d1ee9403 Teacher created resources

Technology Integration

TECH.8.1.12.A.3	Students will collaborate, communicate, and solve problems using Google Classroom.
TECH.8.2.12.E.1	Demonstrate an understanding of the problem-solving capacity of computers in our world; Students will learn how binary, octal, and hexadecimal number systems form the foundation of programming languages.

Differentiated Instruction

Gifted Students (N.J.A.C.6A:8-3.1)

- ❏ Within each lesson, the Gifted Students are to be given the Advanced/Challenge Questions.
- ❏ These questions are to push the knowledge of each portion of the lesson. In the text, Advanced/Challenge questions are indicated by a square next to the problem number in the Exercises section.

English Language Learners (N.J.A.C.6A:15)

- ❏ Work with ELL Teacher to allow for all assignments to be completed with extra time.

At-Risk Students (N.J.A.C.6A:8-4.3c)

- ❏ Encourage student to seek extra help.
- ❏ Work with Guidance Counselor and I&RS Team to create an intervention plan.

Special Education Students (N.J.A.C.6A:8-3.1)

- ❑ Allow for extra time (if needed)
- ❑ Hard copy of notes
- ❑ Chunking of problems
- ❑ Preferential seating
- ❑ Work with contact teacher to assist with additional accommodations noted in IEP/504 plans.

Interdisciplinary Connections****

Math	Science	ELA
		Students will read "A Quick Scan on Bar Codes" article, answer questions, and provide examples of current and future uses of bar code technology.
Fine Arts/ Performing Arts	**World Language**	**Applied Technology/Business**
		In Digital Sound video, students see how laser discs store information using binary code. In It's Electric video, students see how the process of relaying information is like a binary multiplication problem.
Social Studies	**Health/Physical Education**	**Global Awareness**
		Students will read about how bar code technology is used around the world.

Learning Plan

Week 1
Convert between binary and decimal systems
Math Bytes video with Danica McKellar
Perform Binary addition, multiplication, subtraction, and division
Review
Quiz Binary Numbers & Operations

Week 2
Convert between octal-decimal and octal-binary systems
Convert between Hexadecimal-decimal and Hexadecimal-binary systems
Create a note-card to be used on Number Systems Test

Week 3
Review
A Quick Scan on Bar Codes article and questions
Test Number Systems – may use note card