Glen Ridge Public Schools –Mathematics Curriculum

Course Title: Game Theory 8

Subject: Mathematics Elective

Grade Level: Grade 8

Duration: 1 Semester (2 Marking Periods)

Prerequisite: N/A

Elective or Required: Elective

Mathematics Mission Statement:
Mathematics is an integral part of our lives. Students must be actively involved in their mathematics education through the use of modeling and demonstrating the ability to persevere through problem solving. The mathematics curricula will emphasize critical thinking skills through a balance of logic and reasoning, attention to precision by utilizing patterns and structure, and bridging these ideas to cross-curricular learning. Students will be engaged and challenged in a student-centered learning environment that is developmentally appropriate and will communicate mathematical ideas, both in a verbal and written form. Through effectively applying hands-on manipulatives, basic computation skills and the use of technical writing to justify their processes, students will critique the work of themselves and others.

Course Description:
Game Theory is the study of human interaction and decision making. Students in this course will explore the mathematics behind games by applying familiar mathematical model and analyze the relationship between games and real world applications. Students will develop strategies for solving various types of games and take part in several simulations.

As an elective, this course will require individual and group work in the classroom on various projects assigned throughout the semester. Students in this course will be graded on their efforts to meet project deadlines and apply their knowledge of games studies.

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Game Theory 8

Topic/Unit #1: Review of Probability & Statistics

Approximate # Of Weeks: 5 Weeks

Essential Questions:
- How do you use a survey to make conclusions about the general population?
- How can you predict the results of an event?
- How can you find a theoretical probability? Experimental probability?
- What are the differences/similarities between theoretical and experimental probabilities?
- What is the difference between independent and dependent events?
- How do you find the probability of a compound event?

New Jersey Learning Standards: 7.SP.1-8, NCTM Mathematical Practices

Upon completion of this unit students will be able to:
- Use informal measures of probabilities
- Find experimental probability
- Use counting methods to determine possible outcomes
- Find the theoretical probability of an event
- Use probability to predict events
- Find the probability of independent and dependent events
- Find probabilities of compound events

Interdisciplinary Standards (njcccs.org)
- Standard 9.1 21st-Century Life & Career Skills
- Standard 9.3 - Career Awareness, Exploration, and Preparation
- Standard 8.1 – Computer and Information Literacy
- Standard 8.2 – Technology Education

Activities – include 21st Century Technologies:
- Use Random Samples Lab (Holt, pages 292-293)
- Experimental & Theoretical Probability Lab (Holt, pages 430-431)
- Rolling Number Cubes TI-84 Lab (Prentice Hall Mathematics, page 37)
- Dependent/Independent Events (Big Ideas, Activity 1/2, page 404)
- The Birthday Problem (http://mste.illinois.edu/java/java/birthday/birthday.html)
- Rock, Paper, Scissors Simulation (http://chappie.stanford.edu/cgi-bin/roshambot/)
- The Prisoner's Dilemma (http://www.gametheory.net/applets/prisoners.html)

- Problem Solving/ Real-Life Applications

Enrichment Activities:
- Real World Connections (Holt, Chapter 7, page 295)
- Taking Math Deeper (Big Ideas)
- Challenge Worksheets (Holt)

Methods of Assessments/Evaluation:
- Projects
- Math Labs/ Simulations
- Classwork Activities

Resources/Including Online Resources:
- Google Classroom
- GameTheory.net/applets

Topic/Unit #2: Two-Player Games

Approximate # Of Weeks: 4 Weeks

Essential Questions:
- How is Checkers, Chess and Backgammon played?
- What are the tactics and strategies behind the game play of Checkers, Chess and Backgammon?
- What mathematical concepts are applied when playing Checkers, Chess and Backgammon?
- What is the most effective way to play and win Battleship?
- How does randomizing your ships give the player a larger advantage?
- What is an algorithm?
- How do understanding algorithms help a player's game play in Mastermind?

New Jersey Learning Standards: 7.SP.1-8, NCTM Mathematical Practices

Upon completion of this unit students will be able to:
- Discuss the rules and restrictions of each game introduced.
- Describe the strategies of game play for each game
- Relate the strategies to a mathematical concept and describe its application in both game play and the real world.

Interdisciplinary Standards (njcccs.org**)**
- Standard 9.1 21st-Century Life & Career Skills
- Standard 9.3 - Career Awareness, Exploration, and Preparation
- Standard 8.1 – Computer and Information Literacy

- Standard 8.2 – Technology Education

Activities – include 21st Century Technologies:
- Checkers, Chess and Backgammon game play
- Battleship game play
- Mastermind game play

Enrichment Activities:
- Real World Connections (Holt, Chapter 7, page 295)
- Taking Math Deeper (Big Ideas)
- Challenge Worksheets (Holt)

Methods of Assessments/Evaluation:
- Projects
- Math Labs/ Simulations
- Classwork Activities

Resources/Including Online Resources:
- Google Classroom
- GameTheory.net/applets

Topic/Unit #3: Multiplayer Games (With and Without Elimination)

Approximate # Of Weeks: 4 Weeks

Essential Questions:
- How does visual/spatial intelligence assist in the strategy of game play in Blokus?
- What is the probability of a given tile in Scrabble? How does this effect game play?
- What is the probability of each roll in Yahtzee? What is the likeliest roll? Unlikeliest roll?

New Jersey Learning Standards: 7.SP.1-8, NCTM Mathematical Practices

Upon completion of this unit students will be able to:
- Discuss the rules and restrictions of each game introduced.
- Describe the strategies of game play for each game
- Relate the strategies to a mathematical concept and describe its application in both game play and the real world.

Interdisciplinary Standards (njcccs.org)
- Standard 9.1 21st-Century Life & Career Skills
- Standard 9.3 - Career Awareness, Exploration, and Preparation
- Standard 8.1 – Computer and Information Literacy

- Standard 8.2 – Technology Education

Activities – include 21st Century Technologies:
- Scrabble game play
- Yahtzee game play
- Blokus game play

Enrichment Activities:
- Real World Connections (Holt, Chapter 7, page 295)
- Taking Math Deeper (Big Ideas)
- Challenge Worksheets (Holt)

Methods of Assessments/Evaluation:
- Projects
- Math Labs/ Simulations
- Classwork Activities

Resources/Including Online Resources:
- Google Classroom
- GameTheory.net/applets

Topic/Unit #4: Strategic Multiplayer Games

Approximate # Of Weeks: 4 Weeks

Essential Questions:
- How is Monopoly and Settlers of Catan played?
- What strategies can be applied? Why do these strategies work?
- How does probability of events relate to the outcome of each game?

New Jersey Learning Standards: 7.SP.1-8, NCTM Mathematical Practices

Upon completion of this unit students will be able to:
- Discuss the rules and restrictions of each game introduced.
- Describe the strategies of game play for each game
- Relate the strategies to a mathematical concept and describe its application in both game play and the real world.

Interdisciplinary Standards (njcccs.org)
- Standard 9.1 21st-Century Life & Career Skills
- Standard 9.3 - Career Awareness, Exploration, and Preparation
- Standard 8.1 – Computer and Information Literacy
- Standard 8.2 – Technology Education

Activities – include 21st Century Technologies:
- Settlers of Catan game play
- Monopoly game play

Enrichment Activities:
- Real World Connections (Holt, Chapter 7, page 295)
- Taking Math Deeper (Big Ideas)
- Challenge Worksheets (Holt)

Methods of Assessments/Evaluation:
- Projects
- Math Labs/ Simulations
- Classwork Activities

Resources/Including Online Resources:
- Google Classroom
- GameTheory.net/applets

Topic/Unit #5: Final Project (Application of Units #1-4)

Approximate # Of Weeks: 2 Weeks

Essential Questions:
- How can you apply the strategies from each game investigated to create your own game?

New Jersey Learning Standards: 7.SP.1-8, NCTM Mathematical Practices

Upon completion of this unit students will be able to:
- Develop a game using strategies developed in the previous 4 units.
- Share their game by discussing rules & procedures, strategies and its application in mathematics.

Interdisciplinary Standards (njcccs.org)
- Standard 9.1 21st-Century Life & Career Skills
- Standard 9.3 - Career Awareness, Exploration, and Preparation
- Standard 8.1 – Computer and Information Literacy
- Standard 8.2 – Technology Education

Activities – include 21st Century Technologies:
- Game Design Project

- Game Day (sharing project guidelines and strategies)

Enrichment Activities:
- Game Design Project

Methods of Assessments/Evaluation:
- Game Design Project Rubric

Resources/Including Online Resources:
- Google Classroom
- GameTheory.net/applets