Course Title:
Challenge Math

Length:
One Quarter
Grade 6

Primary Content:
Gifted & Talented

School:
Pierrepont

Embedded Content:
English Language Arts, Math, Visual and Performing Arts, Career
Readiness, Life Literacies and Key Skills

Initial BOE Approval Date (Born on):
June 24, 2024

RUTHERFORD PUBLIC SCHOOLS
Rutherford, New Jersey

GIFTED AND TALENTED DEPARTMENT

CHALLENGE MATH - GRADE 6

1.   Introduction/Overview/Philosophy

Children need to see the tangible results of their math work. Mathematics includes many problem solving strategies, including making a model, making a diagram, graphing, codes, ciphers or drawing. Students may complete activities individually or with a partner. Activities provide opportunities for students to complete written analysis, develop questioning skills, engage in group discussion, and experience follow-up learning based on deconstructing the models. Projects combine language arts, math and art. Many of the projects support more than one dimension of Gardner's Multiple Intelligences as students embellish and extend their work.

Course Outline

Challenge Math projects allows students to create their own fold-up math models; students develop their math problem-solving strategies and "see" what math is all about as they develop problem-solving, visual-motor, and creative thinking skills with this series of challenging and fun projects. Using ordinary classroom materials, students work alone or in small groups to design flat patterns that fold into everyday three-dimensional objects such as a house, bookcase, or sailboat. The ability to visualize while solving mathematical problems will help students gain confidence and build superior thinking skills. Each activity is designed so that certain pieces (bits of information) are hidden or left out. By thinking and puzzling over the challenge and asking questions, students can find appropriate and varied solutions. Each project is designed to stand alone, but the projects are arranged from basic to advanced, and build on one another as they progress.

Codes and Ciphers challenge students to think about math in a different way. In the art of creating codes and ciphers, math is used to create formulas and algorithms that can be used to encode and decode messages. For example, the Caesar cipher, one of the oldest and most well-known ciphers, involves shifting each letter of a message by a fixed number of positions in the alphabet.

The Stock Market Game is a real life simulation of finances and money. Students build a fundamental understanding of investing while practicing math, English Language Arts, economics, social studies, and other subjects. The game can be shortened or extended as needed to fit the time allotted.

The variety of enriching and thought-provoking learning experiences offered in the Gifted and Talented Program incorporates three levels of enrichment intended to promote critical thinking.

Type I—General Exploratory Activities (Content)- Exposure to disciplines, authors or events not covered in the regular curriculum. Children can be exposed to such areas long enough to be attracted to some of them for individual study.

Type II—Group Process Activities (Operations)- Students are taught skills for expanding their thinking and feeling processes. Among these activities are: brainstorming, analysis, classification, general inquiry, observation and evaluation.

Type III—Real Problem Solving (Products)- This type of enrichment involves children in thinking, feeling and doing in the manner of the practicing professional. Children are encouraged to focus on solvable problems so that they might become empowered to create products that influence outcomes and make a difference in the world.

In addition, a goal of the Gifted and Talented Program is to include activities aimed at developing the affective domain of our students, such as: valuing, responding, receiving/attending. It is through both thinking and feeling that our students will develop into thoughtful, contributing, valuable members of society.

2.   Objectives

1. Understand that a problem may have more than one acceptable solution.
2. Solve progressively more difficult challenges
3. Apply visualization, measurement, and estimation to construct a model
4. Create challenge materials for use by others
5. Learn to ask clarifying questions
6. Build on previous learning experiences
7. Work cooperatively with other students to develop problems solving strategies
8. Gain confidence in developing individual approaches to problem solving
9. Appreciate the value of collaborative working relationships
10. Become willing to take risks based on knowledge, estimation, and visualization

A.   Curriculum Objectives for Inquiry

Students will be able to refine and broaden
1. Divergent thinking
    a. Creative thinking
    b. Inventive thinking
2. Convergent thinking
    a. Deductive thinking
    b. Analytical thinking
    c. Evaluative thinking
3. Interpretive thinking
4. Research skills

1.   In the area of **divergent thinking** students will:
    a. use **creative thinking** to:

1. use fluent and flexible thinking to brainstorm ideas/solutions
2. develop, produce, and dramatize
3. adapt story versions
4. illustrate interpretations
5. use the five-step writing process to write original pieces
6. create and construct original designs with a variety of manipulatives and art supplies

   b. use **inventive thinking** to:
1. use fluent and flexible thinking to brainstorm ideas/solutions
2. adapt items to be used for an alternate purpose

2.   In the area of **convergent thinking** students will:
   a. use **deductive thinking** to:
1. formulate predictions/hypothesis
   b. use **analytical thinking** to:
1. analyze story elements
2. compare and contrast story elements/manipulatives/interpretations
3. interpret visual representations
   c. use **evaluative thinking** to:
1. judge character traits and motivation
2. compare, rate, rank, revise, and eliminate information
3. determine cause and effect
4. make conclusions about given information
5. self-assess using set criteria

3.   In the area of **interpretive thinking** students will:
   a. use shared inquiry to:
1. build awareness of interpretive issues in a story
2. analyze character motivation and development

4.   In the area of **research skills** students will:
   a. access and select meaningful information using the Internet, books, videos, and other media
   b. use the five-step writing process of prewriting, drafting, editing, conferencing, and publishing for a variety of audiences and purposes
   c. use a variety of computer software to record research
   d. synthesize knowledge of a topic into self-selected culminating activities
   e. cite references
   f. Present to/share research with others

   a. **Skills**
     i. Improvement of reasoning ability
     ii. Development of creativity and personal development

B.   New Jersey Core Curriculum Content Standards

SL.PE.6.1. Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 6 topics, texts, and issues, building on others' ideas and expressing their own clearly.

A. Come to discussions prepared, having read or studied required material; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion.
B. Follow rules for collegial discussions, set specific goals and deadlines, and define individual roles as needed.
C. Pose and respond to specific questions with elaboration and detail by making comments that contribute to the topic, text, or issue under discussion.
D. Review the key ideas expressed and demonstrate understanding of multiple perspectives through reflection and paraphrasing.

SL.II.6.2. Interpret information presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how it contributes to a topic, text, or issue under study.
SL.PI.6.4. Present claims and findings, sequencing ideas logically and using pertinent descriptions, facts, and details to accentuate main ideas or themes; use appropriate speaking behaviors (e.g., eye contact, adequate volume, and clear pronunciation).

6.RP
A. Understand ratio concepts and use ratio reasoning to solve problems.
1. Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.
3. Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.

6.NS
A. Apply and extend previous understandings of multiplication and division to divide fractions by fractions.
1. Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem.
B. Compute fluently with multi-digit numbers and find common factors and multiples.
2. With accuracy and efficiency, divide multi-digit numbers using the standard algorithm.
3. With accuracy and efficiency, add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.

6.G
A. Solve real-world and mathematical problems involving area, surface area, and volume.
1. Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.
4. Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems.

9.4.8.CI.3: Examine challenges that may exist in the adoption of new ideas
9.4.8.CT.2: Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option

Career Readiness, Life Literacies, and Key Skills Practices

Career Readiness, Life Literacies, and Key Skills Practices describe the habits of the mind that all educators in all content areas should seek to develop in their students. They are practices that have been linked to increase college, career, and life success. These practices should be taught and reinforced in all content areas with increasingly higher levels of complexity and expectation as a student advances through a program of study.

Practice	Description
Act as a responsible and contributing community members and employee.	Students understand the obligations and responsibilities of being a member of a community, and they demonstrate this understanding every day through their interactions with others. They are conscientious of the impacts of their decisions on others and the environment around them. They think about the near-term and long-term consequences of their actions and seek to act in ways that contribute to the betterment of their teams, families, community and workplace. They are reliable and consistent in going beyond the minimum expectation and in participating in activities that serve the greater good.
Attend to financial well-being.	Students take regular action to contribute to their personal financial well-being, understanding that personal financial security provides the peace of mind required to contribute more fully to their own career success.
Consider the environmental, social and economic impacts of decisions.	Students understand the interrelated nature of their actions and regularly make decisions that positively impact and/or mitigate negative impact on other people, organization, and the environment. They are aware of and utilize new technologies, understandings, procedures, materials, and regulations affecting the nature of their work as it relates to the impact on the social condition, the environment and the profitability of the organization.
Demonstrate creativity and innovation.	Students regularly think of ideas that solve problems in new and different ways, and they contribute those ideas in a useful and productive manner to improve their organization. They can consider unconventional ideas and suggestions as solutions to issues, tasks or problems, and they discern which ideas and suggestions will add greatest value. They seek new methods, practices, and ideas from a variety of sources and seek to apply those ideas to their own workplace. They take action on their ideas and understand how to bring innovation to an organization.
Utilize critical thinking to make sense of problems and persevere in solving them.	Students readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem. They are aware of problems when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to introducing solutions. They carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through their own actions or the actions of others.

Practice	Description
Model integrity, ethical leadership and effective management.	Students consistently act in ways that align personal and community-held ideals and principles while employing strategies to positively influence others in the workplace. They have a clear understanding of integrity and act on this understanding in every decision. They use a variety of means to positively impact the directions and actions of a team or organization, and they apply insights into human behavior to change others' action, attitudes and/or beliefs. They recognize the near-term and long-term effects that management's actions and attitudes can have on productivity, morals and organizational culture.
Plan education and career paths aligned to personal goals.	Students take personal ownership of their own education and career goals, and they regularly act on a plan to attain these goals. They understand their own career interests, preferences, goals, and requirements. They have perspective regarding the pathways available to them and the time, effort, experience and other requirements to pursue each, including a path of entrepreneurship. They recognize the value of each step in the education and experiential process, and they recognize that nearly all career paths require ongoing education and experience. They seek counselors, mentors, and other experts to assist in the planning and execution of career and personal goals.
Use technology to enhance productivity increase collaboration and communicate effectively.	Students find and maximize the productive value of existing and new technology to accomplish workplace tasks and solve workplace problems. They are flexible and adaptive in acquiring new technology. They are proficient with ubiquitous technology applications. They understand the inherent risks-personal and organizational-of technology applications, and they take actions to prevent or mitigate these risks.
Work productively in teams while using cultural/global competence.	Students positively contribute to every team, whether formal or informal. They apply an awareness of cultural difference to avoid barriers to productive and positive interaction. They find ways to increase the engagement and contribution of all team members. They plan and facilitate effective team meetings.

3.   Proficiency Levels

Students in grades six are identified as "Gifted and Talented." Students that have received 2 points on the Gifted and Talented screening will be offered all 4 available grade level courses.

Differentiating Instruction for Students with Special Needs: Students with Disabilities, English Language Learners, and Gifted & Talented Students

Differentiating instruction is a flexible process that includes the planning and design of instruction, how that instruction is delivered, and how student progress is measured. Teachers recognize that students can learn in multiple ways as they celebrate students' prior knowledge. By providing appropriately challenging learning, teachers can maximize success for all students. Examples of Strategies and Practices that Support
Students with Disabilities and Students with 504 plans
- Use of visual and multi-sensory formats
- Use of assisted technology
- Use of prompts
- Modification of content and student products
- Testing accommodations
- Authentic assessments

Gifted & Talented Students
- Adjusting the pace of lessons
- Curriculum compacting
- Inquiry-based instruction
- Independent study
- Higher-order thinking skills
- Interest-based content
- Student-driven
- Real-world problems and scenarios

English Language Learners
- Pre-teaching of vocabulary and concepts
- Visual learning, including graphic organizers
- Use of cognates to increase comprehension
- Teacher modeling
- Pairing students with beginning English language skills with students who have more advanced English language skills
- Scaffolding
- Word walls references
- Sentence frames
- Think-pair-share
- Cooperative learning groups
- Teacher think-alouds

4. **Methods of Assessment**

  Participation
  Completed products and performance
  Teacher observation
  Rubrics (quality and accuracy, clarity and presentation, and concept;
  Teamwork (participation, level of involvement, quality of work as a team member)
  Sample collections/portfolios

5. **Grouping**

Small group pull-out for students identified as "Gifted and Talented" according to the Rutherford School District Gifted and Talented Policy 2464 (revised December 7, 2020) to be run as a grade 6 cycle course.

6. **Articulation/Scope & Sequence**

  Course length is one quarter.
Major Products:
  a. Finished Models
  b. Self and Peer evaluations

7. **Resources**

  a. References

  b. Technology

  Chromebooks
  Internet

  c. Supplies/Materials
a variety of art project paper
Markers/Pencils/Pens
Printer
Rulers
Scissors
Tape
Protractor
Graph Paper
Calculators

  d. Texts
Challenge Math Projects, Interact www.teachinteract.com C2000

  e. Supplemental Reading
https://www.noetic-learning.com/gifted/index.jsp

The Problem Solver 6, Creative Publications, January 1, 1987
Challenge Math For the Elementary and Middle School Student, Hickory Grove Press, Edward Zaccaro
https://www.teacherspayteachers.com/Product/Paper-City-3D-MathArt-Group-Project-1431027?st=3b66480ffc4ccbad7aa3783f92884d85
https://www.stockmarketgame.org/expteacher.html

8. Methodologies

Methods include but are not limited to:
• Cooperative learning
• Individual and group problem solving
• Inquiry
• Class/group discussion
• Brainstorming
• Critical Thinking
• Experimenting
• Short lecture

9. Suggested Activities

• Skill-building activities
• Exploring multiple intelligences
• Researching
• Shared Inquiry discussions

10. Interdisciplinary Connections

Some students will want to embellish their models with color, patterns, and other creative solutions. Students are also encouraged in creativity as they prepare their designs. As a team activity, Challenge Math provides ideal experiences for teaching students cooperative learning and working strategies. It also encourages individual responsibility and cooperation among team members because each member creates their own model. Each project includes additional tasks for students who finish quickly/or for students who will benefit from additional challenges. Projects combine language arts, math and art.

11. Professional Development

As per the PDP/100 Hours statement: the teacher will continue to improve expertise through participation in a variety of professional development opportunities. Specialized professional development for teachers in the Gifted and Talented Department is offered through the Bergen County Consortium of Teachers of the Gifted (BCCTG) and the New Jersey Association for Gifted Children (NJAGC). Teacher will continue to read professional journals and books.

12.   Curriculum Map

Unit Topic	Time Allocated	Differentiating Instruction for Students with Disabilities, Students at Risk, Students with 504 Plans, English Language Learners, & Gifted & Talented Students	Standards	Assessments
Part 1: House (Basic; Partners) Bookshelf (Basic; Individual) Bookcase (Moderate) Toy Box (Moderate to advanced; Partners) Park Bench (Moderate; individua) U-Shaped House (Advanced-Partners) Easy Chair (Advanced) Dining Room Chair (Advanced-Individual) Dining Table (Advanced) Table (Moderate-Individual) Block Letter K (Advanced-Individual) Sailboat (Advanced-Individual) Sink Bowl (Advanced-Individual) Castle (Advanced-Group- 5 days +) Open Challenge (Culminating Activity-Individual)	Number of weeks Each project will vary in time allotted depending on students involved. Most projects are expected to take 3 days but should be adapted as needed. (This course meets for approx. 8-10 weeks) Time allocated is approx. 4-5 weeks/5 sessions	For Support: Computer-Based Instruction: Use of chromebooks/computers, websites as deemed useful to enhance and modify learning. Multi-media approach to accommodating various learning styles Use of visual and multi-sensory formats For Enhancement: Independent Study Interest driven Inquiry-based instruction Higher order thinking skills ELL: Visual learning, including graphic organizers Scaffolding Cooperative Learning Groups	SL.PE.6.1; 6.RP; 6.NS; 6.G; 9.4.8.CI.3; 9.4.8.CT.2	Formative Assessment: Oral participation in activities (class questioning) Teacher observation of student progress Classwork Peer-Evaluation Group and individual critique Summative Assessment: Finished Models will be assessed to ensure they conform to the information given on the challenge; Creativity; and proper representation of the project.

Part 2: Codes and Ciphers-Understanding ciphers from the time of Caesar to breaking mathematics based ciphers such as the Affine Cipher. OR Stock Market Game-Students use real Internet research and news updates, start with a virtual cash account, and strive to create the best-performing portfolio using a live trading simulation. They work together in teams, practicing leadership, organization, negotiation, and cooperation as they compete for the top spot.	Number of weeks (This course meets for approx. 8-10 weeks) Time allocated is approx. 3-4 weeks/5 sessions wk	For Support: Computer-Based Instruction: Use of chromebooks/computers, websites as deemed useful to enhance and modify learning. Multi-media approach to accommodating various learning styles Use of visual and multi-sensory formats For Enhancement: Independent Study Interest driven Inquiry-based instruction Higher order thinking skills ELL: Visual learning, including graphic organizers Scaffolding Cooperative Learning Groups	SL.PE.6.1, SL.II.6.2, SL.PI.6.4.; 6.RP; 6.NS; 6.G; 9.4.8.CI.3; 9.4.8.CT.2	Formative Assessment: Oral participation in activities (class questioning) Teacher observation of student progress Classwork Peer-Evaluation Group and individual critique Summative Assessment: Finished Models will be assessed to ensure they conform to the information given on the challenge; Creativity; and proper representation of the project.