

PASCACK VALLEY REGIONAL HIGH SCHOOL DISTRICT

Board Approval: 9/11/17

Curriculum Addendum: Math

N.J.A.C. 6A:8-3.1 Curriculum and instruction

(a) District boards of education shall ensure that curriculum and instruction are designed and delivered in such a way that all students are able to demonstrate the knowledge and skills specified by the NJSLS and shall ensure that appropriate instructional adaptations are designed and delivered for students with disabilities, for ELLs, for students enrolled in alternative education programs, and for students who are gifted and talented.

District boards of education shall be responsible for developing for all students with disabilities educational programs aligned with the CCCS with appropriate accommodations, instructional adaptations, and/or modifications as determined by the IEP or 504 team.

District boards of education shall develop appropriate curricular and instructional modifications used for gifted and talented students indicating content, process, products, and learning environment.

District boards of education shall be responsible for developing for ELLs English language assistance programs that are aligned to the NJSLS and the English language development standards.

District boards of education shall provide the time and resources to develop, review, and enhance interdisciplinary connections, supportive curricula, and instructional tools for helping students acquire required knowledge and skills. The tools include, but are not limited to:

- i. A pacing guide;
- ii. A list of core instructional materials, including various levels of texts at each grade level;
- iii. Benchmark assessments; and
- iv. Modifications for special education students, for ELLs in accordance with N.J.A.C. 6A:15, for students at risk of school failure, and for gifted students.

Curriculum Addendum: Math

Content Area Unit Name	<p>Mathematics 9-12</p> <p>This curricular addendum provides educators with clarifications, connections, resources, and adaptations to meet the needs of varied learners, K-12. The NJSLS in Math provide educators with identification of required content, skills, values and dispositions essential to build curricula. This document is an extension to NJSLS, ensuring dynamic, rigorous, and diverse instructional approaches distinct to Math are enacted in NJ school districts.</p>
<i>Interdisciplinary Connections (including WIDA standards if applicable)</i>	<p>Math encompasses a broad multidisciplinary field within its own academic area, including the teaching of making sense of problems and persevering in them, reasoning abstractly and quantitatively, constructing viable arguments and critiquing the reasoning of others, modeling with mathematics, using appropriate tools strategically, attending to precision, looking for and making use of structure, and looking for and expressing regularity in repeated reasoning. The NJSLS are designed to integrate core Math disciplines: counting and cardinality, operations and algebraic thinking, number and operations, measurement and data, geometry, ratios and proportional relationships, the number system, expressions and equations, functions, and statistics and probability. These interdisciplinary connections, as a result, are present within the current standards. Interdisciplinary connections in this document expand outside of the distinct field of Math into: moral/social education; science, social studies, technology, and literacy/language arts. Interdisciplinary connections are framed through essential questions to highlight the integration of content/skills inherent to student inquiries in Math. The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students. These practices rest on important “processes and proficiencies” with longstanding importance in mathematics education. Topics are bulleted below.</p> <ul style="list-style-type: none"> ● making sense of problems and persevering in solving them ● reasoning abstractly and quantitatively ● constructing viable arguments and critiquing the reasoning of others ● modeling with mathematics ● using appropriate tools strategically ● attending to precision ● looking for and making use of structure ● looking for and expressing regularity in repeated reasoning <p>https://www.wida.us/standards/</p>
Core Instructional Materials including digital tools	<p>Many instructional resources are available to educators to teach Math with students’ diverse needs in mind. Several resources are already cited in this curriculum. The below list represents current and prominent instructional resources that are referenced often in classrooms. Digital sources are hyperlinked.</p>

	http://connected.mcgraw-hill.com/connected/login.do https://www.desmos.com https://www.khanacademy.org/ https://www.ixl.com/math/ https://www.illustrativemathematics.org/
21st Century Themes and Skills	<p>The following content statements can be integrated into any of the adopted Math strands: operations and algebraic thinking, number and operations, measurement and data, geometry, ratios and proportional relationships, the number system, expressions and equations, functions, and statistics and probability.</p> <ul style="list-style-type: none"> ● CRP2. Apply appropriate academic and technical skills. ● CRP3. Attend to personal health and financial well-being. ● CRP4. Communicate clearly and effectively and with reason. ● CRP5. Consider the environmental, social and economic impacts of decisions. ● CRP6. Demonstrate creativity and innovation. ● CRP7. Employ valid and reliable research strategies. ● CRP8. Utilize critical thinking to make sense of problems and persevere in solving them. ● CRP9. Model integrity, ethical leadership and effective management. ● CRP10. Plan education and career paths aligned to personal goals. ● CRP11. Use technology to enhance productivity. ● CRP12. Work productively in teams while using cultural global competence
8.1 Educational Technology	<p>As teaching, learning and curriculum across New Jersey evolve to better meet student needs, teachers, when addressing Math content, are expected to integrate the adopted 8.1 Educational Technology, 8.2 Technology Education, Engineering, Design, and Computational Thinking - Programming, and 21st Century Skills into their classroom practice. To that end, teachers will be expected to apply the following anchor standards into their classroom practice.</p> <p>The following content statements can be integrated into any of the adopted Math strands: operations and algebraic thinking, number and operations, measurement and data, geometry, ratios and proportional relationships, the number system, expressions and equations, functions and statistics and probability.</p> <ul style="list-style-type: none"> ● Understand and use technology systems. ● Select and use applications effectively and productively. ● Apply existing knowledge to generate new ideas, products, or processes ● Create original works as a means of personal or group expression. ● Interact, collaborate, and publish with peers, experts, or others by employing a variety of digital environments and media.

	<ul style="list-style-type: none"> ● Communicate information and ideas to multiple audiences using a variety of media and formats. ● Contribute to project teams to produce original works or solve problems. ● Advocate and practice safe, legal, and responsible use of information and technology. ● Demonstrate personal responsibility for lifelong learning. ● Exhibit leadership for digital citizenship. ● Plan strategies to inquiry. ● Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media. ● Evaluate and select information sources and digital tools based on the appropriateness for specific tasks. ● Process data and report results. ● Identify and define authentic problems and significant questions for investigation. ● Plan and manage activities to develop a solution or complete a project. ● Collect and analyze data to identify solutions and/or make informed decisions. ● Use multiple processes and diverse perspectives to explore alternative solutions.
8.2 Technology Education, Engineering, Design, and Computational Thinking - Programming	<p>The following content statements can be integrated into any of the adopted Math strands: operations and algebraic thinking, number and operations, measurement and data, geometry, ratios and proportional relationships, the number system, expressions and equations, functions and statistics and probability.</p> <ul style="list-style-type: none"> ● The characteristics and scope of technology. ● The core concepts of technology. ● The relationships among technologies and the connections between technology and other fields of study. ● The cultural, social, economic and political effects of technology. ● The effects of technology on the environment. ● The role of society in the development and use of technology. ● The influence of technology on history. ● The attributes of design. ● The application of engineering design. ● The role of troubleshooting, research and development, invention and innovation and experimentation in problem solving. ● Apply the design process. ● Use and maintain technological products and systems ● Assess the impact of products and systems ● Computational thinking and computer programming as tools used in design and

	engineering
Pacing Guide	<p>The NJSLS in Math have progress indicators that cover clusters of multiple grades. Local districts, as a result, develop curricular scope and sequence plans that meet their individual community needs while addressing the NJSLS. The NJDOE does not endorse a specific pacing guide at each grade level for this reason. However, individual schools districts must show evidence of creating and following math pacing plans that meet the NJSLS. Pacing Charts are included in each of the individual curricular documents.</p>
Assessments	<p>Math assessments like other content area assessments should be a natural and ongoing part of the teaching and learning process. The more authentic the assessment process is, the better the chance that students will see the interdisciplinary connections between Math and other areas of study.</p> <ol style="list-style-type: none"> 1. What factors should be considered in planning for assessment? <ul style="list-style-type: none"> ● Content mastery (which standards are being assessed) ● Analysis of content ● Skills development ● Connections between and among essential learnings ● Interdisciplinary connections ● Diversity in student learning styles and needs ● Opportunities for democratic participation 2. How are goals of instruction and assessment related? <ul style="list-style-type: none"> ● Are the goals for learning actually being assessed? ● To what degree are we asking students to extend learning? ● Can students transfer their learning to a new situation? ● Does the assessment reflect what is valued instructionally? ● Does the assessment benefit the learner by informing teaching practices? ● Does the assessment allow for a variety of learners to demonstrate their understanding? 3. What should you consider as you develop criteria for scoring? <ul style="list-style-type: none"> ● How many ways can students demonstrate they have learned the material? ● How will students be scored? ● How will the needs of a variety of learners be addressed with this assessment? ● Does the scoring tool reflect the learning goals? 4. What are the most constructive assessment designs and methods for Math educators? <ul style="list-style-type: none"> ● Performance assessment

	<ul style="list-style-type: none"> ● Authentic assessment ● Authentic instruction ● Portfolio assessment <p>Helpful links: Authentic Assessments, Muller Toolbox, NEA Toolbox, 21st Century Assessments</p> <p>Authentic assessment can include (but are not limited to) the following:</p> <ul style="list-style-type: none"> ● Observation ● Argument and Research Writing ● Performance tasks (UBD description of performance task; Michigan DOE) ● Exhibitions and demonstrations ● Portfolios ● Journals ● Self- and peer-evaluation ● Project Based Learning (overview) ● Blogs, Vlogs, other Web 2.0 tools to extend beyond classroom walls ● Unit pre and post tests ● Benchmark assessments ● Timed fact tests
<p style="text-align: center;">Differentiation/Modifications</p> <p><i>Curriculum Differentiation is a process teachers use to increase achievement by improving the match between the learner's unique characteristics: prior knowledge, cognitive level, learning style, motivation, strength or interest and various curriculum components: Nature of the objective, teaching activities, learning activities, resources and products. This broad notion applies to learners from a diverse range of abilities, including: Gifted and Talented, English Language Learners, Students with Disabilities, and Students at Risk of School Failure. Math is a field of education that provides educators with a wealth of opportunities for differentiation, but also real challenges of meeting the needs of diverse learners. This addendum reveals pathways for Math differentiation specific to four distinct student populations.</i></p> <p><i>Teachers can differentiate</i></p> <ul style="list-style-type: none"> ● <i>Content: What we teach and how we give students access to the information and ideas that matter</i> ● <i>Process: How students come to understand and "own" the knowledge, understanding, and skills essential to a topic</i> ● <i>Product: How a student demonstrates what he or she has come to know, understand and be able to do as a result of a segment of study</i> <p><i>According to students'</i></p> <ul style="list-style-type: none"> ● <i>Readiness-The current knowledge, understanding, and skill level a student has related to a particular sequence of learning</i> ● <i>Interest-What a student enjoys learning about, thinking about, and doing</i> 	

- *Learning Style-A student's preferred mode of learning. It is influenced by learning style, intelligence preference, gender and culture*

The NJ Math Framework <http://www.state.nj.us/education/aps/cccs/math/> contains an in-depth overview for meeting the needs of diverse learners in Math. Many of these content specific suggestions are classroom ready.

<i>Gifted and Talented (content, process, product and learning environment)</i>	English Language Learners	Students with Disabilities (appropriate accommodations, instructional adaptations, and/or modifications as determined by the IEP or 504 team)	Students at Risk of School Failure
<p>N.J.A.C. 6A:8-3.1 Curriculum and instruction</p> <p>District boards of education shall develop appropriate curricular and instructional modifications used for gifted and talented students indicating content, process, products, and learning environment.</p> <p><i>Sample Differentiation Strategies and Techniques that apply to Math</i></p> <ul style="list-style-type: none"> • Learning Agendas/Contracts <p>A learning contract is an agreement established between a student and the teacher; it sometimes involves the student's parents. The contract specifies concrete learning and/or behavioral</p>	<p>The purpose of adapting content lessons for LEP students is to lower the language barrier and make the English used in such lessons as comprehensible as possible. In Math, LEP students' capacity to learn can be greatly inhibited by the academic vocabulary and, sometimes, lack of cultural experience living in the United States for short periods of time. Every student deserves an education that culturally relevant and meaningful to his/her present and future lives. Math is the prime location for culturally-relevant pedagogy.</p> <p>Educators provide various grouping strategies such as flexible grouping and/or paired learning</p>	<p>Instructional adaptations for students with disabilities include, but are not limited to, the below approaches. These general suggestions are particularly resonant with students in Math classroom settings.</p> <p>Student Motivation – Expanding student motivation to learn content in math can occur through: activity choice, appeal to diverse learning styles, choice to work with others or alone, hands-on activities, and multimodal activities.</p> <p>Instructional Presentations - The primary purpose of these adaptations is to provide special education students with teacher- initiated and teacher- directed interventions that</p>	<p>Districts are required to administer grade level benchmark and/or interim assessments in Math. After each administration, districts should analyze the data to identify which students are at-risk in this content area. Any of the strategies outlined in the other differentiation/ modification categories may be used to address the needs of these students who are at-risk.</p>

<p>objectives for the student that all parties agree need to be achieved. The contract also specifies:</p> <ul style="list-style-type: none"> - the goals of the contract - the obligations of each party to the contract - the time frame within which the terms of the learning contract are to be fulfilled - the basis on which it will be determined that the conditions of the contract were met <p>Sample Resource</p> <p>http://www.educ.ualberta.ca/staff/olenka.bilash/best%20of%20bilash/learning%20contracts.html</p> <ul style="list-style-type: none"> ● Anchor Activities: Self-directed specified ongoing activities in which students work independently ● Curriculum Compacting: Curriculum Compacting is an instructional technique that is specifically designed to make appropriate curricular adjustments for students in any curricular area and at any grade level. Essentially, the procedure involves (1) defining the goals and outcomes of a particular unit or segment of instruction, (2) determining and documenting which students have already 	<p>being sensitive to the language proficiency level of the LEP students. A student's capacity to become fluent in English will be greatly enhanced by activities in oral and written language that connect one's own life in meaningful and engaging ways.</p> <p>Instructional Supports:</p> <ul style="list-style-type: none"> - Hands-on materials - bilingual dictionaries - visual aids - teacher made adaptations, outlines, study guides - varied leveled texts of the same content <p>Please refer to the following link for instructional supports:</p> <p>http://www.state.nj.us/education/modelcurriculum/math/</p> <p>Preparing students for the lesson:</p> <ol style="list-style-type: none"> 1. Building Background Information through brainstorming, semantic webbing, use of visual aids and other comprehension strategies. 2. Simplifying Language for Presentation by using speech that is appropriate to students' language proficiency level. Avoid jargon and idiomatic speech. 3. Developing Content 	<p>prepare students for learning and engage students in the learning process (Instructional Preparation); structure and organize information to aid comprehension and recall (Instructional Prompts); and foster understanding of new concepts and processes (Instructional Application) e.g. relating to personal experiences, advance organizers, pre-teaching vocabulary and/or strategies; visual demonstrations, illustrations, models.</p> <p>Instructional Monitoring – Math instruction should include opportunities for students to engage in goal setting, work with rubrics and checklists, reward systems, conferences.</p> <p>Classroom Organization - The primary purpose of these classroom organization adaptations is to maximize student attention, participation, independence, mobility, and comfort; to promote peer and adult communication and interaction; and to provide accessibility to information, materials, and equipment.</p> <p>Student Response - The primary purpose of student performance responses is to provide students with disabilities a means of demonstrating</p>	
--	---	--	--

<p>mastered most or all of a specified set of learning outcomes, and (3) providing replacement strategies for material already mastered through the use of instructional options that enable a more challenging and productive use of the student's time.</p> <p>Sample resource:</p> <p>http://gifted.uconn.edu/</p> <ul style="list-style-type: none"> • Flexible grouping <p>Flexible grouping is a range of grouping students together for delivering instruction. This can be as a whole class, a small group, or with a partner. Flexible grouping creates temporary groups that can last an hour, a week, or even a month.</p> <p>Sample resource:</p> <p>http://www.teachhub.com/flexible-grouping-differentiated-instruction-strategy</p> <ul style="list-style-type: none"> • Jigsaw Activities <p>Jigsaw is a strategy that emphasizes cooperative learning by providing students an opportunity to actively help each other build comprehension. Use this technique to assign students to groups composed of varying skill levels. Each group member is responsible for becoming an "expert" on one section of the assigned material and then "teaching" it to the other</p>	<p>Area Vocabulary through the use of word walls and labeling classroom objects. Students encounter new academic vocabulary in Math.</p> <p>4. Concept Development - Students will be learning about math concepts. Enduring Math Framework activities understanding requires thorough and contextualized study of these subjects across grades and courses in Math.</p> <p>5. Giving Directions - Stated clearly and distinctly and delivered in both written and oral forms to ensure that LEP students understand the task. In addition, students should be provided with/or have access to directional words such as: circle, write, draw, cut, underline, etc.</p> <p>Presenting the Lesson:</p> <ul style="list-style-type: none"> - Use multiple strategies and varied instructional tools to increase the opportunities for students to develop meaningful connections between content and the language used in instruction. - Provide students with opportunities to express new knowledge and learning using written, verbal, and non-verbal communication. - Provide students with 	<p>progress toward the lesson objectives related to the Math Framework. Please refer to NJ Math Curriculum Frameworks referenced above.</p>	
---	--	---	--

<p>members of the team.</p> <p>Sample resource:</p> <p>http://www.adlit.org/strategies/2 2371/</p> <ul style="list-style-type: none"> • Depth and Complexity of Curriculum • Graphic Organizers • Extension Menus: Students select from a set of possible assignments (3 to 9 choices is common). Students may be required to select more than one choice. Choices offer differentiated objectives. Choices are often grouped by complexity of thinking skill. Activities are independent so students have freedom as well as responsibility. A variety of options enable students to work in the mode that most interests them. • Advanced Discussion Techniques • Questioning Strategies 	<p>opportunities to participate in numerous Math discussions to increase ELLs competency and confidence in verbal discourse; frame classroom conversations on subjects of interest and cultural relevance.</p> <p>Sample Resources:</p> <p>CanDo Descriptors - https://www.wida.us/standards/CAN_DOs/</p> <p>Colorin Colorado - http://www.colorincolorado.org/teaching-english-language-learners</p> <p>WIDA - https://www.wida.us/</p>		
--	--	--	--