Green Township School District Gr. 8 Math Curriculum - July 2018

<table>
<tr>
<td colspan="3">Unit 7: Irrational Numbers & Geometry
(Approximate Instructional Time: 4 weeks)</td>
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<tr>
<td>NJ Student Learning Standards</td>
<td>Suggested Standards for Mathematical Practice</td>
<td>Critical Knowledge & Skills

(Learning goals are for the Unit but may not necessarily be in sequential order.)</td>
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<tr>
<td>8.NS.A.1. Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually, and convert a decimal expansion which repeats eventually into a rational number.</td>
<td>MP. 2 Reason abstractly and quantitatively.

MP.6 Attend to precision.</td>
<td>Concept(s):
Numbers that are not rational are irrational. •
Every number has a decimal expansion.
Students are able to:
Compare decimal expansions of rational and irrational numbers.
Represent a rational number with its decimal expansion, showing that it repeats eventually.
Convert a decimal expansion (which repeats eventually) into a rational number.
Learning Goal 1: Represent a rational number with its decimal expansion, showing that it eventually repeats, and convert such decimal expansions into rational numbers.</td>
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<tr>
<td>8.NS.A.2. Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., π^2). For example, by truncating the decimal expansion of $\sqrt{2}$, show that $\sqrt{2}$ is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations.</td>
<td>MP.1 Make sense of problems and persevere in solving them.

MP.4 Model with mathematics.

MP.5 Use appropriate tools strategically.</td>
<td>Concept(s): Rational approximation of irrational numbers

Students are able to:
Compare irrational numbers by replacing each with its rational approximation.
Locate rational approximations on a number line.
Estimate the value of expressions containing irrational numbers.
Learning Goal 2: Use rational numbers to approximate irrational numbers, locate irrational numbers on a number line, and estimate the value of expressions containing irrational numbers.</td>
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<tr>
<td>8.G.C.9. Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real world and mathematical problems.</td>
<td>MP.2 Reason abstractly and quantitatively.

MP.4 Model with mathematics.</td>
<td>Concept(s): Volume

Students are able to:
use volume formulas to find a single unknown dimension of cones, cylinders and spheres when solving real world problems.</td>
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	MP.5 Use appropriate tools strategically. MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning	**Learning Goal 3**: Apply the formula for the volume of a cone, a cylinder, or a sphere to find a single unknown dimension when solving real-world and mathematical problems
8.G.B.7. Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.	MP.2 Reason abstractly and quantitatively. MP.5 Use appropriate tools strategically. MP.7 Look for and make use of structure.	Concept(s): *Apply the Pythagorean Theorem to volume problems.* Students are able to: ● Determine side lengths of right triangles by applying the Pythagorean Theorem to solve real world and mathematical problems involving three dimensional spaces. **Learning Goal 4**: Apply the Pythagorean Theorem to determine unknown side lengths of right triangles in three dimensional cases when solving real world and mathematical problems.
Interdisciplinary Connections: **NGSS Appendix for Alignment**	*Science:* *Volume concepts build on earlier grade concepts (Gr 3-5) in NGSS but are not directly cited for Middle School NGSS.* *English-Language Arts:* **RI.8.4**. Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the impact of specific word choices on meaning and tone, including analogies or allusions to other texts. **RI.8.5**. Analyze the structure an author uses to organize a specific paragraph in a text, including the role of particular sentences, to develop and to refine a key concept. **RI.8.6.** Determine an author's point of view or purpose in a text and analyze how the author acknowledges and responds to conflicting evidence or viewpoints. **RI.8.7.** Evaluate the advantages and disadvantages of using different mediums (e.g., print or digital text, video, multimedia) to present a particular topic or idea. **W.8.2.** Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. A. Introduce a topic and organize ideas, concepts, and information, using text structures (e.g., definition, classification, comparison/contrast, cause/effect, etc.) and text features (e.g., headings, graphics, and multimedia). B. Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples. C. Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts. D. Use precise language and domain-specific vocabulary to inform about or explain the topic. E. Establish and maintain a formal style/academic style, approach, and form. F. Provide a concluding statement or section that follows from and supports the information or explanation presented. **W.8.4**. Produce clear and coherent writing in which the development, organization, voice and style are appropriate to task, purpose, and

	audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)
	W.8.5. With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.
	W.8.6. Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas efficiently as well as to interact and collaborate with others.
	W.8.7. Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.
	SL.8.1. Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others' ideas and expressing their own clearly.
	A. Come to discussions prepared, having read or researched material under study; 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 and decision-making, track progress toward specific goals and deadlines, and define individual roles as needed.
	C. Pose questions that connect the ideas of several speakers and respond to others' questions and comments with relevant evidence, observations, and ideas.
	D. Acknowledge new information expressed by others, and, when warranted, qualify or justify their own views in light of the evidence presented.
	SL.8.2. Analyze the purpose of information presented in diverse media and formats (e.g., visually, quantitatively, orally) and evaluate the motives (e.g., social, commercial, political) behind its presentation.
	SL.8.3. Delineate a speaker's argument and specific claims, evaluating the soundness of the reasoning and relevance and sufficiency of the evidence and identifying when irrelevant evidence is introduced.
	SL.8.5. Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest.
21st Century Skills/ Career Ready Practices:	**CRP1. Act as a responsible and contributing citizen and employee.** ● Students will learn to work respectfully in groups within the classroom. **CRP2. Apply appropriate academic and technical skills.** ● Students will use technology to collect and compare data to understand concepts with volumes as applied to real world situations such as in sales and packaging. **CRP4. Communicate clearly and effectively and with reason.** ● In line with the mathematical practices, students will explain and defend their reasoning when working on tasks in class and support this reasoning with evidence either verbally or in writing. **CRP5. Consider the environmental, social and economic impacts of decisions.** ● Through the course of real world applications of volume and its impact on environment, etc. Water bottle project expanded. **CRP6. Demonstrate creativity and innovation.** ● Students are encouraged to look at more than one way to solve a problem. This is evident through tasks that require the mathematical practice: modeling with mathematics. **CRP7. Employ valid and reliable research strategies.** ● Students will have the opportunity when exploring real world applications and resources through the Internet to question the validity of the data presented, and to use the information gathered to make decisions. **CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.**

	● Students will need to make sense of problems and persevere in dealing with rational and irrational numbers and volume related to real world applications. **CRP9. Model integrity, ethical leadership and effective management.** ● Students will learn time management skills when given both short-term and long-term tasks to complete. ● Students will learn leadership skills when working with groups. ● Students model integrity when completing assignments independently. **CRP10. Plan education and career paths aligned to personal goals.** ● In this unit, various real world applications are explored which may lead to a student's interest in a particular career field. **CRP11. Use technology to enhance productivity.** ● Students will use technology (calculator, online resources) to help with volume problems. **CRP12. Work productively in teams while using cultural global competence.** ● When working in groups, students will be encouraged to include all members and to encourage the contribution of all members.
2014 NJ Technology Standards:	**8.1 Educational Technology** (Word | PDF) All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and create and communicate knowledge. ● **8.1.8.A.1:** Students will use technology (calculator, online resources) to help with volume problems. ● **8.1.8.F.1**: Explore a local issue, by using digital tools to collect and analyze data to identify a solution and make an informed decision. (Water bottle project expanded.) **8.2 Technology Education, Engineering, Design and Computational Thinking - Programming** (Word | PDF) All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment. Please see relevant projects for technology standards 8.1 and 8.2:

District/School Primary and Supplementary Resources	
Primary Resource: **Eureka Math (Unbound Ed - Module 7)**	**Supplementary Resources:** *Algebra I* (Glencoe 2018) *Ch. 0 Lesson 0-2 & 0-9* *Larsen Pre-Algebra* (Houghton Mifflin Harcourt 2012) *Ch 10 Lessons 10.4-10.6* *NJ Progress for Grade 8* (William H. Sadlier) *Unit 1: Lessons 1-2; Unit 4: Lessons 35-36* *Understanding Algebra I* (The Critical Thinking Company) Open Up Resources Online Curriculum **Khan Academy**

eMath : Unit 2 from Geometry

Performance Tasks are available for use from the following sites:
Illustrative Mathematics
Coherence Map
Inside Mathematics Problems of the Month
YouCubed Tasks
PARCC Released test items- Grade 8

Materials:	Suggested Workstations & Activities for Use During Unit
❏ *3-D models (truncated cone, pyramid)* ❏ *Scientific Calculator*	**TBD and updated as lesson planning commences**

District/School Formative Assessment Plan	District/School Summative Assessment Plan
● Teacher observation of students engaged in group and independent activities. ● Individual and small group conferences/interviews to assess understanding with rubric ● Self-assessment by students with guidance from teacher. ● Eureka Math Sprints ● Exit tickets	● Teacher created assessments and projects ● *Eureka Math* Mid- and End- Module Assessments (Constructed response item with rubric) ● Teacher/District created Quarterly Assessments

Instructional Best Practices and Exemplars	Mathematical Terms/Vocabulary
● *Facilitate partner and group collaborations* ● *Inquiry based tasks introduced before direct teaching* ● *Small and large group discussions* ● *Have students use a variety of representations or methods to show and explain their understanding.* ● *Build fluency over time.*	● **Decimal Expansion** ● **Finite Decimals** ● **Number Line** ● **Rate of Change** ● **Rational Number** ● **Volume** ● **Cube Root** A cube root of the number ☐ is a number whose cube is ☐. It is denoted by $\sqrt{☐}3$. ● **Decimal Expansion** A whole number (e.g., 3) and an infinite sequence of single-digit

numbers (e.g., 1, 4, 1, 5, 9, 2, …) is called a decimal expansion and is written as a finite decimal together with ellipses to indicate the infinite sequence (i.e., 3.141592…).

- **Decimal Expansion of a Negative Number** A decimal expansion of a negative number is a decimal expansion of the absolute value of the number together with a negative sign in front of the expansion.
- **Decimal System** The decimal system is a positional numeral system for representing real numbers by their decimal expansions. The decimal system extends the whole number place value system and the place value systems to decimal representations with an infinite number of digits.
- **Irrational Number** An irrational number is a real number that cannot be expressed as □/□ for integers □ and □ with □ ≠ 0. An irrational number has a decimal expansion that is neither terminating nor repeating.
- **The □ th Decimal Digit of a Decimal Expansion** The □ th single-digit number in the infinite sequence is called the □ th decimal digit of the decimal expansion. The whole number is called the whole number part of the decimal expansion. For example, the whole number part of 3.141592… is 3, and the 4 th decimal digit is 5.
- **The □ th Finite Decimal of a Decimal Expansion** The □ th finite decimal of a decimal expansion is the number represented by the finite decimal obtained by discarding all the digits in the decimal expansion after the □ th decimal digit. For example, the 2 nd finite decimal of 3.141592… is 3.14.
- **Perfect Square** A perfect square is a number that is the square of an integer.
- **Rational Approximation** A rational approximation of a real number □ is a rational number □ with absolute error less than some specified number. Rational approximations are usually found by taking the □ th finite decimal □ of a decimal expansion of □, which approximates □ with absolute error less than or equal to 1 10□ .
- **Real Number** A real number is a number that can be represented by a point on the number line. Any point on the number line corresponds to a real number. (Recall that a number line is a line equipped with a coordinate system.)
- **A Square Root of a Number** A square root of the number □ is a number whose square is □. In symbols, a square root of □ is a number □ such that □ 2 = □. Negative numbers do not have any square roots, zero has exactly one square root, and positive numbers have two square roots.
- **The Square Root of a Number** Every positive real number □ has a unique positive square root called the square root of the number □ or principle square root of □; it is denoted √□. The square root of zero is zero.

	● **Truncated Cone** Given a cone, a truncated cone is a solid obtained by taking all points of the cone that lie between two planes that are both parallel to its base together with the points of the cone that lie in both planes.

Focus Mathematical Concepts

Grade Level Fluency Requirement:

❖ *Concepts related to linear algebra and linear functions*

Mathematical Practices Applied to this Unit

MP.6 Attend to precision. Students begin attending to precision by recognizing and identifying numbers as rational or irrational. Students know the definition of an irrational number and can represent the number in different ways (e.g., as a root, as a non-repeating decimal block, or as a symbol such as ▢). Students will attend to precision when clarifying the difference between an exact value of an irrational number compared to the decimal approximation of the irrational number. Students use appropriate symbols and definitions when they work through proofs of the Pythagorean theorem and its converse. Students know and apply formulas related to volume of cones and truncated cones.

MP.7 Look for and make use of structure. Students learn that a radicand can be rewritten as a product and that sometimes one or more of the factors of the product can be simplified to a rational number. Students look for structure in repeating decimals, recognize repeating blocks, and know that every fraction is equal to a repeating decimal. Additionally, students learn to see composite solids as made up of simpler solids. Students interpret numerical expressions as representations of volumes of complex figures.

MP.8 Look for and express regularity in repeated reasoning. While using the long division algorithm to convert fractions to decimals, students recognize that when a sequence of remainders repeats, the decimal form of the number will contain a repeat block. Students recognize that when the decimal expansion of a number does not repeat or terminate, the number is irrational and can be represented with a method of rational approximation using a sequence of rational numbers to get closer and closer to the given number.

Prerequisite skills & Foundational Standards

Refer to Achieve the Core Coherence Map for full detail on vertical and horizontal alignment to prerequisite skills & future skills.

Coherence Map

Compute fluently with multi-digit numbers and find common factors and multiples.
6.NS.B.2 Fluently divide multi-digit numbers using the standard algorithm.

Apply and extend previous understandings of numbers to the system of rational numbers.
6.NS.C.6 Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates.
a. Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognize that the opposite of the opposite of a number is the number

itself, e.g., −(−3) = 3 and that 0 is its own opposite.

b. Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes.

c. Find and position integers and other rational numbers on a horizontal and vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane.

Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.

7.NS.A.2 Apply and extend previous understandings of multiplication and division of fractions to multiply and divide rational numbers.

a. Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as (−1)(−1) = 1 and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real world contexts.

b. Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If $\square$ and $\square$ are integers, then $-\square/\square = -\square/\square = \square/(-\square)$. Interpret quotients of rational numbers by describing real-world contexts.

c. Apply properties of operations as strategies to multiply and divide rational numbers.

d. Convert a rational number to a decimal using long division; know that the decimal form of a rational number terminates in 0s or eventually repeats.

Draw, construct, and describe geometrical figures and describe the relationships between them.

7.G.A.2 Draw (freehand, with ruler and protractor, and with technology) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.

Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.

7.G.B.6 Solve real-world and mathematical problems involving area, volume, and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.

Differentiation/Accommodations/Modifications
Gifted and Talented

(content, process, product and learning environment)

Extension Activities
- Conduct research and provide presentation of various topics.
- Design surveys to generate and analyze data to be used in discussion.
- Debate topics of interest / cultural importance.
- Authentic listening and reading sources that provide data and support for speaking and writing prompts.
- Implement RAFT Activities as they pertain to the types / modes of communication (role, audience, format, topic).
- Activities defined as "Gold" require more advanced logic and reasoning skills and will be provided as additional or replacement work on a weekly basis.
- Coordination with the G&T teacher in order to supplement the math curriculum as needed.

Anchor Activities
- Use of Higher Level Questioning Techniques
- Provide assessments at a higher level of thinking

English Language Learners

Modifications for Classroom

- Pair visual prompts with verbal presentations
- Ask students to restate information, directions, and assignments.
- Repetition and practice.
- Model skills/techniques that need to be mastered.
- Extended time to complete class work
- Visual dictionaries to help build vocabulary
- Provide copy of class notes
- Pair with a peer for assistance during class

Modifications for Homework/Assignments

- Modified Assignments
- Native Language Translation (peer, online assistive technology, translation device, bilingual dictionary)
- Extended time for assignment completion as needed
- Highlight key vocabulary
- Use graphic organizers

Students with Disabilities

(**possible appropriate accommodations, instructional adaptations, and/or modifications as determined by the IEP or 504 team**)

Modifications for Classroom
- Pair visual prompts with verbal presentations
- Ask students to restate information, directions, and assignments.
- Repetition and practice
- Model skills / techniques to be mastered.
- Extended time to complete class work
- Provide copy of class notes
- Preferential seating to be mutually determined by the student and teacher
- Establish expectations for correct spelling on assignments.
- Assign a peer helper in the class setting
- Provide oral reminders and check student work during independent work time
- Assist student with long and short term planning of assignments
- Encourage student to proofread assignments and tests and check Google classroom for updates and assignments
- Provide regular parent/ school communication
- Teachers will check/sign student agenda daily

Modifications for Homework and Assignments
- Extended time to complete assignments.
- Student requires more complex assignments to be broken up and explained in smaller units, with work to be submitted in phases.
- Provide the student with clearly stated (written) expectations and grading criteria for assignments.
- Implement RAFT activities as they pertain to the types / modes of communication (role, audience, format, topic).

Modifications for Assessments
- Extended time on classroom tests and quizzes.
- Student may take/complete tests in an alternate setting as needed.
- Restate, reread, and clarify directions/questions
- Distribute study guide for classroom tests.
- Establish procedures for accommodations / modifications for assessments.

Students at Risk of School Failure

Modifications for Classroom
- Pair visual prompts with verbal presentations
- Ask students to restate information, directions, and assignments.
- Repetition and practice
- Model skills / techniques to be mastered.
- Extended time to complete class work
- Provide copy of classnotes

- Preferential seating to be mutually determined by the student and teacher
- Assign a peer helper in the class setting
- Provide oral reminders and check student work during independent work time
- Assist student with long and short term planning of assignments
- Encourage student to proofread assignments and tests
- Provide regular parent/ school communication
- Teachers will check/sign student agenda daily

Modifications for Homework and Assignments
- Extended time to complete assignments.
- Student requires more complex assignments to be broken up and explained in smaller units, with work to be submitted in phases.
- Provide the student with clearly stated (written) expectations and grading criteria for assignments.
- Implement RAFT activities as they pertain to the types / modes of communication (role, audience, format, topic).

Modifications for Assessments
- Extended time on classroom tests and quizzes.
- Student may take/complete tests in an alternate setting as needed.
- Restate, reread, and clarify directions/questions
- Distribute study guide for classroom tests.
- Establish procedures for accommodations / modifications for assessments.