Englewood Public School District
Mathematics
Grade 8
First Marking Period

Unit – Irrational Numbers, Exponents and Scientific Notation

Overview: During this unit, students will learn about irrational numbers, exponents, scientific notation, and algebraic linear equations.

Time Frame: Chapter 1 (& Online CC Additional Resources) – 20 days, Chapter 2 – 10 days, Chapter 3 – 10 days

Enduring Understandings:
You can use exponential notation to represent repeated multiplication of the same factor.
Scientific notation is a way of writing numbers that makes it easier to work with very large or very small numbers.
Linear equations can be used to solve mathematical and real-world problems.
A linear equation with one variable can have one solution, no solution or infinitely many solutions.

Essential Questions:
In what ways can rational numbers be represented and how can they be used?
How are the properties of integer exponents used to generate equivalent numerical expressions?
How are the properties of integer exponents used to generate equivalent numerical expressions?
How are very large and very small numbers expressed?
How can scientific and decimal notation be used to solve problems involving very small and/or very large numbers?

Standards	Topics and Objectives	Activities	Resources	Assessments
Chapter 1				
Note: It is recommended that additional lessons be taught for the following standards. The lessons are listed in the Resources column and are located in the Online Common Core Additional Resources. These lessons should be taught before 1.1.	**Topics** Irrational numbers, exponential notation, the product and the quotient of powers, the power of a power, the power of a product and the power of a quotient, zero and negative exponents. Twenty-First Century Themes	8.NS.A.1 Converting Decimal Representations of Rational Numbers to Fraction Representations 8.NS.A.2 Irrational Numbers on the Number Line 8.EE.A.1 Extending the Definitions of Exponents	**SE-8A:** 1-57 ***Online Common Core Additional Resources for Course 3:*** 1.3 Introducing Irrational Numbers ***Online Common Core Additional Resources for Course 3:***	**Unit 1 Benchmark Assessments:** Common Formative Assessment Exact Path **Summative Assessments:** **Math in Focus Assessments**

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.**

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., $\pi 2$). *For example, by truncating the decimal expansion of $\sqrt{2}$, show that $\sqrt{2}$ is between 1and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations.***

8.EE.A.1. **Know and apply the properties of integer exponents to generate equivalent numerical expressions. *For example, $3^2 \times 3^{-5} = 3^{-3} = 1/3^3 = 1/27$.***

8.EE.A.2. **Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots**

and Skills include:

- Creativity and Innovation
- Critical Thinking and Problem Solving
- Communication and Collaboration

Objectives

The students will be able to:

- Understand irrational numbers and how they fill the number line.
- Use rational numbers to locate irrational numbers approximately on the number line.
- Show that irrational numbers are characterized by a non-terminating and non repeating decimal representation.
- Introduce the real number system and the real number line.
- Understand and use exponential notation.
- Use exponents to write the prime factorization of a number.
- Understand the product of understand the power of a product property.
- understand the power of a quotient property.
- use property of exponents to simplify expressions.
- understand zero and negative exponents
- simplify expressions involving zero and negative

Math Playground
http://www.mathplayground.com/

Math Fact Practice
http://www.playkidsgames.com/games/mathfact/mathFact.htm

Grades 6-8 Math Fluency Support
https://www.engageny.org/resource/mathematics-fluency-support-grades-6-8

Brain Genie
http://braingenie.ck12.org/

Math Game Time
http://www.mathgametime.com/

Everything you need to know about math journals:
https://thecornerstoneforteachers.com/math-journals/
(NJSLSA.R1, NJSLSA.W2, NJSLSA.L1)

Exponent math game:
http://www.math-play.com/exponents-pirate-game/exponents-pirate-game_html5.html
(8.1.8.A.1)

Operating with exponents:
http://www.cpalms.org/Public/PreviewResourceLesson/P

1.4 Introducing the Real Number System

My HRW - Online access to all Math in Focus materials listed above and Virtual Manipulatives

Technology Resources

- Math in Focus eBooks
- Math in Focus Teacher Resources CD
- Interactive Whiteboard lessons
- Virtual Manipulatives
- Online Professional Development Videos

North Carolina Dept of Ed. Wikispaces:
http://maccss.ncdpi.wikispaces.net/Middle+School

Math Goodies – Math Lessons
http://www.mathgoodies.com/

Standards Solution Lessons:

- **PARCC Lesson 15:** Practice Type I items – The Number System domain
- **PARCC Lesson 7:** Type I Selected Response-Sort by Category
- **PARCC Lesson 8:** Type I Selected Response – Multiple Answers
- **CCSS Lesson Plan:** Finding Value in Irrational Numbers

Online Common Core Additional Resources for Course 3:
Chapter 1 The Real Number System, Review/Test: Items: 11–24

Online Common Core Additional Resources for Course 3:
Assessments
Chapter 1
Test A, Items: 11–12, 14–15;
Test B, Items: 12–14

SE/TE: pp. 55, 56–57

Assessments Course 3: Chapter 1
Test A pp. 2–5;
Test B pp. 6–9

ExamView Assessment Suite – Test and Practice Generator

Formative Assessments:
Math journal (NJSLSA.R1, NJSLSA.W2, NJSLSA.L1)

Multiple choice / short answer assessments (CRP8)

Mini quizzes – assess just one topic, or what was done within 1 or 2 days

of small perfect cubes. Know that √2 is irrational. *Mathematical Practices* MP.2, MP.3, MP.4, MP.5, MP.6, MP.7, MP.8	exponents. powers property. • Understand the quotient of powers property. • Multiply and divide expressions in exponential notation. • Understand raising a power to a power. • Use properties of exponents to simplify expressions.	review/51107 (CRP2) **Number properties math game:** https://www.mathgames.com/grade8 (8.1.8.A.1) **Additional texts:** www.newsela.com www.readworks.org www.commonlit.org	• **CCSS Lesson Plan:** Numbers Outside the Box: Rational and Irrational Numbers • **CCSS Lesson Plan:** Square and Cube Roots • **CCSS Prescriptive Lesson Plan:** Number Line Location of Irrational Numbers • **CCSS Prescriptive:** Number Line Location • **CCSS Prescriptive Lesson Plan:** Simplifying Expressions with Exponents • **CCSS Prescriptive Lesson Plan:** Squared and Cubed Solutions **Worksheets for every topic:** http://kutasoftware.com/freeipa.html (CRP2, CRP4, CRP8) **8th grade assessments, interactive, videos, games, lessons, homework:** https://www.opened.com/search?area=mathematics&grade=8&offset=0&resource_type=interactive-assessment (CRP2, CRP4, CRP8, 8.1.8.A.1) **8th grade common core worksheets:** https://www.ixl.com/math/grade-8 (CRP2, CRP4, CRP8)	(CRP8) **Alternative Assessments:** Learning centers: each learning center focuses on a different type of problem (CRP8, 9.2.8.B.3) Create posters illustrating the main objectives of the unit (RH.6-8.7) Create a dictionary defining and illustrating vocabulary terms (RH.6-8.7)

			Khan Academy – videos, lessons, assessments **www.khanacademy.org** (8.1.8.A.1)	

Chapter 2

8.EE.A.3. **Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other.** ***For example, estimate the population of the United States as*** 3×10^{8} ***and the population of the world as*** 7×10^{9} ***and determine that the world population is more than 20 times larger.*** 8.EE.A.4. **Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology.**	**Topics** Scientific notation and adding, subtracting, multiplication and division in scientific notation. Twenty-First Century Themes and Skills include: • Creativity and Innovation • Critical Thinking and Problem Solving • Communication and Collaboration **Objectives** • Understand the need for scientific notation. • Write numbers in scientific notation or in standard form. • Compare numbers in scientific notation. • Add and subtract numbers in scientific notation. • Introduce the prefix system. • Multiply and divide numbers in scientific notation. • Solve real-world problems	8.EE.A.3 Ant and Elephant 8.EE.A.4 Giantburgers **Math Playground** http://www.mathplayground.com/ **Math Fact Practice** **http://www.playkidsgames.com/games/mathfact/mathFact.htm** **Grades 6-8 Math Fluency Support** https://www.engageny.org/resource/mathematics-fluency-support-grades-6-8 **Brain Genie** http://braingenie.ck12.org/ **Math Game Time** http://www.mathgametime.com/ **Everything you need to know about math journals:** https://thecornerstoneforte	**SE-8A:** 58-91 **My HRW** - Online access to all Math in Focus materials listed above and Virtual Manipulatives **Technology Resources** • Math in Focus eBooks • Math in Focus Teacher Resources CD • Interactive Whiteboard lessons • Virtual Manipulatives • Online Professional Development Videos **North Carolina Dept of Ed. Wikispaces:** **http://maccss.ncdpi.wikispaces.net/Middle+School** **Math Goodies – Math Lessons** **http://www.mathgoodies.com/** **Standards Solution Lessons:** • **PARCC Lesson 11:** PBA – Pre-assessment • **PARCC Lesson 15:**	**Summative Assessments:** **Math in Focus Assessments** **SE/TE**: pp. 87, 88–89, 90–91 **Assessments Course 3: Chapter 2** Test A pp. 11–14; Test B pp. 15–18 **Assessments Course 3: Benchmark Test A** pp. 19–25; **Benchmark Test B** pp. 26–32 ExamView Assessment Suite – Test and Practice Generator **Formative Assessments:** Math journal (NJSLSA.R1, NJSLSA.W2, NJSLSA.L1) Multiple choice / short answer assessments (CRP8)

Mathematical Practices MP.1, MP.2, MP.3, MP.4, MP.5, MP.6, MP.7, MP.8	involving the calculation of numbers in different forms. • Use calculations to operate with numbers written in scientific notation. • Reinforce, consolidate, and extend chapter skills and concepts.	achers.com/math-journals/ (NJSLSA.R1, NJSLSA.W2, NJSLSA.L1) **5 awesome scientific notation activities:** http://mashupmath.com/blog/2017/10/17/5-awesome-8th-grade-scientific-notation-activities (8.1.8.A.1) **10 activities to make practicing scientific notation awesome:** https://ideagalaxyteacher.com/10-scientific-notation-activities/ (8.1.8.A.1) **Additional texts:** www.newsela.com www.readworks.org www.commonlit.org	Performance Based Assessment – 8.EE.1, 3 & 4 • **CCSS Lesson Plan:** Estimating Very Large and Very Small Numbers • **CCSS Lesson Plan:** Making Sense of Scientific Notation • **CCSS Prescriptive Lesson Plan:** Using Observations of Scientific Notation **Worksheets for every topic:** http://kutasoftware.com/freeipa.html (CRP2, CRP4, CRP8) **8th grade assessments, interactive, videos, games, lessons, homework:** https://www.opened.com/search?area=mathematics&grade=8&offset=0&resource_type=interactive-assessment (CRP2, CRP4, CRP8, 8.1.8.A.1) **8th grade common core worksheets:** https://www.ixl.com/math/grade-8 (CRP2, CRP4, CRP8) **Khan Academy – videos, lessons, assessments www.khanacademy.org** (8.1.8.A.1)	Mini quizzes – assess just one topic, or what was done within 1 or 2 days (CRP8) **Alternative Assessments:** Learning centers: each learning center focuses on a different type of problem (CRP8) (9.2.8.B.3) Create posters illustrating the main objectives of the unit (RH.6-8.7) Create a dictionary defining and illustrating vocabulary terms (RH.6-8.7)

Chapter 3

8.EE.B.5. **Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways.** ***For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.***

8.EE.C.7. **Solve linear equations in one variable.**

a. Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form *x = a, a = a,* or *a = b* results (where *a* and *b* are different numbers).
b. Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.

Mathematical Practices
MP.1, MP.2, MP.3, MP.4
MP.5, MP.6, MP.7, MP.8

Topics

Solving linear equations with one variable, identifying the number of solutions to a linear equation, and linear equations with two variables.

Twenty-First Century Themes and Skills include:

- Creativity and Innovation
- Critical Thinking and Problem Solving
- Communication and Collaboration

Objectives

The students will be able to:

- Solve linear equations with one variable.
- Solve real-world problems involving linear equations with one variable.
- Understand and identify linear equations with no solution.
- Understand and identify linear equations with infinitely many solutions.
- Represent a relationship between two variables using a linear equation.
- Represent a linear relationship using a table of values.
- Solve for a variable in a two-variable linear equation.
- Reinforce, consolidate, and

8.EE.B.5 Who Has the Best Job?

8.EE.C.7 The Sign of Solutions

8.EE.C.7 Coupon versus discount

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SE-8A: 92-127

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Math Goodies – Math Lessons
http://www.mathgoodies.com/

Standards Solution Lessons:
CCSS Prescriptive Lesson Plan: Interpreting Representations of Proportional Relationships

Worksheets for every topic:
http://kutasoftware.com/freeipa.html
(CRP2, CRP4, CRP8)

8th grade assessments,

Summative Assessments:

Math in Focus Assessments

SE/TE: pp. 125, 126–127

Assessments Course 3: Chapter 3
Test A pp. 35–39;
Test B pp. 40–44

ExamView Assessment Suite – Test and Practice Generator

Formative Assessments:
Math journal (NJSLSA.R1, NJSLSA.W2, NJSLSA.L1)

Multiple choice / short answer assessments (CRP8)

Mini quizzes – assess just one topic, or what was done within 1 or 2 days (CRP8)

Alternative Assessments:
Learning centers: each learning center focuses on a different type of problem
(CRP8) (9.2.8.B.3)

	extend chapter skills and concepts.	**Solving equations with partner's card activity:** https://betterlesson.com/lesson/443157/solving-equations-with-partner-s-card-activity (8.1.8.A.1) **Additional texts:** www.newsela.com www.readworks.org www.commonlit.org	**interactive, videos, games, lessons, homework:** https://www.opened.com/search?area=mathematics&grade=8&offset=0&resource_type=interactive-assessment (CRP2, CRP4, CRP8, 8.1.8.A.1) **8th grade common core worksheets:** https://www.ixl.com/math/grade-8 (CRP2, CRP4, CRP8) **Khan Academy – videos, lessons, assessments www.khanacademy.org** (8.1.8.A.1)	Create posters illustrating the main objectives of the unit (RH.6-8.7) Create a dictionary defining and illustrating vocabulary terms (RH.6-8.7) Create a road trip project: https://www.coast2coast.me/carl/2015/01/28/the-road-trip-project-made-to-support-a-linear-equations-unit/ (8.1.8.A.1, RH.6-8.7)

Key Vocabulary:
Chapter 1:
exponential notation, power, base, exponent, prime factorization

Chapter 2:
scientific notation, coefficient, standard form

Chapter 3:
Inconsistent equation, consistent, equation, identity

NJ Learning Standards Vocabulary:
8.NS.A.1 & 2
Know that there are numbers that are not rational, and approximate them by rational numbers.
Real Numbers, Irrational numbers, Rational numbers, Integers, Whole numbers, Natural numbers, radical, radicand, square roots, perfect squares, cube roots, terminating decimals, repeating decimals, truncate

8.EE.A.1, 2, 3 & 4

Work with radicals and integer exponents.
laws of exponents, power, scientific notation, standard form of number

8.EE.B.5
Understand the connections between
proportional relationships, lines, and linear equations.
unit rate, proportional relationships, slope, vertical, horizontal, similar triangles, *y*-intercept

8.EE.C.7
Analyze and solve linear equations and pairs of simultaneous linear equations.
intersecting, parallel lines, coefficient, distributive property, like terms

Accommodations and Modifications:

Students with special needs: Support staff will be available to aid students related to IEP specifications. 504 accommodations will also be attended to by all instructional leaders. Modifications, alternative assessments, and scaffolding strategies will be used to support this learning. The use of Universal Design for Learning (UDL) will be considered for all students as teaching strategies are considered. Additional staff should be included so all students can fully participate in the standards associated with this curriculum.

ELL/ESL students: Students will be supported according to the recommendations for "can do's" as outlined by WIDA - https://www.wida.us/standards/CAN_DOs/

Students at risk of school failure: Formative and summative data will be used to monitor student success at first signs of failure. Student work will be reviewed to determine support. This may include parent consultation, basic skills review and differentiation strategies. With considerations to UDL, time may be a factor in overcoming developmental considerations. More time will be made available with a certified instructor to aid students in reaching the standards.

Gifted and Talented Students: Students excelling in mastery of standards will be challenged with complex, high level challenges**.**

English Language Learners:	**Special Education:**	**At-Risk:**	**Gifted and Talented:**
• Provide text in native language • Teaching modeling • Peer modeling • Word walls • Give directions in small steps and in as few words as possible	• Provide extra time to complete a task when needed • Utilize modifications & accommodations delineated in the students' IEP • Work with paraprofessional • Work with a partner	• Increased one – on – one and small group time • Use visual demonstrations, illustrations and models • Give directions / instructions verbally and in simple written format • Peer support	• Act as peer support as needed • Inquiry based instruction • Independent study • Higher order thinking skills • Adjusting the pace of the lessons

• Provide visual aids • Group similar problems together • Repeat directions when necessary • Provide a vocabulary list with definitions • Use of alge-tiles when needed • Use of number line when needed	• Shorten assignments to focus on mastery or key concepts • Maintain adequate space between desks • Keep workspaces clear of unrelated materials • Provide fewer problems to attain passing grades • Tape a number line to the student's desk • Create a math journal that they can use during class, on assignments and (if teacher allows) on assessments • Provide definitions of different graphs / charts with illustrations • Allow tests to be taken in a separate room • Allow students to use a calculator when appropriate • Divide test into small sections of similar questions or problems • Use of alge-tiles when needed • Use of number line when needed	• Teachers may modify instructions by modeling what the student is expected to do • Instructions may be printed out in large print and hung up for the students to see during the time of the lesson • Review behavior expectations and make adjustments • Create a math journal that they can use during class, on assignments and (if teacher allows) on assessments • Allow students to complete an independent project as an alternative test • Use of alge-tiles when needed • Use of number line when needed	• Real world scenarios • Student driven instruction • Allow students to complete an independent project as an alternative test

Interdisciplinary Connections: ELA

NJSLSA.R1. Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
NJSLSA.W2. Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content

W.8.1: Write arguments to support claims with clear reasons and relevant evidence.
W.8.10: Write routinely over extended time frames (time for research, reflection, metacognition/self correction, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.
NJSLSA.L1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking

Integration of Technology Standards NJSLS:

8.1.8.A.1: Demonstrate knowledge of a real world problem using digital tools.

21st Century Standards

9.2.8.B.3: Evaluate communication, collaboration and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career.

Career Ready Practices:

CRP2: Apply appropriate academic and technical skills.
CRP4: Communicate clearly and effectively and with reason.
CRP6: Demonstrate creativity and innovation.
CRP8: Utilize critical thinking to make sense of problems and persevere in solving them.
CRP11: Use technology to enhance productivity.

History / Social Studies:

RH.6-8.7 Integrate visual information (e.g., in charts, graphs, photographs, videos or maps) with other information in print and digital texts

Major Supporting Additional (Identified by PARCC Model Content Frameworks)