

Englewood Public School District
Algebra 1
Fourth Marking Period

Unit 4: Radical and Rational Expressions and Equations and Data Analysis

Overview: During this unit, students will investigate radical and rational expressions and work with Data Analysis and Probability.

Time Frame: 43 to 47 Days

Enduring Understandings:

- *Radical and rational expressions can be represented in different ways.*
- *To simplify a square root factor out a perfect square from the radicand.*
- *Square root functions contain a variable in the radicand. The parent square root function is $y = \sqrt{x}$.*
- *To isolate the variable in a radical equation first isolate the radical, then square both sides.*
- *When a rational expression is simplified, the numerator and denominator have no common factors other than 1.*
- *Rational functions have equations of the form $f(x) = \text{polynomial} \div \text{polynomial}$. The graph of a rational function may have vertical and horizontal asymptotes.*
- *To isolate the variable in a rational equation, multiply by the LCD and then solve the resulting equation. Check for extraneous solutions.*
- *When collecting data, a sampling technique should be used that is free of bias.*
- *Standard measures can be used to describe data sets, make estimates, decisions, or predictions.*
- *Matrices, frequency tables, histograms, box and whisker plots, tree diagrams and other representations can be used to describe data sets.*
- *Theoretical and experimental probabilities can be used to make decisions or predictions about future events.*

Essential Questions:

- *How are radical expressions represented?*
- *What are the characteristics of square root functions?*
- *How can you solve a radical equation?*
- *How are rational expressions represented?*
- *What are the characteristics of rational expressions?*
- *How can you solve a rational equation?*
- *How can collecting and organizing data help you make decisions or predictions?*
- *How can you make and interpret different representations of data?*
- *How is probability related to real world events?*

Standards	Topics and Objectives	Activities	Resources	Assessments
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<p>MP1, MP2, MP3, MP6, MP7</p> <p>N-Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.</p> <p>N-Q.A.2 Define appropriate quantities for the purpose of descriptive modeling.</p> <p>A-CED.A.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.</p> <p>A-REI.A.2 Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.</p> <p>A-APR.D.6 Rewrite simple rational expressions in different forms; write $\frac{a(x)}{b(x)}$ in the form $q(x) + \frac{r(x)}{b(x)}$, where $a(x)$, $b(x)$, $q(x)$, and $r(x)$ are polynomials with the degree of $r(x)$ less than the degree of $b(x)$, using inspection, long division, or, for the more complicated examples, a computer</p>	<p>Topics</p> <p>Radical and rational expressions, and data analysis</p> <p>Twenty-First Century Themes and Skills include:</p> <ul style="list-style-type: none"> The Four C's Global awareness Financial, economic, business and entrepreneurial literacy <p>Objectives</p> <p>Students will</p> <ul style="list-style-type: none"> Add, subtract, multiply, and divide radical expressions including rationalizing the denominator Draw graphs to investigate square root functions Estimate values of square roots Use inverse operations to solve square root equations Simplify and graph rational expressions Add, subtract, multiply, and divide rational expressions Investigate inverse functions Use inverse operations to 	<p>Standards Solution Statistics and Probability Lessons:</p> <ul style="list-style-type: none"> Recognizing Distributions Repairing Distributions Comparing Data <p>Basketball https://www.illustrativemathematics.org/content-standards/HSA/REI/A/2/tasks/702</p> <p>An Extraneous Solution https://www.illustrativemathematics.org/content-standards/HSA/REI/A/2/tasks/1927</p> <p>Canoe Trip https://www.illustrativemathematics.org/content-standards/HSA/REI/A/2/tasks/1926</p> <p>Radical Equations https://www.illustrativemathematics.org/content-standards/HSA/REI/A/2/tasks/391</p> <p>Who Wins the Race? https://www.illustrativemathematics.org/content-standards/HSA/REI/A/2/tasks/391</p>	<p>Pearson Realize chapters 10, 11, and 12</p> <p>Standards Solution Common Core Lessons</p> <p>Illustrative Mathematics https://www.illustrativemathematics.org/</p> <p>National Library of Virtual Manipulatives http://nlvm.usu.edu/</p> <p>Alabama Learning Exchange http://alex.state.al.us/search.php?fa_submit=ALLPLANS</p> <p>Arizona Math Flipbook http://www.azed.gov/azcom/moncore/files/2012/11/high-school-ccss-flip-book-usd-259-2012.pdf</p> <p>NYC Department of Education http://schools.nyc.gov/default.htm</p> <p>Mathematics Assessment Project http://map.mathshell.org/</p> <p>Texas Instruments https://education.ti.com/en/us/home</p> <p>Desmos</p>	<p>Formative Assessments:</p> <p>Textbook Pages 575, 607–608, 632, 657–658, 690, 719–720</p> <p>Math journal (NJSLSA.R1, NJSLSA.W2, NJSLSA.L1, SL.9-10.4, NJSLSA.L6, 9.2.12.C.1, 9.2.12.C.2)</p> <p>Summative Assessments:</p> <p>Multiple choice / short answer assessments (CRP2, CRP4, CRP8)</p> <p>Chapter quizzes/tests</p> <ul style="list-style-type: none"> Pearson Realize MathXL <p>Grade 9 Algebra I Common Core Assessment IV, Standards Solution</p> <p>Benchmark Assessment:</p> <p>End of Year Assessment</p> <p>Alternate Assessments:</p> <p>Learning centers: each learning center focuses on a different type of problem (9.3.ST.2, 9.3.ST-ET.5)</p>
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algebra system.

A-APR.D.7 Understand that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expression; add, subtract, multiply, and divide rational expressions.

F-IF.A.2 Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.

F-IF.B.4 For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship.

F-IF.B.5 Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.

F-IF.C.7b Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.

G-SRT.C.6 Understand that by similarity, side ratios in

- solve a rational equation
- Understand the concept of an extraneous solution
- Find the measures of central tendency
- Examine samples and conduct surveys
- Make predictions based upon data they collect and observe
- Organize data in displays
- Compare theoretical and experimental probabilities
- Find probabilities of simple and compound events

[sks/1915](https://www.illustrativemathematics.org/content-standards/HSS/ID/A/tasks/sks/1915)

Accuracy of Carbon Dating

<https://www.illustrativemathematics.org/content-standards/HSS/ID/A/tasks/782>

Haircut Costs

<https://www.illustrativemathematics.org/content-standards/HSS/ID/A/2/tasks/942>

Speed Trap

<https://www.illustrativemathematics.org/content-standards/HSS/ID/A/2/tasks/1027>

Musical Preferences

<https://www.illustrativemathematics.org/content-standards/HSS/ID/B/5/tasks/123>

Support for a Longer School Day

<https://www.illustrativemathematics.org/content-standards/HSS/ID/B/5/tasks/2044>

Cards and Independence

<https://www.illustrativemathematics.org/content-standards/HSS/CP/A/2/tasks/sks/1915>

<https://teacher.desmos.com/>

Worksheets for every topic:
<http://kutasoftware.com/free.html>

(CRP2, CRP4, CRP8, 9.3.ST.2, 9.3.ST-ET.5)

Algebra assessments, interactive, videos, games, lessons, homework:
https://www.opened.com/search?area=mathematics&grade=9&offset=0&resource_type=interactive-assessment
(CRP2, CRP4, CRP8, 9.3.ST.2, 9.3.ST-ET.5, 8.1.12.A.3)

Algebra common core worksheets:
<https://www.ixl.com/math/algebra-1>
(CRP2, CRP4, CRP8, 9.3.ST.2, 9.3.ST-ET.5)

Khan Academy – videos, lessons, assessments
www.khanacademy.org
(CRP2, CRP4, CRP8, CRP11, 9.3.ST.2, 9.3.ST-ET.5, 8.1.12.A.3)

Worksheets / assessment items for all topics based on standards:
http://jmap.org/JMAP_RESOURCES_BY_TOPIC.htm#

Create posters illustrating the main objectives of the unit (CRP6)

right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles. G-SRT.C.8 Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.

S-ID.A.1 Represent data with plots on the real number line (dot plots, histograms, and box plots).

S-ID.A.2 Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.

S-ID.A.3 Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).

S-ID.A.4 Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets,

[ks/943](#)

The Titanic 2

<https://www.illustrativemathematics.org/content-standards/HSS/CP/A/2/tasks/950>

Rain and Lightning

<https://www.illustrativemathematics.org/content-standards/HSS/CP/A/2/tasks/1112>

Box Plot

<https://www.illustrativemathematics.org/content-standards/HSS/CP/A/2/tasks/1112>

Coin Tossing

http://nlvm.usu.edu/en/nav/frames_asid_305_g_4_t_5.html?from=category_g_4_t_5.html

Hamlet Happens

http://nlvm.usu.edu/en/nav/frames_asid_310_g_4_t_5.html?from=category_g_4_t_5.html

Spinners

http://nlvm.usu.edu/en/nav/frames_asid_186_g_4_t_5.html?open=activities&from=category_g_4_t_5.html

[AI](#)

(CRP2, CRP4, CRP8, 9.3.ST.2, 9.3.ST-ET.5)

and tables to estimate areas under the normal curve.

S-ID.B.5 Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.

S-IC.B.5 Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.

S-CP.A.1 Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not").

S-CP.A.2 Understand that two events A and B are independent if the probability of A and B occurring together is the product of their probabilities, and use this characterization to determine if they are independent.

S-CP.A.3 Understand the

Dartboard Probability
http://alex.state.al.us/lesson_view.php?id=26387

Dice Roll Project
http://alex.state.al.us/lesson_view.php?id=14515

Representing Data with Box Plots
<http://map.mathshell.org/lessons.php?unit=9420&collection=8>

Representing Trigonometric Functions
<http://map.mathshell.org/lessons.php?unit=9255&collection=8>

Trigonometric Ratios
<https://education.ti.com/en/us/activity/detail?id=B4816CC00264432DB10DE63BEA361239&ref=/en/us/activity/search/advanced>

Perms and Combs
<https://education.ti.com/en/us/activity/detail?id=20FFE01257E74EC7BCC53DDB8289BE4E&ref=/en/us/activity/search/advanced>

Everything you need to know about math journals:

conditional probability of A given B as $P(A \text{ and } B)/P(B)$, and interpret independence of A and B as saying that the conditional probability of A given B is the same as the probability of A , and the conditional probability of B given A is the same as the probability of B .

S-CP.A.4 Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities.

S-CP.A.5 Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations.

S-CP.B.7 Apply the Addition Rule, $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$, and interpret the answer in terms of the model.

S-CP.B.8 Apply the general Multiplication Rule in a uniform probability model, $P(A \text{ and } B) = P(A)P(B|A) = P(B)P(A|B)$, and interpret the answer in terms of the

<https://thecornerstoneforteachers.com/math-journals/>
(NJSLSA.R1,
NJSLSA.W2,
NJSLSA.L1, SL.9-10.4,
NJSLSA.L6)

Additional texts:

www.newsela.com
www.readworks.org
www.commonlit.org

Key Vocabulary:

Conditional, conjugates, extraneous solution, hypotenuse, like radicals, Pythagorean Theorem, radical expression, square root function, trigonometric ratios, asymptote, constant of variation for an inverse variation, excluded value, inverse variation, rational equation, rational expression, rational function, combination, event, matrix, measure of central tendency, outcome, outlier, permutation, probability, quartile, sample space

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:

- Teaching modeling
- Peer modeling
- Word walls
- Give directions in small steps and in as few words as possible
- Provide visual aids
- Group similar problems together
- Repeat directions when necessary

Special Education:

- Utilize modifications & accommodations delineated in the students’ IEP
- Work with paraprofessional
- Work with a partner
- Shorten assignments to focus on mastery or key concepts
- Maintain adequate space between desks
- Keep workspaces clear of

At-Risk:

- Use visual demonstrations, illustrations and models
- Give directions / instructions verbally and in simple written format
- Peer support
- Increased one – on – one time
- Teachers may modify instructions by modeling what the student is expected

Gifted and Talented:

- Inquiry based instruction
- Independent study
- Higher order thinking skills
- Adjusting the pace of the lessons
- Real world scenarios
- Student driven instruction
- Allow students to complete an independent project as an alternative

<ul style="list-style-type: none"> • Provide a vocabulary list with definitions • Use of alge-tiles when needed • Use of number line when needed 	<ul style="list-style-type: none"> unrelated materials • Provide fewer problems to attain passing grades • Tape a number line to the students desk • Create a math journal that they can use during class, on assignments and (if teacher allows) on assessments • Provide extra time to complete a task when needed • 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 	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> test
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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

NJSLSA.L1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking

SL.9-10.4: Present information, findings and supporting evidence clearly, concisely and logically. The content, organization, development and style are appropriate to task, purpose and audience.

NJSLSA.L6: Acquire and use accurately a range of general academic and domain-specific words and phrases sufficient for reading, writing,

speaking and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when encountering an unknown term important to comprehension or expression.

21st Century Standards

9.2.12.C.1: Review career goals and determine steps necessary for attainment.

9.2.12.C.2: Modify Personalized Student Learning Plans to support declared career goals.

9.3.ST.2: Use technology to acquire, manipulate, analyze and report data.

9.3.ST-ET.5: Apply the knowledge learned in STEM to solve problems.

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

Technology Standards:

8.1.12.A.3: Collaborate in online courses, learning communities, social networks or virtual worlds to discuss a resolution to a problem or issue.

Major **Supporting** **Additional** (Identified by PARCC Model Content Frameworks)