Englewood Public School District
Algebra II
Third Marking Period

Unit 3: Sequences and Series, Conics, and Probability

Overview: During this unit, students will study sequences and series, equations and graphs of the conic sections, and probability and statistics.

Time Frame: 43 to 47 Days

Enduring Understandings:
- *A sequence can be defined by describing its nth term or by stating its first term and a formula that related the $n – 1$ and nth terms.*
- *A geometric sequence can be modeled explicitly or recursively.*
- *There are different types of conic sections each defined by its own set of properties.*
- *Both the ellipse and hyperbolas shape is determined by its distance from its foci.*
- *The intersection of a cone and a plane parallel to the side of the cone is a parabola.*
- *A combination is a collection. A permutation is an ordered collection.*
- *Experimental probability is based on the results of an experiment. Theoretical probability is the mathematical chance it will happen.*
- *Standard deviation describes how data is spread out from a particular middle value.*

Essential Questions:
- *How can you represent the terms of a sequence explicitly and recursively?*
- *What are equivalent explicit and recursive definitions for an arithmetic sequence?*
- *How can you model a geometric sequence and sum?*
- *What is the intersection of a cone and a plane parallel to a line along the side of a cone?*
- *What does the algebraic representation of a circle look like?*
- *What is the difference between the algebraic representation of ellipses and hyperbolas?*
- *What is the difference between a permutation and a combination?*
- *What is the difference between experimental and theoretical probability?*
- *How are measures of central tendency different from standard deviation?*

Standards	Topics and Objectives	Activities	Resources	Assessments
MP1, MP2, MP3, MP4, MP5, MP6, MP7, MP8	**Topics**	Standards Solution Common Core Function Lessons:	Pearson Realize Chapters 9, 10, and 11	**Formative Assessments:** Textbook Pages 579, 607, 608, 637, 667, 668, 710, 751, 757
A-SSE.B.4 **Derive and/or**	Arithmetic sequences and series, geometric sequences and	• Arithmetic and Geometric Series	Standards Solution Common	

explain the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems
F-IF.A.3 Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers
F-IF.C.8 Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function
G-GPE.A.1 Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation
G-GPE.A.2 Derive the equation of a parabola given a focus and directrix
G-GPE.A.3 Derive the equations of ellipses and hyperbolas given the foci, using the fact that the sum or difference of distances from the foci is constant
S-IC.A.1 Understand statistics as a process for making inferences about population parameters based on a random sample from that population
S-IC.A.2 Decide if a specified model is consistent with results from a given data---generating process, e.g., using simulation
S-IC.B.3 Recognize the

series, parabolas, circles, ellipses, hyperbolas, permutations, combinations, probability of multiple events, standard deviation, samples and surveys, normal distribution, and binomial distribution

Twenty-First Century Themes and Skills include:
- The Four C's
- Global awareness
- Financial, economic, business and entrepreneurial literacy

Objectives

Students will
- Identify mathematical patterns found in a sequence
- Use a formula to find the nth term of a sequence
- Define, identify, and apply arithmetic sequences
- Define, identify, and apply geometric sequences
- Define arithmetic series and find their sums
- Define geometric series and find their sums
- Graph and identify conic sections
- Write the equation and graph a parabola
- Write and graph the equation of a circle
- Find the center and radius of a circle and use them to graph the circle

Core Lessons

Standards Solution Common Core Geometry Lessons:
- Deriving the Equations of Circles and Parabolas
- Deriving the Distance Formula

Standards Solution Common Core Probability and Statistics Lessons:
- Conditional Probability and Independence
- Events and their Sample Space
- Probability of Compound Events: Understanding Or

A Lifetime of Savings
https://www.illustrativemathematics.org/content-standards/HSA/SSE/B/4/tasks/1283

Cantor Set
https://www.illustrativemathematics.org/content-standards/HSA/SSE/B/4/tasks/929

Course of Antibiotics
https://www.illustrativemathematics.org/content-standards/HSA/SSE/B/4/tasks/805

Triangle Series
https://www.illustrativemathematics.org/content-standards/HSA/SSE/B/4/tasks/442

Illustrative Mathematics
https://www.illustrativemathematics.org/

National Library of Virtual Manipulatives
http://nlvm.usu.edu/

Alabama Learning Exchange
http://alex.state.al.us/search.php?fa_submit=ALLPLANS

Arizona Math Flipbook
http://www.azed.gov/azcommoncore/files/2012/11/high-school-ccss-flip-book-usd-259-2012.pdf

NYC Department of Education
http://schools.nyc.gov/default.htm

Mathematics Assessment Project
http://map.mathshell.org/

Texas Instruments
https://education.ti.com/en/us/home

Desmos
https://teacher.desmos.com/

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

Math journal (NJSLSA.R1, NJSLSA.W2)

Summative Assessments:
Multiple choice / short answer assessments (CRP2, CRP4, CRP8)

Chapter quizzes/tests
- Pearson Realize
- MathXL

Grade 11 Algebra II Common Core Assessment 3, Standards Solution

Benchmark Assessment:
Common Formative Assessment

Alternative Assessments:
Learning centers: each learning center focuses on a different type of problem (9.3.ST.2, 9.3.ST-ET.5)

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

purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each

S-IC.B.4 Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling

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-IC.B.6 Evaluate reports based on data

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, and tables to estimate areas under the normal curve

S-MD.B.6 Use probabilities to make fair decisions

S-MD.B.7 Analyze decisions and strategies using probability concepts

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,

- Write the equation, find the foci, and graph an ellipse
- Graph hyperbolas and find and use the foci of a hyperbola
- Write the equation of a translated conic section
- Identify a translated conic section from an equation
- Count permutations and combinations
- Find the probability of an event using theoretical, experimental, and simulation methods
- Find the probability of an event (A and B) or (A or B)
- Find conditional probabilities
- Use tables and tree diagrams to determine conditional probabilities
- Use probabilities to make fair decisions and analyze decisions
- Calculate measures of central tendency
- Draw and interpret box and whisker plots
- Find the standard deviation and variance of a set of values
- Apply standard deviation and variance
- Identify sampling methods
- Recognize bias in samples and surveys
- Find binomial probabilities and to use binomial distributions

YouTube Explosion
https://www.illustrativemathematics.org/content-standards/HSA/SSE/B/4/tasks/1797

Snake on a Plane
https://www.illustrativemathematics.org/content-standards/HSF/IF/A/3/tasks/1695

Explaining the Equation for a Circle
https://www.illustrativemathematics.org/content-standards/HSG/GPE/A/1/tasks/1425

Slopes and Circles
https://www.illustrativemathematics.org/content-standards/HSG/GPE/A/1/tasks/479

Defining Parabolas Geometrically
https://www.illustrativemathematics.org/content-standards/HSG/GPE/A/2/tasks/1561

Coordinates of Points on a Circle
https://www.illustrativemathematics.org/content-standards/HSG/GPE/B/tasks/1894

Return to Fred's Fun Factory
https://www.illustrativemathematics.org/content-

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

intersections, or complements of other events

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 conditional probability of *A* given *B* as *P*(*A* 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.6 Find the conditional probability of *A* given *B* as the fraction of *B*'s outcomes that also belong to *A*, and interpret the answer in terms

- Use a normal distribution

standards/HSS/CP/A/1/tasks/1198

Cards and Independence
https://www.illustrativemathematics.org/content-standards/HSS/CP/A/2/tasks/943

Finding Probabilities of Compound Events
https://www.illustrativemathematics.org/content-standards/HSS/CP/A/3/tasks/1831

Lucky Envelopes
https://www.illustrativemathematics.org/content-standards/HSS/CP/A/3/tasks/944

Rain and Lightning
https://www.illustrativemathematics.org/content-standards/HSS/CP/A/3/tasks/1112

How Do You Get to School?
https://www.illustrativemathematics.org/content-standards/HSS/CP/B/6/tasks/1025

Coffee at Mom's Diner
https://www.illustrativemathematics.org/content-standards/HSS/CP/B/7/tasks/1024

False Positive Test Results
https://www.illustrativemathe

of the model

S-CP.B.7 **Apply the Addition Rule, P(A or B) = P(A) + P(B) – P(A 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 and B) = P(A)P(B|A) = P(B)P(A|B), and interpret the answer in terms of the model**
S-CP.B.9 Use permutations and combinations to compute probabilities of compound events and solve problems

Grapher
http://nlvm.usu.edu/en/nav/frames_asid_109_g_4_t_2.html?open=activities&from=category_g_4_t_2.html

Stick or Switch
http://nlvm.usu.edu/en/nav/frames_asid_117_g_4_t_2.html?from=category_g_4_t_2.html

Family Ties: Parabolas
http://alex.state.al.us/lesson_view.php?id=11801

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

Investigating Parabolas in Standard Form
http://alex.state.al.us/lesson_view.php?id=24121

Representing Conditional Probabilities 1
http://map.mathshell.org/lessons.php?unit=9425&collection=8

Representing Conditional Probabilities 2
http://map.mathshell.org/lessons.php?unit=9430&collection=8

Around the Vertex in 80 Days
https://education.ti.com/en/us/

activity/detail?id=ADEEA615DB764EF6A5DE7E5A578A95EE&ref=/en/us/activity/search/advanced

Probability of Repeated Independent Events
https://education.ti.com/en/us/activity/detail?id=278A996A76194FE3989499697FF4F9E0&ref=/en/us/activity/search/advanced

Permutations and Combinations
https://education.ti.com/en/us/activity/detail?id=86AF798EA04C4D49875728BB12CF46D8&ref=/en/us/activity/search/advanced

Orbit of Jupiter
https://education.ti.com/en/us/activity/detail?id=CEF82B5852734E408E50F597E1D9097F&ref=/en/us/activity/search/advanced

Arithmetic Sequences and Series
https://education.ti.com/en/us/activity/detail?id=EF53AC5DC8974242B1F80C2E1796DEBC&ref=/en/us/activity/search/advanced

Crazy Conics Can Create Creativity
https://teacher.desmos.com/activitybuilder/custom/562eba14242df94206f9e026

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

Additional texts:
www.newsela.com
www.readworks.org
www.commonlit.org

Key Vocabulary:
Arithmetic sequence, arithmetic series, common difference, common ratio, converge, diverge, explicit formula, geometric sequence, geometric series, limits, recursive formula, center of a circle, circle, conic section, directrix, ellipse, hyperbola, radius, standard form of an equation of a circle, combination, conditional probability, experimental probability, measure of central tendency, mutually exclusive events, normal distribution, permutation, simulation, theoretical probability

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:
• Teaching modeling	• Utilize modifications &	• Use visual demonstrations,	• Inquiry based instruction

• 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 • Provide a vocabulary list with definitions • Use of alge-tiles when needed • Use of number line when needed	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 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 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	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 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	• 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 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

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)