BLOOMINGDALE PUBLIC SCHOOLS

MATHEMATICS
GRADE 8

Adapted from:
New Jersey Student Learning Standards
New Jersey Department of Education Instructional Units for Mathematics

Approval Date:
July 20, 2022

Implementation Date:
2022 - 2023 School Year

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June 2022

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I. OVERVIEW

This full-year course has been designed to further student understanding of mathematical concepts in each of five areas identified by the New Jersey Student Learning Standards for Mathematics (NJSLS-M) as critical in Grade 8: Numerical Operations, Expressions & Equations, Ratio & Proportion, Statistics & Probability, and Geometry. Real-life problems and concrete representations of concepts will form the center of lessons that will implement this integration. The New Jersey Student Learning Standards for - Career Readiness, Life Literacies, Key Skills are infused throughout the course with specific attention to Critical Thinking and Problem Solving, Technology Literacy, and Financial Literacy. These standards endorse the use of manipulatives, cooperative learning, financial applications and technology as a means to effectively communicate mathematical ideas. This course is designed to prepare students for higher-level mathematics instruction and includes opportunities for self-motivated students to challenge themselves with differentiated instructional and independent learning opportunities that introduce further concepts in mathematics.

This course is aligned with the 2020 New Jersey Student Learning Standards (NJSLS) for 8th grade Mathematics and is enriched with some extensions into 8th grade mathematics. The enriched 8th grade content standards are intended for differentiation opportunities that prepare students for placement into high school mathematics. This course is also aligned with the 2020 New Jersey Student Learning Standards (NJSLS) for Career Readiness, Life Literacies, and Key Skills and is designed to prepare the students for success in their future mathematical courses

II. RATIONALE

The purpose of this course, the third in the three-year middle school sequence, is to prepare students for higher-level mathematics. It is aligned with the 2020 New Jersey Student Learning Standards (NJSLS) for Mathematics and the 2020 New Jersey Student Learning Standards for Career Readiness, Life Literacies, and Key Skills.

III. AFFIRMATIVE ACTION COMPLIANCE STATEMENT

Bloomingdale Public Schools are committed to the achievement of increased cultural awareness, respect, and equity amongst our students, teachers, and community. We are pleased to present all pupils with information pertaining to possible career, professional, or vocational opportunities which in no way restricts or limits options on the basis of race, color, creed, religion, sex, ancestry, national origin, or socioeconomic status.

IV. STUDENT OUTCOMES (Link to New Jersey Student Learning Standards)

In accordance with district policy as mandated by the New Jersey Administrative Code and the New Student Learning Standards, the following are proficiencies required for the successful completion of the above named course.

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As a result of a Bloomingdale Mathematics education, students will be able to…

- Synthesize mathematical skills across disciplines
- Develop into confident mathematicians
- Learn at their own pace and advance their understanding in a variety of ways
- Collaborate with others and contribute productively and articulately
- Act responsibly and be accountable for actions, in person and online
- Effectively approach, analyze, plan, and apply appropriate strategies for problem solving in ambitious contexts with accommodations for those who need it.
- Persevere through difficult situations and tasks and maintain a growth mindset despite adversity.
- Draw on knowledge from a wide variety of mathematical topics with flexibility to approach the same problem from different mathematical perspectives or represent the mathematics in different ways.
- Evaluate situations, draw logical conclusions, and develop, describe and apply solutions.
- Construct and support arguments.
- Evaluate their own reasoning and critique the reasoning of others.
- Assess the reasonableness of a solution with respect to the given construct or problem context.
- Use effective communication to engage in peer collaboration, reflecting on whether or not a solution is viable.
- Create appropriate representations of mathematical situations across a variety of mediums. These models will support the student's ability to demonstrate and explain their mathematical understanding.
- Use mathematical tools to explore and deepen their understanding of mathematical concepts.
- Make effective choices regarding the use of any available tools.
- Make appropriate use of technology as a tool that is constantly changing and evolving.
- Attend to precision in their mathematical calculations and in their communication.
- Calculate accurately and efficiently and express numerical answers with a degree of precision that is appropriate to the given context.
- Develop precision in their use of mathematical language.
- Look closely to determine patterns and structures within mathematics.
- Make meaningful connections between their knowledge from previous experiences and the content they are currently exploring.
- Develop deep understandings of mathematical concepts such that these understandings become applicable building blocks for future learning.
- Use their mathematical understandings to make generalizations that apply to various mathematical circumstances.
- Identify patterns in mathematics that can be used to solve problems that are challenging relative to their learning comfort zone.
- Use generalizations to increase the efficiency and manageability of their work.

- Demonstrate growth mindset and grit in effectively approaching ever-rigorous problem solving.
- Apply appropriate strategies with differentiated levels of support.
- Be confident in participating in higher level discussions that will assess and advance the understanding of concepts.
- Learn mathematics through exploring and solving contextual and mathematical problems

V. Links to NEW JERSEY STUDENT LEARNING STANDARDS

- Visual and Performing Arts
- English Language Arts
- Mathematics
- Science
- Social Studies
- Technology
- 21st Century Life and Careers

VI. INTEGRATED ACCOMMODATIONS AND MODIFICATIONS

Students with IEPs, 504s, and/or Students at Risk of Failure Students read authentic texts and write authentic pieces at their independent and instructional reading levels. Individualized feedback is provided through conferences and small groups. The teacher utilizes visual and multi-sensory methods of instruction in addition to assistive technology when needed. Students are provided with graphic organizers and other scaffolded material. Modification of content and product may be deemed necessary based on student needs. Students are provided with testing accommodations and authentic assessments.

Gifted & Talented Students Students read authentic texts and write authentic pieces at their independent and instructional reading levels. Individualized feedback is provided to the student through conferences and small groups. Students are engaged through inquiry-based instruction to develop higher-order thinking skills. Activities are developed based on student interests and student goals. Students engage in real-world projects and scenarios.

English Language Learners Students read authentic texts and write authentic pieces at their independent and instructional reading levels. Individualized feedback is provided to students through conferences and small groups. Students are pre-taught vocabulary terms and concepts. Teachers engage students through visual learning, including the use of graphic organizers. Teachers use cognates to increase comprehension. The teacher models tasks and concepts, and pairs students learning English with students who have more advanced English language skills. Scaffolding is provided including word walls, sentence frames, think-pair-share, cooperative learning groups, and teacher think-alouds.

VII. 21ST CENTURY THEMES & SKILLS

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Embedded in many of our units of study and problem based learning projects are the 21st Century Themes as prescribed by the New Jersey Department of Education. These themes are as follows:

- Global Awareness
- Financial, Economic, Business, and Entrepreneurial Literacy
- Civic Literacy
- Health Literacy

VIII. CURRICULUM ADDENDA FOR SPECIAL EDUCATION

This curriculum can be both grade and age appropriate for special education students and serves as a guide for the special education teacher in line with the district's written philosophy of special education, as stated within Policy #6700 concerning Programs for Educationally Disabled Students. Based on the Child Study Team evaluation and consultation with the parent and classroom teacher, an individualized education plan may include modifications to content, instructional procedures, student expectations, and targeted achievement outcomes of this curriculum document in accordance with the identified needs of an eligible student. This educational plan will then become a supplement guide that the classroom teacher, parent, and Child Study Team will use to measure the individual student's performance and achievement.

IV. CURRICULUM ADDENDA FOR ENGLISH LANGUAGE LEARNERS

This curriculum guide is appropriate and is implemented for all students according to age and grade, and is in line with the district's written philosophy of English language acquisition concerning Bilingual Instruction and English as a Second Language Programs. In accordance with the New Jersey Administrative Code 6A:15, the contents herein provide equitable instructional opportunities for English Language Learners to meet the New Jersey Student Learning Standards and to participate in all academic and non-academic courses. Students enrolled in a Bilingual and/or an ESL program may, in consultation with the classroom teacher and Bilingual and/or ESL teacher, receive modification to content, instructional procedures, student expectations and targeted achievement outcomes of this curriculum document in accordance with the students developmental and linguistic needs.

SCOPE AND SEQUENCE
(*Pacing Guide*)

Unit of Study	**Estimated Time**
Unit 1: Exponents, Irrational Numbers and Linear Expressions	12 weeks
Unit 2: Pythagorean Theorem, Congruence and Similarity	7 weeks

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Unit 3: Linear Relationships and Functions	13 weeks
Unit 4: Linear Models for Scatter Plots and Two Way Tables	4 weeks

UNIT 1
Exponents, Irrational Numbers and Linear Equations
UNIT SUMMARY
In this unit, students will... ● show that the decimal expansion of a rational number terminates or repeats eventually. ● convert a decimal expansion which repeats eventually into a rational number. ● find rational approximations of irrational numbers. ● compare the size of approximations of irrational numbers. ● locate approximations of irrational numbers on a number line. ● estimate the value of expressions of irrational numbers. ● apply properties of integer exponents to generate equivalent numerical expressions. ● use square root and cube root symbols to represent solutions to equations of the form $x^2=p$ and $x^3=p$ ● evaluate square roots of small perfect squares and cube roots of small perfect cubes. ● use numbers expressed in the form of a single digit times a whole-number power of 10 to estimate very large or very small quantities. ● express how many times as much one number in scientific notation is than another. ● perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. ● choose units of appropriate size for measurements of very large or very small quantities. ● interpret scientific notation that has been generated by technology. ● solve linear equations in one variable. ● give examples of linear equations with one solution. ● give examples of linear equations with infinitely many solutions. ● give examples of linear equations with no solution. ● transform a linear equation into an equivalent form, x = a, a = a, or a = b, where a and b are different, in order to show the type of solution. ● expand expressions using the distributive property. ● solve linear equations with rational number coefficients. ● state formulas of: ○ cone ○ cylinders ○ spheres. ● use formulas of cones, cylinders, and spheres to solve real-world and mathematical problems.

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NEW JERSEY STUDENT LEARNING STANDARDS MATHEMATICS

Module A:

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., π2) For example, by truncating the decimal expansion of √2, show that √2 is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations.

Module B:

8.EE.A.1 Know and apply the properties of integer exponents to generate equivalent numerical expressions. For example, 32 = 1/27. = 1/33 –3 3

8.EE.A.3 Use numbers expressed in the form of a single digit times a whole-number 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 times 108 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.

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.

8.EE.A.2 Use square root and cube root symbols to represent solutions to equations of the form x positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that √2 is irrational.

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.

INTERDISCIPLINARY CONNECTIONS

Interdisciplinary Standards NJSLS- Science:

MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
MS-ETS1-2. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
MS-ETS1-3. Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
MS-ETS1-4. Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

NJSLS Language Arts Companion Standards for Technical subjects:

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.R7. Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.
RST.6-8.2. Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.
RST.6-8.3. Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
RST.6-8.4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics
RST.6-8.7. Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table

New Jersey Student Learning Standards: Career Readiness, Life Literacies and Key Skills (2020)
9.4.8.CI.1: Assess data gathered on varying perspectives on causes of climate change (e.g., crosscultural, gender-specific, generational), and determine how the data can best be used to design multiple potential solutions
9.4.8.CT.2: Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option
9.4.8.GCA.2: Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal

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9.4.8.IML.5: Analyze and interpret local or public data sets to summarize and effectively communicate the data

9.4.8.TL.1: Construct a spreadsheet in order to analyze multiple data sets, identify relationships, and facilitate data-based decision-making.

21st CENTURY LIFE AND CAREER STANDARDS

Career Readiness, Life Literacies, and Key Skills Practices describe the habits of the mind that all educators in all content areas should seek to develop in their students. They are practices that have been linked to increase college, career, and life success.

1. Act as a responsible and contributing community member and employee.
2. Attend to financial well-being.
3. Consider the environmental, social and economic impacts of decisions.
4. Demonstrate creativity and innovation.
5. Utilize critical thinking to make sense of problems and persevere in solving them.
6. Model integrity, ethical leadership and effective management.
7. Plan education and career paths aligned to personal goals.
8. Use technology to enhance productivity, increase collaboration and communicate effectively.
9. Work productively in teams while using cultural global competence.

9.1: Personal Financial Literacy

A. Civic Responsibility
B. Financial Institutions
C. Financial Psychology
D. Planning and Budgeting
E. Risk Management and Insurance
F. Civic Financial Responsibility
G. Credit Profile
H. Economic and Government Influences
I. Credit and Debt Management

9.2: Career Awareness, Exploration & Preparation, and Training

A. Career Awareness (K-2)
B. Career Awareness and Planning (3-5)
C. Career Awareness and Planning (6-8)
D. Career Awareness and Planning (9-12)

9.4 Life Literacies and Key Skills

A. Creativity and Innovation
B Critical Thinking and Problem-solving
C. Digital Citizenship
D. Global and Cultural Awareness
E. Information and Media Literacy

9.3: Career and Technical Education

A. Agriculture
B. Architecture
C. Arts,A/V, Technology
D. Business Management
E. Education
F. Finance
G. Government
H. Health Science
I. Hospital & Tourism
J. Human Services
K. Information Tech.
L. Law and Public Safety
M. Manufacturing
N. Marketing
O. Science, Technology, Engineering & Math
P. Trans./Logistics

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	F. Technology Literacy	

TECHNOLOGY STANDARDS

8.1: Computer Science	**8.2 Design Thinking**
A. Computing systems B. Networks and the Internet C. Impacts of Computing D. Data & Analysis E. Algorithms & Programming	A. Engineering Design B. Interaction of Technology and Humans C. Nature of Technology D. Effects of Technology on the Natural World E. Ethics & Culture

ENDURING UNDERSTANDINGS

- all numbers, rational and irrational, have a location on a number line.
- every number has a decimal expansion.
- every rational number has a decimal expansion that terminates or eventually repeats.
- a number in the form a/b means a is divided by b.
- every irrational square root can be estimated by its location between two rational square roots, e.g., √7 is between √4 and √9.
- numbers that are not rational are called irrational.
- the process of dividing one number by another.
- how to truncate or round a decimal expansion to a specific number of places.
- how to compare decimal values.
- a number raised to a power m means that number is multiplied by itself m times.
- numbers can be written in many equivalent forms.
- perfect square numbers are the whole numbers each raised to the second power.
- perfect cube numbers are the whole numbers each raised to the third power.
- very large or very small quantities can be estimated using numbers expressed in scientific notation.
- how many times as much one number is than another is determined by the relationship between both the single digit parts and their respective powers of ten. For example, 12 x 105 12 to 3 (4 times larger) and 105 so 12 x 105
- operations can be performed with numbers expressed in scientific notation.
- to find a measurement, the appropriate unit should be used.
- the properties of integer exponents.
- √2 is irrational.
- the perfect squares are 1, 4, 9, 16, …
- the square root of every non-perfect square number is irrational.
- the perfect cubes are 1, 8, 27, 64, ...
- the cube root of every non-perfect cube number is irrational.
- scientific notation is when a number is expressed as a decimal number between 1 and 10 multiplied by a power of 10.
- the appropriate units of measurement used for very large quantities and very small quantities.

- the rule followed by a piece of technology when it converts a number into scientific notation.
- the perfect square numbers (if not memorized, students should know how to find the perfect square numbers by multiplying each whole number by itself).
- the solution to a linear equation is a point or set of points which will make the equation true.
- properties of operations with numbers can be applied to variables.
- linear equations in one variable can have one solution, infinitely many solutions, or no solutions.
- linear equations in one variable can be transformed into x = a (one solution), a = a (infinitely many solutions), or a = b (no solutions) results (where a and b are different numbers).
- the distributive property.
- like terms need to be combined.
- volume is a unit of measurement that indicates the number of cubic units a three-dimensional shape can hold.
- volume is measured in cubic units.
- know the formulas for the volumes of:
    - cones
    - cylinders
    - spheres

ESSENTIAL QUESTIONS

- Why does one need to distinguish between rational and irrational numbers?
- How does one locate irrational numbers on a number line?
- Why does one need to express a number in a form with integer exponents?
- Why does one need to write numbers in scientific notation?
- What is the advantage of performing operations on numbers expressed in scientific notation rather than numbers in standard form?
- How does one interpret the number of solutions to linear equations in one variable?
- How can one use volume to solve real-world and mathematical problems?
- What is the relationship, if any, between volume of cones, cylinders, and spheres?

STUDENT LEARNING OBJECTIVES (Students are learning to / Students are learning that)

Students are learning to/that…

- explain that numbers that are not rational are called irrational
- show every number has a decimal expansion
- show that rational numbers have decimal expansions that either terminate in zeros or repeats eventually
- convert a repeating decimal to a rational number
- estimate the value of irrational numbers using rational approximations
- use rational approximations of irrational numbers to compare their size

- use rational approximations of irrational numbers to locate them on a number line
- know the properties of integer exponents
- determine whether two numerical expressions involving integer exponents are equivalent
- generate equivalent expressions using the properties of exponents
- estimate a very large or very small number as a single digit times an integer power of ten
- express how many times larger one quantity is compared to another when written as a single digit times an integer power of ten
- add, subtract, multiply, and divide numbers expressed in scientific notation
- add, subtract, multiply, and divide numbers where one is expressed in decimal notation and the other is expressed in scientific notation
- choose appropriate units to represent measurements of very large or very small quantities
- interpret scientific notation generated by technology as a number multiplied by a power of ten
- show a linear equation in one variable can result in one solution, infinitely many solutions, or no solution
- show which of these outcomes is the case by transforming the original equation into the form $x = a$, $a = a$, or $a = b$
- solve linear equations in one variable with rational number coefficients, including equations that require expanding expressions using the distributive property and combining like terms
- use square root and cube root symbols to represent solutions to equations in the form $x^2 = p$ and $x^3 = p$
- evaluate square roots of small perfect squares and cube roots of small perfect cubes
- know $\sqrt{2}$ is an irrational number
- apply the formulas for volume of a cone, cylinder, or sphere in a real-world context
- calculate the volume of a cone, cylinder, or sphere
- find a missing dimension of a cone, cylinder or sphere given its volume

SUGGESTED ACTIVITIES

Volume Investigation
Scientific Notation Project (Giantville vs Tinytown)
8.EE.A.1 Extending the Definition of Exponents
8.EE.A.3 Ant and Elephant
8.EE.A.4 Giantburgers
8.NS.A.1 Converting Decimal Representations of Rational Numbers to Fraction Representation
8.NS.A.2 Irrational Numbers on the Number Line
8.EE.C.7 The Sign of Solutions
8.EE.C.7 Coupon vs Discount

EVIDENCE OF LEARNING

Formative Assessments:	**Summative Assessment:**

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Classroom Discussion Exit Slip Checklists Peer Assessment Vocabulary Quizzes Rubrics Participation and teacher observation Mini Whiteboard Responses Think-Pair-Share Concept Map Classroom Poll	Unit Tests End-of-Book Test NJSLA Test
Benchmark Assessment: iReady Benchmark Unit Benchmarks	**Alternative Assessments:** Project Portfolio

INSTRUCTIONAL RESOURCES

Core Instructional Resource:	**Teacher Created Materials:**	**Supplemental Resources:**
HMH Into Math Achieve the Core	Nearpod Presentations	Nearpod Desmos Reflex Math/ FRAX Khan Academy Kendall Hunt Open Middle NJ Digital Item Library

INTEGRATED ACCOMMODATIONS AND MODIFICATIONS

Special Education:
Provide modified notes and access to extra copies online
Provide oral reminders and check student work during independent work time
Model skills/techniques to be mastered
Check and sign assignment planner
Preferential seating
Pair visual prompts with verbal presentations
Modified or scaffolded homework and classwork
Extended time as needed
Provide graphic organizers and study guides

English Learners:
Provide scaffolded assignments and assessments
Pair visual prompts with visual presentations
Check and sign assignment planner

Native Language translation (peer, online assistive technology, translation device, bilingual dictionary)
Extended time for assignment and assessment as needed
Highlight key vocabulary
Use graphic organizers
Provide verbal and written directions
Preferential seating with a English-speaking peer

At Risk of Failure:
Check and sign assignment planner
Encourage class participation and reinforce skills
Model skills and assignments
Extended to time to complete class work
Preferential seating
Provide extra help outside of class and 1:1 instruction when needed
Communicate regularly with students' other teachers
Provide positive feedback for tasks well done
Encourage student to proofread assessments and projects and ask for teacher proofreading of large writing assignments

Gifted and Talented:
Pose higher-level thinking questions
Provide higher level reading and writing materials for literacy based activities
Probe student to extend thinking beyond the text or connect two or more texts
Provide alternate or project-based assessments and assignments

Students with 504 Plans
Provide extended time as needed
Modify length of writing assignment
Provide short breaks within the lesson
Provide scaffolding for students
Utilize graphic organizers

UNIT 2
Pythagorean Theorem, Congruences and Similarity
UNIT SUMMARY
In this unit, students will… ● explain a proof of the Pythagorean Theorem and its converse.

- apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two- and three-dimensions.
- apply the Pythagorean Theorem to find the distance between two points in a coordinate system.
- verify experimentally the properties of:
    - rotations
    - reflections
    - translations
- describe a sequence that exhibits the congruence between two congruent figures.
- describe the effect of the following on two-dimensional figures using coordinates:
    - dilations
    - translations
    - rotations
    - reflections
- describe a sequence that exhibits the similarity between two similar two-dimensional figures.
- use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so.

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Module A:
8.G.B.6 Explain a proof of the Pythagorean Theorem and its converse.

8.G.B.8 Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.

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.

Module B:
8.G.A.1 Verify experimentally the properties of rotations, reflections, and translations.
a. Lines are transformed to lines and line segments to line segments of the same length
b. Angles are transformed to angles of the same measure
c. Parallel lines are transformed to parallel lines

8.G.A.2 Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them.

8.G.A.3 Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.

8.G.A.4 Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them.

8.G.A.5 Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so.

INTERDISCIPLINARY CONNECTIONS

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1. Act as a responsible and contributing community member and employee.
2. Attend to financial well-being.
3. Consider the environmental, social and economic impacts of decisions.
4. Demonstrate creativity and innovation.
5. Utilize critical thinking to make sense of problems and persevere in solving them.
6. Model integrity, ethical leadership and effective management.
7. Plan education and career paths aligned to personal goals.
8. Use technology to enhance productivity, increase collaboration and communicate effectively.
9. Work productively in teams while using cultural global competence.

9.1: Personal Financial Literacy	**9.2: Career Awareness, Exploration & Preparation, and Training**	**9.3: Career and Technical Education**
J. Civic Responsibility K. Financial Institutions L. Financial Psychology M. Planning and Budgeting N. Risk Management and Insurance O. Civic Financial Responsibility P. Credit Profile Q. Economic and	G. Career Awareness (K-2) H. Career Awareness and Planning (3-5) I. Career Awareness and Planning (6-8) J. Career Awareness and Planning (9-12)	Q. Agriculture R. Architecture S. Arts,A/V, Technology T. Business Management U. Education V. Finance W. Government X. Health Science Y. Hospital & Tourism Z. Human Services AA. Information Tech.

BLOOMINGDALE PUBLIC SCHOOLS

Government Influences R. Credit and Debt Management	**9.4 Life Literacies and Key Skills** A. Creativity and Innovation B Critical Thinking and Problem-solving C. Digital Citizenship D. Global and Cultural Awareness K. Information and Media Literacy L. Technology Literacy	BB. Law and Public Safety CC. Manufacturing DD. Marketing EE. Science, Technology, Engineering & Math FF. Trans./Logistics

TECHNOLOGY STANDARDS	
8.1: Computer Science A. Computing systems B. Networks and the Internet C. Impacts of Computing D. Data & Analysis E. Algorithms & Programming	**8.2 Design Thinking** A. Engineering Design B. Interaction of Technology and Humans C. Nature of Technology D. Effects of Technology on the Natural World E. Ethics & Culture

ENDURING UNDERSTANDINGS

- application of the Pythagorean Theorem.
- application of the converse of the Pythagorean Theorem.
- why the Pythagorean Theorem can be used to find the distance between two points.
- the Pythagorean Theorem:
  - if a and b are the legs, and c is the hypotenuse of the triangle then $a^2 + b^2 = c^2$
  -
- when two sides of a triangle are known, the third side can be found using the Pythagorean Theorem.
- the converse of the Pythagorean Theorem:
  - If $a^2 + b^2 = c^2$ triangle, then the triangle is a right triangle.
- the distance between two points can be found using the Pythagorean Theorem.
- rotations, reflections, and translations take:
  - lines to lines
  - line segments to line segments of the same length
  - angles to angles of the same measure
  - parallel lines to parallel lines
- a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations.
- a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations.
- there are relationships between the interior and exterior angles of a triangle.

- there are relationships among the angles formed when parallel lines are cut by a transversal.
- when two angles of one triangle are congruent to two angles of another triangle, the third angles are also congruent.
- on its own, congruence of corresponding angles determines similarity only for triangles.
- congruent figures have the same shape and the same size.
- similar figures have the same shape and not necessarily the same size.
- that a dilation is a figure which is enlarged or reduced using a scale factor, without altering the center.
- that a translation of a figure slides an object a fixed distance in a given direction.
- that a rotation is a transformation that turns a figure a given number of degrees around a fixed point.
- that a reflection is a transformation in which the figure is the mirror image of the original.
- transformations can be described using coordinates.
- the sum of the interior angles in a triangle is 180°.when two angles of one triangle are congruent to two angles of a second triangle, the triangles are similar.

ESSENTIAL QUESTIONS

- How can one use the Pythagorean Theorem to solve real-world and mathematical problems?
- Why does one need to perform transformations on figures?
- How does knowing two figures are congruent or similar help one to solve problems?

STUDENT LEARNING OBJECTIVES (Students are learning to / Students are learning that)

Students are learning to/that…

- the Pythagorean Theorem states that the square of the hypotenuse of a right triangle is equal to the sum of the squares of the other two sides
- explain a proof of the Pythagorean Theorem
- explain a proof of the converse of the Pythagorean Theorem
- apply the Pythagorean Theorem to find the distance between two points in a coordinate system
- apply the Pythagorean Theorem to determine unknown side lengths in right triangles in two-dimensional figures
- apply the Pythagorean Theorem to determine unknown side lengths in right triangles in three-dimensional figures
- apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world problems
- verify that when a reflection, rotation, and/or translation is performed, lines are transformed to lines, and line segments to line segments of the same length
- verify that when a reflection, rotation, and/or translation is performed, angles are transformed to angles of the same measure

- verify that when a reflection, rotation, and/or translation is performed, parallel lines are transformed to parallel lines
- two figures are congruent if one can be obtained from the other by a sequence of rotations, reflections, and/or translations
- describe a sequence of transformations that maps one congruent figure onto another
- dilate, translate, rotate, and reflect two-dimensional figures on a coordinate plane
- describe the effects of dilations, translations, rotations, and reflections using coordinates
- two figures are similar if one can be obtained from the other by a sequence of dilations and rotations, reflections, and/or translations
- describe a sequence of transformations that maps one similar figure onto another
- the sum of the interior angles of a triangle is 180 degrees
- the measure of an exterior angle of a triangle is equal to the sum of the two remote interior angles
- when parallel lines are cut by a transversal, corresponding, alternate interior, and alternate exterior angles are congruent
- if two sets of corresponding angles in two triangles are congruent, then the triangles are similar
- use facts about angles to construct an informal argument

SUGGESTED ACTIVITIES

Converse of Pythagorean Theorem Project
8.G.B.6 Converse of Pythagorean Theorem
8.G.B.7 Running on the Football Field
8.G.B.8 Finding Isosceles Triangles
8.G.B.8 Finding the Distance Between Points
8.G.A.1 Reflections, Rotations and Translations
8.G.A.2 Congruent Triangles
8.G.A.3 Effects of Dilations on Length, Area and Angles
8.G.A.4 Are They Similar
8.G.A.5 Street Intersections
8.G.A.5 Similar Triangles II
8.G.A.4 Triangle's Interior Angles

EVIDENCE OF LEARNING

Formative Assessments:	**Summative Assessment:**
Classroom Discussion	Unit Tests
Exit Slip	End-of-Book Test
Checklists	
Peer Assessment	NJSLA Test
Quizzes	
Rubrics	
Participation and teacher observation	
Mini Whiteboard Responses	
Think-Pair-Share	

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Concept Map Classroom Poll	
Benchmark Assessment: iReady Benchmark Unit Benchmarks	**Alternative Assessments:** Project Portfolio

INSTRUCTIONAL RESOURCES

Core Instructional Resource:	**Teacher Created Materials:**	**Supplemental Resources:**
HMH Into Math Achieve the Core	Nearpod Presentations	Nearpod Desmos Reflex Math/ FRAX Khan Academy Kendall Hunt Open Middle NJ Digital Item Library

INTEGRATED ACCOMMODATIONS AND MODIFICATIONS

Special Education:
Provide modified notes and access to extra copies online
Provide oral reminders and check student work during independent work time
Model skills/techniques to be mastered
Check and sign assignment planner
Preferential seating
Pair visual prompts with verbal presentations
Modified or scaffolded homework and classwork
Extended time as needed
Provide graphic organizers and study guides

English Learners:
Provide scaffolded assignments and assessments
Pair visual prompts with visual presentations
Check and sign assignment planner
Native Language translation (peer, online assistive technology, translation device, bilingual dictionary)
Extended time for assignment and assessment as needed
Highlight key vocabulary
Use graphic organizers
Provide verbal and written directions
Preferential seating with a English-speaking peer

At Risk of Failure:

Check and sign assignment planner
Encourage class participation and reinforce skills
Model skills and assignments
Extended to time to complete class work
Preferential seating
Provide extra help outside of class and 1:1 instruction when needed
Communicate regularly with students' other teachers
Provide positive feedback for tasks well done
Encourage student to proofread assessments and projects and ask for teacher proofreading of large writing assignments

Gifted and Talented:
Pose higher-level thinking questions
Provide higher level reading and writing materials for literacy based activities
Probe student to extend thinking beyond the text or connect two or more texts
Provide alternate or project-based assessments and assignments

Students with 504 Plans
Provide extended time as needed
Modify length of writing assignment
Provide short breaks within the lesson
Provide scaffolding for students
Utilize graphic organizers

UNIT 3
Linear Relationships and Functions
UNIT SUMMARY

In this unit, students will...

- compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).
- interpret the equation y = mx + b as defining a linear function whose graph is a straight line.
- give examples of functions that are not linear.
- construct a function to model a linear relationship between two quantities.
- determine the rate of change of the function from a description of a relationship.
- determine the initial value of the function from a description of a relationship.
- determine the rate of change of the function from two (x, y) values, including reading these from a table or from a graph.

- determine the initial value of the function from two (x, y) values, including reading these from a table or from a graph.
- interpret the rate of change of a linear function in terms of the situation it models.
- interpret the initial value of a linear function in terms of the situation it models.
- interpret the rate of change of a linear function in terms of its graph or a table of values.
- interpret the initial value of a linear function in terms of its graph or a table of values.
- describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear).
- sketch a graph that exhibits the qualitative features of a function that has been described verbally.
- graph proportional relationships.
- interpret the unit rate as the slope of the graph.
- compare two different proportional relationships represented in different ways, e.g. graph to table; table to equation.
- use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane.
- derive the equation y = mx for a line through the origin.
- derive the equation y = mx + b for a line intercepting the vertical axis at b.
- analyze and solve pairs of simultaneous linear equations.
- solve systems of two linear equations in two variables algebraically.
- estimate solutions by graphing the equations.
- solve simple cases of two simultaneous linear equations by inspection.
- solve real-world and mathematical problems leading to two linear equations in two variables.

NEW JERSEY STUDENT LEARNING STANDARDS MATHEMATICS

Module A:

8.F.A.1 Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output.

8.F.B.5 Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.

8.F.A.3 Interpret the equation y = mx + b as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. For example, the function A = s2 graph contains the points (1,1), (2,4) and (3,9), which are not on a straight line.

Module B:

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.B.6 Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation y = mx for a line through the origin and the equation y = mx + b for a line intercepting the vertical axis at b**.**

8.F.B.4 Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.

8.F.A.2 Compare properties (e.g., rate of change, intercepts, domain and range) of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change

Module C:
8.EE.C.8 Analyze and solve pairs of simultaneous linear equations.

a. Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously.

b. Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection. For example, 3x + 2y = 5 and 3x + 2y = 6 have no solution because 3x + 2y cannot simultaneously be 5 and 6.

c. Solve real-world and mathematical problems leading to two linear equations in two variables. For example, given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair.

INTERDISCIPLINARY CONNECTIONS

Interdisciplinary Standards NJSLS- Science:

MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
MS-ETS1-2. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
MS-ETS1-3. Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

MS-ETS1-4. Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

NJSLS Language Arts Companion Standards for Technical subjects:

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.R7. Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.
RST.6-8.2. Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.
RST.6-8.3. Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
RST.6-8.4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics
RST.6-8.7. Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table

New Jersey Student Learning Standards: Career Readiness, Life Literacies and Key Skills (2020)
9.4.8.CI.1: Assess data gathered on varying perspectives on causes of climate change (e.g., crosscultural, gender-specific, generational), and determine how the data can best be used to design multiple potential solutions
9.4.8.CT.2: Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option
9.4.8.GCA.2: Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal
9.4.8.IML.5: Analyze and interpret local or public data sets to summarize and effectively communicate the data
9.4.8.TL.1: Construct a spreadsheet in order to analyze multiple data sets, identify relationships, and facilitate data-based decision-making.

21st CENTURY LIFE AND CAREER STANDARDS

Career Readiness, Life Literacies, and Key Skills Practices describe the habits of the mind that all educators in all content areas should seek to develop in their students. They are practices that have been linked to increase college, career, and life success.

1. Act as a responsible and contributing community member and employee.
2. Attend to financial well-being. 3. Consider the environmental, social and economic impacts of decisions.
4. Demonstrate creativity and innovation.

5. Utilize critical thinking to make sense of problems and persevere in solving them.
6. Model integrity, ethical leadership and effective management.
7. Plan education and career paths aligned to personal goals.
8. Use technology to enhance productivity, increase collaboration and communicate effectively.
9. Work productively in teams while using cultural global competence.

9.1: Personal Financial Literacy

S. Civic Responsibility
T. Financial Institutions
U. Financial Psychology
V. Planning and Budgeting
W. Risk Management and Insurance
X. Civic Financial Responsibility
Y. Credit Profile
Z. Economic and Government Influences
AA. Credit and Debt Management

9.2: Career Awareness, Exploration & Preparation, and Training

M. Career Awareness (K-2)
N. Career Awareness and Planning (3-5)
O. Career Awareness and Planning (6-8)
P. Career Awareness and Planning (9-12)

9.4 Life Literacies and Key Skills

A. Creativity and Innovation
B Critical Thinking and Problem-solving
C. Digital Citizenship
D. Global and Cultural Awareness
Q. Information and Media Literacy
R. Technology Literacy

9.3: Career and Technical Education

GG. Agriculture
HH. Architecture
II. Arts,A/V, Technology
JJ. Business Management
KK. Education
LL. Finance
MM. Government
NN. Health Science
OO. Hospital & Tourism
PP. Human Services
QQ. Information Tech.
RR. Law and Public Safety
SS. Manufacturing
TT. Marketing
UU. Science, Technology, Engineering & Math
VV. Trans./Logistics

TECHNOLOGY STANDARDS

8.1: Computer Science

A. Computing systems
B. Networks and the Internet
C. Impacts of Computing
D. Data & Analysis
E. Algorithms & Programming

8.2 Design Thinking

A. Engineering Design
B. Interaction of Technology and Humans
C. Nature of Technology
D. Effects of Technology on the Natural World
E. Ethics & Culture

ENDURING UNDERSTANDINGS

- a function is a rule that assigns to each input exactly one output.

- the graph of a function is the set of ordered pairs consisting of an input and the corresponding output.
- functions can be represented in 4 different ways:
  - algebraically
  - graphically
  - numerically in tables
  - by verbal descriptions
- an ordered pair that satisfies a function is the (x, y) that makes the equation true.
- properties of functions when they are represented:
  - algebraically
  - graphically
  - numerically in tables
  - by verbal descriptions
- $y = mx + b$ defines a linear function whose graph is a straight line.
- when the points on a graph do not fall in a straight line, the function is not linear.
- linear functions can be used to model some relationships between two quantities.
- the rate of change of a linear function in terms of the situation it models, its graph, or a table of values.
- the initial value of a linear function in terms of the situation it models, its graph, or a table of values.
- there are many different functional relationships that are not linear.
- the rate of change is:
  - the coefficient of x in a linear function $y = mx+b$.
  - the ratio of the rise to the run between two points on a graph.
  - the constant rate of change between values of the dependent variable for consecutive values in the independent variable.
  - a per unit amount in verbal descriptions.
- the initial value is:
  - the constant in an equation of a linear function $y = mx+b$.
  - the point where the line intercepts y-axis.
  - the value that is paired with the zero in the independent column.
  - the starting point in a verbal description.
- a function is called increasing when it goes up from left to right...decreasing when it goes down from left to right.
- since rate is a ratio that compares two quantities of different units, a unit rate is a ratio between two measurements in which the second term is one.
- the relationship between variables can be represented using word descriptions, tables, graphs and equations.
- proportional relationships can be represented by lines and linear equations.
- when slopes are the same, the rise divided by the run is constant.
- when the ratio of rise to run is the same between two right triangles, their corresponding sides must be proportional.
- the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane.

- slopes represent unit rates.
- the ratio of rise to run is the change in y-values divided by the respective change in x-values.
- when comparing the relationship between two variables, how to change from one representation to another (words descriptions, tables, graphs, and equations).
- the corresponding angles in similar triangles have the same measure.
- the corresponding sides in similar triangles are proportional.
- right similar triangles must have the same rise to run ratio.
- equations of the form y = mx pass through the origin.
- equations of the form y = mx + b intercept the vertical axis at b.
- solutions to a system of two linear equations are points that will make both equations true.
- solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs.
- graphing linear equations will enable one to estimate solutions.
- equations need to be examined for similarities and differences to facilitate finding solutions. For example, 3x + 2y = 5 and 3x + 2y = 6 have no solution because 3x + 2y cannot simultaneously be 5 and 6.

ESSENTIAL QUESTIONS

- Why does one need to define a function?
- When should functions be evaluated and compared?
- How does knowing the algebraic properties of a function help to graph that function?
- What applications could be represented by variables that are not related by a linear function?
- Why would one use functions to model relationships between quantities?
- What are the distinguishing characteristics of a graph of a function?
- Why is there a need to represent relationships between variables in more than one way?
- When is a relationship between two variables proportional?
- How does thinking of a unit rate as the slope of a line help to solve problems?
- What applications require solving simultaneous linear equations?

STUDENT LEARNING OBJECTIVES (Students are learning to / Students are learning that)

Students are learning to/that…

- understand a function is a rule that assigns to each input exactly one output
- understand the graph of a function is the set of ordered pairs consisting of an input and the corresponding output
- describe qualitatively the functional relationships between two quantities by analyzing a graph
- sketch a graph that exhibits the qualitative features of a function given a verbal description
- the equation $y = mx + b$ defines a linear function
- interpret a set of points forming a straight line as the graph of a linear function

- graph linear equations
- give examples of nonlinear functions
- graph proportional relationships represented in different ways (i.e. ordered pairs, table, equation, phrases, etc.)
- recognize that for proportional relationships, the unit rate is the slope of the graph
- compare the unit rates of two proportional relationships represented in different ways
- explain why the slope is the same between any two distinct points on a non-vertical line by drawing similar right triangles and comparing the ratios of their sides
- derive the equation $y = mx$ for a line through the origin
- derive the equation $y = mx + b$ for a line intercepting the y-axis at b
- construct a function to model a linear relationship between two quantities
- determine the rate of change and initial value of a function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph
- interpret the rate of change and initial value of a function in terms of the situation it models
- compare properties such as rate of change, intercepts, domain and range of two functions each represented in a different way
- understand solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs
- understand points of intersection satisfy both equations simultaneously
- solve systems of two linear equations in two variables algebraically
- estimate solutions of two linear equations in two variables by graphing the equations
- determine the number of solutions a system of two linear equations will have based upon inspection
- solve a system of two linear equations modeling real-world and mathematical problems

SUGGESTED ACTIVITIES

Linear Systems Project
Function Choice Board Project
8.EE.B.5 Who Has the Best Job?
8.EE.B.6 Slopes Between Points on a Line
8.F.A.1 Function Rules
8.F.A.2 Battery Charging
8.F.A.3 Introducing to Linear Functions
8.F.B.4 Chicken and Steak, Variation 1
8.F.B.4 Baseball Cards
8.F.B.4 Delivering the Mail
8.EE.C.8a Intersection of Two Lines
8.EE.C.8 How Many Solutions?
8.EE.C.8 Kimi and Jordan

EVIDENCE OF LEARNING

Formative Assessments:	**Summative Assessment:**

BLOOMINGDALE PUBLIC SCHOOLS

Classroom Discussion Exit Slip Checklists Peer Assessment Vocabulary Quizzes Rubrics Participation and teacher observation Mini Whiteboard Responses Think-Pair-Share Concept Map Classroom Poll	Unit Tests End-of-Book Test NJSLA Test
Benchmark Assessment: iReady Benchmark Unit Benchmarks	**Alternative Assessments:** Project Portfolio

INSTRUCTIONAL RESOURCES

Core Instructional Resource:	**Teacher Created Materials:**	**Supplemental Resources:**
HMH Into Math Achieve the Core	Nearpod Presentations	Nearpod Desmos Reflex Math/ FRAX Khan Academy Kendall Hunt Open Middle NJ Digital Item Library

INTEGRATED ACCOMMODATIONS AND MODIFICATIONS

Special Education:
Provide modified notes and access to extra copies online
Provide oral reminders and check student work during independent work time
Model skills/techniques to be mastered
Check and sign assignment planner
Preferential seating
Pair visual prompts with verbal presentations
Modified or scaffolded homework and classwork
Extended time as needed
Provide graphic organizers and study guides

English Learners:
Provide scaffolded assignments and assessments
Pair visual prompts with visual presentations
Check and sign assignment planner

Native Language translation (peer, online assistive technology, translation device, bilingual dictionary)
Extended time for assignment and assessment as needed
Highlight key vocabulary
Use graphic organizers
Provide verbal and written directions
Preferential seating with a English-speaking peer

At Risk of Failure:
Check and sign assignment planner
Encourage class participation and reinforce skills
Model skills and assignments
Extended to time to complete class work
Preferential seating
Provide extra help outside of class and 1:1 instruction when needed
Communicate regularly with students' other teachers
Provide positive feedback for tasks well done
Encourage student to proofread assessments and projects and ask for teacher proofreading of large writing assignments

Gifted and Talented:
Pose higher-level thinking questions
Provide higher level reading and writing materials for literacy based activities
Probe student to extend thinking beyond the text or connect two or more texts
Provide alternate or project-based assessments and assignments

Students with 504 Plans
Provide extended time as needed
Modify length of writing assignment
Provide short breaks within the lesson
Provide scaffolding for students
Utilize graphic organizers

UNIT 4
Linear Models for Scatter Plots and Two - Way Tables
UNIT SUMMARY
In this unit, students will… • construct scatter plots for bivariate measurement data to investigate patterns of association between two quantities.

- interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities.
- describe patterns such as:
  - clustering
  - outliers
  - positive association
  - negative association
  - linear association
  - nonlinear association
- informally fit a straight line for scatter plots that suggest a linear association.
- informally assess the model fit by judging the closeness of the data points to the line for scatterplots that suggest a linear association.
- use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. For example, in a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height.
- construct a two-way table summarizing data on two categorical variables collected from the same subjects
- interpret a two-way table summarizing data on two categorical variables collected from the same subjects.
- use relative frequencies calculated for rows or columns to describe possible association between the two variables. For example, collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores?

NEW JERSEY STUDENT LEARNING STANDARDS MATHEMATICS

Module A:

8.SP.A.1 Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.

8.SP.A.2 Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit (e.g., line of best fit) by judging the closeness of the data points to the line

8.SP.A.3 Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. For example, in a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height.

8.SP.A.4 Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a

two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables. For example, collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores?

INTERDISCIPLINARY CONNECTIONS

Interdisciplinary Standards NJSLS- Science:

MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
MS-ETS1-2. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
MS-ETS1-3. Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
MS-ETS1-4. Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

NJSLS Language Arts Companion Standards for Technical subjects:

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.R7. Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.
RST.6-8.2. Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.
RST.6-8.3. Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
RST.6-8.4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics
RST.6-8.7. Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table

New Jersey Student Learning Standards: Career Readiness, Life Literacies and Key Skills (2020)
9.4.8.CI.1: Assess data gathered on varying perspectives on causes of climate change (e.g., crosscultural, gender-specific, generational), and determine how the data can best be used to design multiple potential solutions

9.4.8.CT.2: Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option

9.4.8.GCA.2: Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal

9.4.8.IML.5: Analyze and interpret local or public data sets to summarize and effectively communicate the data

9.4.8.TL.1: Construct a spreadsheet in order to analyze multiple data sets, identify relationships, and facilitate data-based decision-making.

21st CENTURY LIFE AND CAREER STANDARDS

Career Readiness, Life Literacies, and Key Skills Practices describe the habits of the mind that all educators in all content areas should seek to develop in their students. They are practices that have been linked to increase college, career, and life success.

1. Act as a responsible and contributing community member and employee.
2. Attend to financial well-being.
3. Consider the environmental, social and economic impacts of decisions.
4. Demonstrate creativity and innovation.
5. Utilize critical thinking to make sense of problems and persevere in solving them.
6. Model integrity, ethical leadership and effective management.
7. Plan education and career paths aligned to personal goals.
8. Use technology to enhance productivity, increase collaboration and communicate effectively.
9. Work productively in teams while using cultural global competence.

9.1: Personal Financial Literacy

BB. Civic Responsibility
CC. Financial Institutions
DD. Financial Psychology
EE. Planning and Budgeting
FF. Risk Management and Insurance
GG. Civic Financial Responsibility
HH. Credit Profile
II. Economic and Government Influences
JJ. Credit and Debt Management

9.2: Career Awareness, Exploration & Preparation, and Training

S. Career Awareness (K-2)
T. Career Awareness and Planning (3-5)
U. Career Awareness and Planning (6-8)
V. Career Awareness and Planning (9-12)

9.4 Life Literacies and Key Skills

A. Creativity and Innovation
B Critical Thinking and Problem-solving
C. Digital Citizenship

9.3: Career and Technical Education

WW. Agriculture
XX. Architecture
YY. Arts,A/V, Technology
ZZ. Business Management
AAA. Education
BBB. Finance
CCC. Government
DDD. Health Science
EEE. Hospital & Tourism
FFF. Human Services
GGG. Information Tech.
HHH. Law and Public Safety
III. Manufacturing
JJJ. Marketing
KKK. Science, Technology, Engineering & Math
LLL. Trans./Logistics

	D. Global and Cultural Awareness W. Information and Media Literacy X. Technology Literacy	

TECHNOLOGY STANDARDS

8.1: Computer Science A. Computing systems B. Networks and the Internet C. Impacts of Computing D. Data & Analysis E. Algorithms & Programming	**8.2 Design Thinking** A. Engineering Design B. Interaction of Technology and Humans C. Nature of Technology D. Effects of Technology on the Natural World E. Ethics & Culture

ENDURING UNDERSTANDINGS

- lines used to model the association between two quantities will provide more information than just the data points themselves.
- the model line gets more accurate as more data points are located on the line.
- once the equation of a linear model is found, it can be used to solve problems in the context of bivariate measurement data.
- the slope and intercept of the linear model can be interpreted in the context of the problem.
- scatterplots show whether or not there is an association between two quantities.
- patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table.
- clustering is when members of a data set surround a particular number.
- an outlier is an element of a data set that distinctly stands out from the rest of the data.
- positive association is when the slope of the model line is positive.
- negative association is when the slope of the model line is negative.
- the association is linear when a line will model the data.
- the association is nonlinear when a line will not model the data.
- straight lines are widely used to model relationships between two quantitative variables.
- a two-way table summarizes data about two categorical variables collected from the same subjects.
- relative frequencies for rows or columns in a two-way table can be used to describe possible associations between the two variables.

ESSENTIAL QUESTIONS

- Why is it important to describe patterns of an association between two quantities
- When is a scatterplot used to determine if there is an association between two quantities?

- When is a two-way table used to determine if there is an association between two variables?

STUDENT LEARNING OBJECTIVES (Students are learning to / Students are learning that)

Students are learning to/that…

- construct scatter plots
- interpret scatter plots to investigate patterns of association between two quantities
- describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association
- know straight lines are used to model relationships between two quantitative variables
- informally fit a straight line for scatter plots that suggest a linear association
- informally assess the fit of the line for a scatter plot by judging the closeness of the data points to the line
- interpret the slope and intercept in the context of bivariate measurement data using the equation of a linear model
- understand two-way tables can be used to show patterns of association in categorical data
- construct a two-way table summarizing data on two categorical variables collected from the same subjects
- interpret a two-way table by identifying joint frequencies and calculating marginal frequencies
- use relative frequencies calculated for rows or columns to describe possible association between the two variables

SUGGESTED ACTIVITIES

Olympic Interdisciplinary Project
8.SP.A.1 Texting and Grades 1
8.SP.A.2 Animal Brains
8.SP.A.3 US Airports
8.SP.A.4 What's Your Favorite Subject
8.SP.A.4 Music and Sports

EVIDENCE OF LEARNING

Formative Assessments:	**Summative Assessment:**
Classroom Discussion Exit Slip Checklists Peer Assessment Vocabulary Quizzes Rubrics Participation and teacher observation Mini Whiteboard Responses Think-Pair-Share	Unit Tests End-of-Book Test NJSLA Test

BLOOMINGDALE PUBLIC SCHOOLS

Concept Map Classroom Poll	
Benchmark Assessment: iReady Benchmark Unit Benchmarks	**Alternative Assessments:** Project Portfolio

INSTRUCTIONAL RESOURCES

Core Instructional Resource:	**Teacher Created Materials:**	**Supplemental Resources:**
HMH Into Math Achieve the Core	Nearpod Presentations	Nearpod Desmos Reflex Math/ FRAX Khan Academy Kendall Hunt Open Middle NJ Digital Item Library

INTEGRATED ACCOMMODATIONS AND MODIFICATIONS

Special Education:
Provide modified notes and access to extra copies online
Provide oral reminders and check student work during independent work time
Model skills/techniques to be mastered
Check and sign assignment planner
Preferential seating
Pair visual prompts with verbal presentations
Modified or scaffolded homework and classwork
Extended time as needed
Provide graphic organizers and study guides

English Learners:
Provide scaffolded assignments and assessments
Pair visual prompts with visual presentations
Check and sign assignment planner
Native Language translation (peer, online assistive technology, translation device, bilingual dictionary)
Extended time for assignment and assessment as needed
Highlight key vocabulary
Use graphic organizers
Provide verbal and written directions
Preferential seating with a English-speaking peer

At Risk of Failure:

Check and sign assignment planner
Encourage class participation and reinforce skills
Model skills and assignments
Extended to time to complete class work
Preferential seating
Provide extra help outside of class and 1:1 instruction when needed
Communicate regularly with students' other teachers
Provide positive feedback for tasks well done
Encourage student to proofread assessments and projects and ask for teacher proofreading of large writing assignments

Gifted and Talented:
Pose higher-level thinking questions
Provide higher level reading and writing materials for literacy based activities
Probe student to extend thinking beyond the text or connect two or more texts
Provide alternate or project-based assessments and assignments

Students with 504 Plans
Provide extended time as needed
Modify length of writing assignment
Provide short breaks within the lesson
Provide scaffolding for students
Utilize graphic organizers