GREEN TOWNSHIP SCHOOL DISTRICT

Content Area: **Mathematics**

Course/Grade Level: **8th Grade**

Curriculum Committee Members: Grade Level Staff Members

Principal:
Jon Paul Bollette

Board Approval Date:
2/18/26

Mission:

A New Jersey education in Mathematics builds quantitatively and analytically literate citizens prepared to meet the demands of college and career, and to engage productively in an information-driven society. All students will have access to a high-quality mathematics education that fosters a population that:

- **leverages data in decision-making and as a lens for discussing, analyzing, and responding to practical questions.**
- **persists to make sense of and model problems arising in everyday life, society, and the workplace.**
- **thinks critically and strategically to assess quantitative relationships and to solutions to complex problems.**
- **employs precise reasoning and constructs viable arguments to deduce conclusions, recognize false statements and assess peers' reasoning.**
- **interprets, evaluates and critiques the mathematics embedded in social, scientific and commercial systems, as well as the claims made in the private and public sectors.**
- **communicates precisely when conveying, representing, and justifying both qualitative and quantitative perspectives.**

Key Performance and Benchmark Tasks/Assessments

Resources for help in creating assessments

Formative assessments:

- Exit Tickets
- Homework
- Sprints
- Mini Quiz
- Online assessments

Summative Assessments:

Examples may include:

- Topic/Chapter Quiz
- Unit Test/Assessment
- Culminating Projects

Benchmark Assessments:

- Teacher-created benchmark assessments to be given periodically during the year.

Alternative Assessments:

- Teacher modifies assignments and activities based on student needs.
- Oral assessments administered in place of written when necessary.
- Accommodation and modification ideas may be found here:
    - Modifications & Accommodations Menu
    - *Assessments other than paper & pencil tests See link for more info:*

http://education.gmu.edu/assets/docs/forms/mirs/assessment_brochure.pdf

Integrated Accommodations & Modifications

Please utilize the link below for ideas and strategies to use with ***ELL, Students with IEPS & 504s, At-Risk Students and Gifted & Talented Students***.

The attached worksheets can be printed ahead of each unit during the planning phase to help the teacher plan for the needs of particular students in each class, allowing for differentiation per unit and per year. The worksheets contain suggested accommodations and modifications for Content & Material, Student Organization, Instructional Strategies, Assessments, Attention/Focus, Written Language, and Social/Behavioral.
Modifications & Accommodations Menu

Unit 1

Scientific Notation, Exponents, and Irrational Numbers	**Pacing:**
Unit Summary:	
Essential Questions: **How do the properties of exponents and scientific notation help us represent, compare, and compute with very large and very small numbers?** **What patterns and relationships exist between squares, square roots, cubes, and cube roots, and how do they help us solve equations and understand area and volume?** **Why do some geometric measurements lead to irrational numbers, and how does the Pythagorean theorem help us understand and approximate these values within the real number system?**	**Enduring Understandings:** **Exponents and scientific notation provide powerful tools for representing and operating on very large and very small numbers efficiently**, allowing us to reason about magnitude and simplify calculations without writing long strings of zeros. **The properties of exponents—including zero and negative exponents—reveal consistent patterns in mathematics**, and understanding these patterns helps us simplify expressions, solve equations, and connect numerical representations to real-world contexts. **Square roots, cube roots, and the Pythagorean theorem extend our understanding of numbers beyond rational values**, helping us model geometric relationships, approximate irrational numbers, and recognize how all real numbers are connected within a single number system.

New Jersey Student Learning Standards	Student Learning Objectives	Practices

8.EE.A.1 Know and apply the properties of integer exponents to generate equivalent numerical expressions. **8.EE.A.2** Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that $\sqrt{2}$ is irrational. **8.EE.A.3** Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. **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.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. **8.NS.A.2** Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., π^2).	Students use their place value understanding and knowledge of powers of 10 learned in grade 5 to write and operate with numbers in scientific notation. Students work with properties involving positive exponents and progress to learning definitions of an exponent of 0 and negative exponents. Students build proficiency in simplifying exponential expressions and apply these properties and definitions to more complex exponential expressions. Students order and operate with numbers written in scientific notation by combining the properties and definitions of exponents from topic B with scientific notation from topic A. By applying the properties of exponents, students can now operate with large and small positive numbers without needing to write out the many factors of 10. Students explore geometric representations of perfect squares and perfect cubes and relate these concepts to area and volume before expanding to consider squares and cubes of any rational number. Students are introduced to the Pythagorean theorem to support the need for expressing numbers that are not rational and to develop students' early awareness of the meaning of these numbers. Students begin by approximating the length of a hypotenuse of a right triangle, such as the square root of 2. . Students name and classify irrational numbers as part of the real numbers. Students then solve equations involving square roots and cube roots using square root and cube root notation. Additionally, students use the relationship between the square and the square root, and the cube and the cube root, to determine the number of solutions for equations	MP.1 Make sense of problems and persevere in solving them MP.4 Model with mathematics MP.5 Use appropriate tools strategically MP.6 Attend to precision MP.8 Look for and express regularity in repeated reasoning

Interdisciplinary Connections

2020 Career Readiness, Life Literacies, and Key Skills

9.4.8.CT.1: Evaluate diverse solutions proposed by a variety of individuals, organizations, and/or agencies to a local or global problem, such as climate change, and use critical thinking skills to predict which one(s) are likely to be effective (e.g., MS-ETS1-2).

9.4.8.CT.2: Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option (e.g., MS-ETS1-4, 6.1.8.CivicsDP.1).

Unit 1: Core Unit Content

Vocabulary

- ❑ -standard form
- ❑ -exponential form
- ❑ -power of ten
- ❑ -product
- ❑ -powers
- ❑ -to the power of
- ❑ -review of exponent rules
- ❑ -value
- ❑ -The difference between an expression and an equation.
- ❑ -simplify
- ❑ -least to greatest
- ❑ -review of properties of exponents
- ❑ -units of measurement
- ❑ -powers
- ❑ -scientific notation
- ❑ -expanded form
- ❑ -exponential notation
- ❑ -perfect cubes
- ❑ -perfect squares
- ❑ -cube root
- ❑ -square root
- ❑ -legs, hypotenuse of Pythagorean Theorem
- ❑ -square roots, cube roots
- ❑ -a number squared, a number cubed
- ❑ -The Number System (irrational, rational, whole, natural, integers
- ❑ -positive and negative number lines

Key Concepts

Scientific Notation

What students need to know

- **Definition:** A way to write very large or very small numbers using powers of 10.
  - Form: $a \times 10^n$ where $1 \leq a < 10$ and n is an integer.
- **Converting to scientific notation:**
  - Move the decimal so the number is between 1 and 10.
  - Count how many places you moved → that's the exponent.
- **Converting from scientific notation:**
  - Positive exponent → move decimal right.
  - Negative exponent → move decimal left.
- **Operations:**
  - Multiply: multiply the a values, add exponents.
  - Divide: divide the a values, subtract exponents.
  - Compare numbers using powers of 10.

Exponents

Core ideas

- **Meaning of an exponent:**
  - a^n means multiply a by itself n times.

- **Zero exponent:**
  - a^0=1 (as long as a≠0).
- **Negative exponents:**
  - a^−n=1/a^n.
- **Product rule:**
  - am⋅an=a^m+n
- **Quotient rule:**
  - (a^m)/(a^n)=a^m−n
- **Power of a power:**
  - (a^m)^n=a^mn
- **Power of a product:**
  - (ab)^n=a^nb^n
- **Power of a quotient:**
  - (a/b)^n=(a^n/b^n)

Irrational Numbers

What students need to understand

- **Definition:** Numbers that **cannot** be written as a fraction of integers.
  - Their decimals are **non-terminating** and **non-repeating**.
- **Examples:**
  - π, √2,√ 3, e
- **Rational vs. irrational:**
  - Rational → repeating or terminating decimals.
  - Irrational → never ends, never repeats.
- **Square roots:**
  - Perfect squares → rational (e.g., √49=7).
  - Non-perfect squares → irrational (e.g.,√ 5).
- **Locating irrational numbers on a number line:**
  - Estimate using nearby perfect squares.
- **Real number system:**
  - Integers, whole numbers, rational numbers, and irrational

	numbers all fit inside the real numbers.

Unit 1: Instructional Materials & Resources	
Eureka Math Squared	• Zearn (Module 7, Module 8) • DeltaMath (Grade 8: Exponents and Scientific Notation, Pythagorean Theorem, Rational and Irrational) • Khan Academy

Unit 1: Assessments

Formative assessments:

- Exit Tickets
- Homework
- Sprints
- Mini Quiz
- Online Assessments

Summative Assessments:

- Topic/Chapter Quiz
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Unit 1: Accommodations & Modifications

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Modifications & Accommodations Menu

Unit 2

Rigid Motions and Congruent Figures	Pacing:
Unit Summary: In this unit, students explore **rigid motions—translations, reflections, and rotations—as a way to understand movement and structure in the geometric plane**.	
Essential Questions: **How do translations, reflections, and rotations help us determine when two figures are congruent?** **How can rigid motions and congruence be used to explain angle relationships formed by parallel lines and the angle properties of triangles?** **Why does the Pythagorean theorem work, and how can it be applied to find distances and lengths in geometric and real-world contexts?**	**Enduring Understandings:** **Rigid motions (translations, rotations, and reflections) preserve size and shape**, allowing us to define congruence and describe geometric relationships precisely on the plane and coordinate plane. **Congruence and rigid motions provide a foundation for understanding angle relationships and triangle properties**, including angle sums, parallel line relationships, and the connection between interior and exterior angles. **The Pythagorean theorem emerges from geometric reasoning with congruent figures and rigid motions**, and it serves as a powerful tool for solving real-world and coordinate-based problems involving distance and right triangles.

New Jersey Student Learning Standards	Student Learning Objectives	Practices
8.G.A.1 Verify experimentally the properties of rotations, reflections, and translations: **8.G.A.1a** Lines are transformed to lines, and line segments to line segments of the same length. **8.G.A.1b**	Students experience rigid motions by using a transparency to represent the movement of the plane under a translation, reflection, or rotation. They apply rigid motions to draw images of figures and learn to use precise language to describe rigid motions of the plane and on the coordinate plane. Students apply and describe sequences of rigid motions through	MP.4 Model with mathematics MP.5 Use appropriate tools strategically

Angles are transformed to angles of the same measure. **8.G.A.1c** 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.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. **8.G.B.6** Explain a proof of the Pythagorean Theorem and its converse. **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. **8.G.B.8** Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.	hands-on and digital activities. They define one figure as congruent to another if there is a sequence of rigid motions that maps the figure onto the other. Applying rigid motions and the definition of congruent figures, students establish facts about the angles created by parallel lines cut by a transversal. Students use angle relationships to determine the sum of the interior angle measures of a triangle and the relationship between the exterior angle and the pair of remote interior angles of a triangle. Students use rigid motions and congruent figures to prove the Pythagorean theorem and its converse. Then they solve mathematical and real-world problems by finding unknown leg lengths of right triangles, finding the distance between two points in the coordinate plane, and finding the length of a rectangular prism's diagonal.	MP.7 Look for and make use of structure MP.8 Look for and express regularity in repeated reasoning

Interdisciplinary Connections

2020 Career Readiness, Life Literacies, and Key Skills

9.4.8.CT.1: Evaluate diverse solutions proposed by a variety of individuals, organizations, and/or agencies to a local or global problem, such as climate change, and use critical thinking skills to predict which one(s) are likely to be effective (e.g., MS-ETS1-2).

9.4.8.CT.2: Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option (e.g., MS-ETS1-4, 6.1.8.CivicsDP.1).

Unit 2: Core Unit Content

Vocabulary	*Key Concepts*
❑ -Types of Rigid Motions (translation, rotation, reflection) ❑ -image and its prime ❑ -the coordinate plane ❑ -units ❑ -vector ❑ -sequence ❑ -coordinate plane ❑ -Converse as it relates to Pythagorean Theorem (in addition to legs and hypotenuse)	**Rigid Motions** Rigid motions (also called **transformations**) are movements of a figure that **do not change its size or shape**. **Core Types of Rigid Motions** **Translations** ● Slide a figure in any direction. ● Every point moves the **same distance** and **same direction**. ● Orientation stays the same. **Reflections** ● Flip a figure over a line (line of reflection). ● Creates a mirror image. ● Distance to the line of reflection is preserved. **Rotations** ● Turn a figure around a fixed point (center of rotation). ● Need to know: ○ Direction (clockwise or counterclockwise) ○ Angle of rotation (90°, 180°, 270°)

What congruence means

Two figures are **congruent** if one can be mapped onto the other using **one or more rigid motions**.

🔹 Key ideas

- Congruent figures have the **same size and shape**.
- Corresponding sides are equal in length.
- Corresponding angles are equal in measure.
- A sequence of rigid motions can show two figures are congruent.

🔹 Showing congruence

Students should be able to:

- Describe a sequence of transformations that maps one figure onto another.
- Identify corresponding parts (angles, sides).
- Explain why a transformation proves congruence.

Coordinate Geometry Connections

8th graders also apply rigid motions on the coordinate plane.

Important skills

- Translate using rules like $(x,y)\rightarrow(x+a,y+b)$.
- Reflect across:

	○ x-axis: (x,y)→(x,−y) ○ y-axis: (x,y)→(−x,y) ○ line y=x: (x,y)→(y,x) ● Rotate around the origin: ○ 90° CCW: (x,y)→(−y,x) ○ 180°: (x,y)→(−x,−y) ○ 270° CCW: (x,y)→(y,−x)

Unit 2: Instructional Materials & Resources	
Eureka Math Squared	● Zearn (Modules 1 and 8) ● DeltaMath (Grade 8: Rigid Motions, Congruence and Similarity, Similar Figures, Basic Angle Relationship) ● Khan Academy

Unit 2: Assessments

Formative assessments:

- Exit Tickets
- Homework
- Sprints
- Mini Quiz

Summative Assessments:

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- Unit Test/Assessment
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Alternative Assessments:

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Unit 2: Accommodations & Modifications

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Modifications & Accommodations Menu

Unit 3

Dilations and Similar Figures	Pacing:
Unit Summary: This unit explores non-rigid transformations and their role in defining similar figures.	
Essential Questions: **How do dilations differ from rigid transformations, and how do these differences lead to the definition of similarity in mathematics?** **How can properties of similar figures—such as angle preservation and proportional side lengths—be used to solve real-world problems involving scale, proportions, and triangles?**	**Enduring Understandings:** • **Dilations change the size of a figure while preserving its shape**, leading to the concept of similarity, where corresponding angles remain equal and corresponding side lengths are proportional. • **Similarity provides a powerful tool for modeling and solving real-world problems**, especially with triangles, by using proportional reasoning and angle relationships to find unknown measurements.

New Jersey Student Learning Standards	Student Learning Objectives	Practices
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.	Students learn that while rigid transformations preserve both size and shape, dilations preserve only shape, leading to the mathematical definition of similarity. It focuses on the process of changing a figure on the coordinate plane. As students progress to properties of dilation and similar figures, they establish the formal relationship between figures that result from a dilation, such as angle preservation and side proportionality. Students then apply the concept of similarity,	MP.4 Model with mathematics MP.5 Use appropriate tools strategically MP.7 Look for and make use of structure

	especially focusing on triangles, to solve real-world problems where they use concepts such as solving proportions and the Triangle Angle Sum Theorem.	MP.8 Look for and express regularity in repeated reasoning

Interdisciplinary Connections
2020 Career Readiness, Life Literacies, and Key Skills

Unit 3: Core Unit Content	
Vocabulary	***Key Concepts***
❑ dilation ❑ -scale factor ❑ -center of dilation ❑ -enlargement ❑ -reduction ❑ -pre-image ❑ -image ❑ -similar figures ❑ -congruent figures ❑ -corresponding sides ❑ -corresponding angles ❑ -proportional ❑ -indirect measurement ❑ -Triangle Angle Sum Theorem ❑	**Dilations** A **dilation** is a transformation that **changes the size** of a figure but **keeps its shape**. **Core ideas** **Scale Factor** • The number that tells how much a figure is enlarged or reduced. • If the scale factor k>1: the figure **enlarges**. • If 0<k<1: the figure **shrinks**.

- If k=1: the figure stays the same size.

🔹 Center of Dilation

- The fixed point from which the figure expands or contracts.
- Every point moves along a straight line from the center.

Properties of Dilations

Dilations **preserve**:

- Angle measures
- Proportionality of side lengths
- Orientation (the figure doesn't flip)

Dilations **do not preserve**:

- Lengths
- Perimeter
- Area

Similar Figures

Two figures are **similar** if one can be mapped onto the other using a **sequence of transformations**, including **dilations** and possibly rigid motions.

What similarity means:

- Same **shape**, different **size**.
- Corresponding angles are **equal**.
- Corresponding side lengths are **proportional**.

Similarity Ratio

- The ratio of corresponding side lengths.
- Equivalent to the **scale factor** of the dilation.

Showing Figures Are Similar

Students should be able to:

- Identify corresponding sides and angles.
- Check if side lengths form equal ratios.
- Describe a dilation (and possibly a translation/rotation/reflection) that maps one figure to another.

Coordinate Geometry Connections

Dilations on the coordinate plane follow predictable rules.

Important skills

- Dilate a point from the origin using:

  $(x,y) \rightarrow (kx,ky)$

❏ Understand how dilations affect:
  - ❏ Slope (unchanged)
  - ❏ Distance (multiplied by k)
  - ❏ Area (multiplied by k2)

❏

Unit 3: Instructional Materials & Resources

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Unit 3: Assessments

Formative assessments:

- Exit Tickets
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Summative Assessments:

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Unit 3: Accommodations & Modifications

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Modifications & Accommodations Menu

Unit 4

Linear Equations in One or Two Variables	Pacing:
Unit Summary: This section focuses on solving for a single unknown and analyzing the outcome. Students learn to solve complex equations with the variable on both sides.	
Essential Questions: **How can we represent and compare linear relationships in different ways to understand how quantities change?** **What does the slope and y-intercept tell us about a real-world situation, and how can we determine them from equations, graphs, tables, or descriptions?** **Why do linear equations create straight-line graphs, and how can we tell when a relationship is not linear?**	**Enduring Understandings:** **Linear relationships describe constant rates of change.** **Multiple representations of linear relationships are connected and equivalent.** **The structure of linear equations explains why graphs are straight lines.**

New Jersey Student Learning Standards	Student Learning Objectives	Practices
. **8.EE.C7** Solve linear equations in one variable, including those with rational coefficients and requiring the distributive property and combining like terms. **8.EE.B5** Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. **8.EE.B6** Use similar triangles to explain why the slope (m) is the same between any two distinct points on a non-vertical line; derive the equation y=mx and y=mx+b. **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. **8.F.B.4**	Students learn to solve complex equations with the variable on both sides. This involves using the distributive property and combining like terms with rational coefficients to simplify the equation. A critical focus is on analyzing the final, simplified form to determine the number of solutions (one solution, no solution, infinitely many solutions). This section also introduces a two-variable equation and its graphical representation. Students use the concept of similar triangles on the coordinate plane to explain why the slope is the same between any two distinct points on a non-vertical line. Students learn to derive and interpret the core forms of a linear equation: (y=mx, y=mx+b). Students connect the symbolic forms to the graphical representation and real-world modeling. Students learn to interpret the rate of change (slope) and the initial value (y-intercept) in the context of the problem being modeled. They also distinguish these linear functions from non-linear functions (like $y=x^2$).	MP.1 Make sense of problems and persevere in solving them MP.2 Reason abstractly and quantitatively MP.3 Construct viable arguments and critique the reasoning of others MP.4 Model with mathematics MP.6 Attend to precision

Construct a function to model a linear relationship. Determine the rate of change (slope) and initial value (y-intercept) from a graph, table, or description, and interpret them in context.		

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Unit 4: Core Unit Content

Vocabulary

- ❑ equation
- ❑ -variable
- ❑ -solution
- ❑ -equivalent equations
- ❑ -inverse operations
- ❑ -distributive property
- ❑ -no solution
- ❑ -infinitely many solutions
- ❑ -like terms
- ❑ Linear equations in two variables:
- ❑ -linear equation
- ❑ -coordinate plane
- ❑ -ordered pair
- ❑ -y-intercept
- ❑ -x-intercept
- ❑ -slope (rate of change)
- ❑ Forms of Linear Equations:

Key Concepts

Linear Equations in One Variable

These are equations with only **one unknown**, like 3x+5=20.

Core Concepts

1. Solving Linear Equations

Students should understand how to:

- Use **inverse operations** to isolate the variable
- Maintain **balance** on both sides of the equation
- Solve equations with:

- ❑ -slope-intercept form
- ❑ -standard form
- ❑ -point-slope form
- ❑ -vertical line
- ❑ -horizontal line
- ❑ -linear function

    - Addition/subtraction
    - Multiplication/division
    - Variables on both sides
    - Parentheses (using the distributive property)
    - Combining like terms

2. Types of Solutions

- **One solution** (e.g., $2x=10$)
- **No solution** (e.g., $3x+2=3x-5$)
- **Infinitely many solutions** (e.g., $4x-1=4x-1$)

3. Checking Solutions

- Substitute the value back into the original equation
- Verify both sides are equal

Linear Equations in Two Variables

These involve **x** and **y**, like $y=2x+3$.

Core Concepts

1. Understanding Linear Relationships

- A linear equation represents a **straight line** on a graph
- Solutions are **ordered pairs** (x,y) that make the equation true

2. Slope

- Measures **rate of change**

- Formula:

slope=ΔyΔx=y2−y1x2−x1

- Positive, negative, zero, or undefined slopes

3. Slope-Intercept Form

y=mx+b

Where:

- m = slope
- b = y-intercept (where the line crosses the y-axis)

4. Graphing Linear Equations

Students should be able to:

- Plot using slope and y-intercept
- Create a table of values
- Identify intercepts
- Recognize horizontal and vertical lines

5. Solutions to Systems (Intro Level)

Even though full systems of equations are often 8th-grade or Algebra 1 topics, students should understand:

- A point where two lines intersect is a **solution** to both equations
- Parallel lines → no solution
- Same line → infinitely many solutions

	Connecting One-Variable and Two-Variable Equations 8th graders should see how these ideas relate: ● Solving 2x+3=11 gives a **single value** ● Solving y=2x+3 gives **infinitely many pairs** ● Both rely on understanding operations, variables, and equality

Unit 4: Instructional Materials & Resources	
Eureka Math Squared	●

Unit 4: Assessments
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Unit 5

Systems of Linear Equations	**Pacing:**
Unit Summary: This unit focuses on systems of linear equations and the methods used to find their common solution. The core understanding is that the solution is the point where all equations are satisfied simultaneously.	
Essential Questions: **What does it mean for two linear equations to have a solution in common, and how is that shown on a graph?** **How can different methods—graphing, substitution, and elimination—be used to solve a system, and how do we decide which method is most effective?**	**Enduring Understandings:** **Solutions to systems of linear equations represent shared values that satisfy both relationships.** **Systems of linear equations can be solved using multiple strategies that are mathematically equivalent.**

How can we predict and explain the number of solutions a system will have, and what do those solutions mean in real-world situations?	**The structure of linear systems determines the number of possible solutions.**

New Jersey Student Learning Standards	Student Learning Objectives	Practices
8.EE.C.8.a Understand that solutions to a system of two linear equations in two variables correspond to points of intersection on their graphs. **8.EE.C.8.b** Solve systems of two linear equations in two variables algebraically (using Substitution and Elimination methods). **8.EE.C.8.c** Analyze the number of solutions a system can have and solve simple cases by inspection (e.g., recognizing parallel lines have no solution). Solve real-world and mathematical problems leading to two linear equations in two variables.	. This section connects the algebraic equations to their visual representation on the coordinate plane. Algebraic methods provide exact solutions and are crucial for solving real-world problems. Here, students will master the substitution method and the elimination method. After that, students learn to analyze systems not just for the solution but for the fundamental relationship between the two lines. Students apply their skills to write systems that model real-world scenarios. They define the variables, write the two equations, and solve the system to answer the practical question posed.	MP.1 Make sense of problems and persevere in solving them MP.2 Reason abstractly and quantitatively MP.3 Construct viable arguments and critique the reasoning of others MP.4 Model with mathematics MP.6 Attend to precision

Interdisciplinary Connections

2020 Career Readiness, Life Literacies, and Key Skills

9.4.8.CT.1: Evaluate diverse solutions proposed by a variety of individuals, organizations, and/or agencies to a local or global problem, such as climate change, and use critical thinking skills to predict which one(s) are likely to be effective (e.g., MS-ETS1-2).

9.4.8.CT.2: Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option (e.g., MS-ETS1-4, 6.1.8.CivicsDP.1).

Unit 5: Core Unit Content

Vocabulary	*Key Concepts*
❑ System of Linear Equations ❑ -solution of a system ❑ -simultaneous equations ❑ -substitution method ❑ -elimination method ❑ -intersecting lines ❑ -parallel lines ❑ -standard form	**What Is a System of Linear Equations?** A **system of linear equations** is a set of **two or more linear equations** with the **same variables** (usually x and y). Example: {y=2x+3y=−x+9 The goal is to find the **solution**, which is the point (x,y) that makes **both** equations true. **Types of Solutions** Students should understand the three possible outcomes: **One Solution** ● The lines intersect at exactly **one point**. ● The system is **consistent and independent**. **No Solution** ● The lines are **parallel** (same slope, different intercepts). ● The system is **inconsistent**. **Infinitely Many Solutions** ● The lines are **the same line** (same slope and intercept).

- The system is **consistent and dependent**.

Methods for Solving Systems

8th graders typically learn **three main methods**:

1. Graphing

- Plot both equations on the coordinate plane.
- The intersection point is the solution.
- Best for visual understanding, but not always precise.

2. Substitution

- Solve one equation for a variable (e.g., $y=3x-2$).
- Substitute into the other equation.
- Solve for the remaining variable.

3. Elimination (Addition Method)

- Add or subtract equations to eliminate one variable.
- Solve the resulting one-variable equation.
- Substitute back to find the other variable.

Interpreting Solutions in Context

Students should be able to:

- ❏ Understand what the solution means in a **real-world situation**
- (e.g., when two costs are equal, when two moving objects meet).
- Write systems from word problems.

- Check if a solution makes sense in the context.

Recognizing Systems from Equations

Students should be able to identify:

- Whether lines are parallel, intersecting, or identical by comparing:
  - **Slopes**
  - **Y-intercepts**

Example:

- Same slope, different intercept → **no solution**
- Same slope, same intercept → **infinitely many solutions**

Using Tables and Patterns

Students may also explore systems by:

- Creating tables of values for each equation
- Looking for matching (x,y) pairs
- Understanding how different representations connect

Putting It All Together

By the end of 8th grade, students should be able to:

- Solve systems using graphing, substitution, and elimination
- Identify the number of solutions

	• Interpret solutions in real-world contexts • Compare slopes and intercepts to predict solution types • Write systems from word problems

Unit 5: Instructional Materials & Resources	
Eureka Math Squared	•

Unit 5: Assessments
Formative assessments: • Exit Tickets • Homework • Sprints • Mini Quiz
Summative Assessments: • Topic/Chapter Quiz • Unit Test/Assessment • Culminating Projects

Alternative Assessments:
• Teacher modifies assignments and activities based on student needs.
• Oral assessments administered in place of written when necessary.
• Accommodation and modification ideas may be found here:
  ○ Modifications & Accommodations Menu
  ○ *Assessments other than paper & pencil tests See link for more info:* *http://education.gmu.edu/assets/docs/forms/mirs/assessment_brochure.pdf*

Unit 5: Accommodations & Modifications

Please utilize the link below for ideas and strategies to use with ELL, Students with IEPS & 504s, At-Risk Students and Gifted & Talented Students. Note possible accommodations or modifications for this unit below.
Modifications & Accommodations Menu

Unit 6

Functions and Bivariate Statistics	Pacing:
Unit Summary: This unit establishes the definition of a function and compares different types of rates of change	
Essential Questions: **How can we determine whether a relationship is a function, and why does that matter?** **How do different representations—graphs, tables, equations, and data displays—help us understand patterns and relationships between variables?** **How can mathematical models and formulas be used to solve real-world problems and justify our solutions?**	**Enduring Understandings:** **Functions model relationships between variables with clear rules and constraints.** **Patterns in data and relationships help us make sense of real-world situations.** **Mathematical formulas and models allow us to solve practical problems efficiently.**

New Jersey Student Learning Standards	Student Learning Objectives	Practices
8.F.A.1 Understand that a function is a rule that assigns to each input exactly one output. **8.F.A.3** Interpret the equation y=mx +b as defining a linear function; give examples of functions that are not linear (non-linear functions) **8.F.B.4** Construct a function to model a linear relationship. Determine the rate of change (m) and initial value (b) from a description, table, or graph **8. SP.A.1** Construct and interpret scatter plots for bivariate numerical data to investigate patterns of association (clustering, outliers, positive/negative/nonlinear association). **8.SP.A.2** Informally fit a straight line to a model of a linear association in a scatter plot. **8.SP.A.3**	Students understand that a function is a rule that assigns exactly one output (y) to each input (x). Students use the Vertical Line Test to identify a function from its graph. Linear functions are straight lines, and their equations can be written in the form y=mx +b. Non-linear functions are characterized by a rate of change that is not constant. Students can construct a function to model a linear relationship from a description, a table, or a graph, interpreting the rate of change and initial value. Students also examine relationships between two variables using statistical tools. They use scatter plots to visually represent this data and analyze the pattern. Students also use two-way tables to summarize and display the frequencies and relative frequencies, allowing them to examine possible associations between the two variables. In the last section of the unit, students apply formulas to calculate the space occupied by geometric solids. Students use these formulas to solve real-world and mathematical problems, often involving finding an unknown dimension given the volume, or calculating the volume for comparison.	MP.1 Make sense of problems and persevere in solving them MP.2 Reason abstractly and quantitatively MP.3 Construct viable arguments and critique the reasoning of others MP.4 Model with mathematics MP.6 Attend to precision

Use the equation of a linear model to solve problems, interpreting the slope and intercept in context. **8.SP.A.4** Understand patterns of association in bivariate categorical data by displaying frequencies in a two-way table. **8.G.C.9** Know the formulas for the volume of cones ($V=1/3\pi r^2h$), cylinders ($V=\pi r^2h$), and spheres ($V=4/3\pi r^3$) and use them to solve problems.		

Interdisciplinary Connections

[2020 Career Readiness, Life Literacies, and Key Skills]

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Unit 6: Core Unit Content

Vocabulary	*Key Concepts*
❑ In functions, the key vocabulary is: ❑ -function ❑ -input ❑ -output ❑ -rate of change ❑ -linear function ❑ -non-linear function ❑ -initial value ❑ -Vertical Line Test ❑ ❑ In bivariate data, the key vocabulary is: ❑ -bivariate data	# Functions A **function** is a rule that assigns **each input exactly one output**. ## Core Concepts ◆ **1. Definition of a Function**

- ❑ -scatter plot
- ❑ -association
- ❑ -positive association
- ❑ -negative association
- ❑ -no association
- ❑ -Line of Best Fit
- ❑ -Outlier
- ❑ -two-way table
- ❑ -categorical vs. numerical data
- ❑
- ❑ In volume, the key vocabulary is:
- ❑ -volume
- ❑ -cylinder
- ❑ -cone
- ❑ -sphere
- ❑ -radius
- ❑ -height
- ❑ -pi
- ❑

- A relation is a **function** if no input (x-value) is paired with more than one output (y-value).
- Can be represented by:
  - Tables
  - Graphs
  - Equations
  - Mappings
  - Verbal descriptions

🔹 2. Function Notation

- Written as f(x), meaning “the output when the input is x.”
- Example: If f(x)=3x+2, then f(4)=14.

🔹 3. Linear Functions

- Have a constant rate of change (slope).
- Represented by y=mx+b.
- Graph is a straight line.

🔹 4. Rate of Change

- Measures how much the output changes for each unit of input.
- For linear functions, the rate of change is the **slope**.

🔹 5. Identifying Functions

Students should be able to:

- Tell if a graph is a function (vertical line test).
- Determine if a table or mapping shows a function.
- Recognize linear vs. nonlinear functions.

Bivariate Statistics

Bivariate data involves **two variables** measured together (e.g., hours studied and test score).

Core Concepts

1. Scatter Plots

- A graph showing paired data points.
- Helps visualize relationships between two variables.

2. Types of Associations

Students should recognize:

- **Positive association** (as x increases, y increases)
- **Negative association** (as x increases, y decreases)
- **No association**
- **Nonlinear association**

3. Line of Best Fit (Trend Line)

- A line that best represents the pattern in the data.
- Used to:
    - Make predictions
    - Describe the relationship
    - Estimate values between or beyond data points

4. Clusters and Outliers

- **Clusters:** groups of points close together

	● **Outliers:** points far from the rest of the data ● Students should understand how these affect interpretation. **5. Using Two-Way Tables (Optional in some curricula)** ● Organize data into categories for two variables. ● Used to analyze frequencies and associations. **Putting It All Together** By the end of 8th grade, students should be able to: ● Identify and evaluate functions ● Use function notation ● Compare linear and nonlinear relationships ● Interpret rate of change and initial value ● Create and analyze scatter plots ● Describe associations between variables ● Draw and interpret lines of best fit ● Use data to make predictions

Unit 6: Instructional Materials & Resources	
Eureka Math Squared	●

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