Eureka Math² Level 8 Correlation to Connecticut Model Curriculum

Level 8: Ratios and Linearity			
Model Unit Name	**Model Unit Standards**	**Lessons**	**Pacing** *Lessons that address concepts in more than one unit are only counted once*
Real Numbers	**8.NS.A.1**	**Module 1: Scientific Notation, Exponents, and Irrational Numbers** Topic E: Irrational Numbers Lesson 22: Familiar and Not So Familiar Numbers	**23 days**
	8.NS.A.2	**Module 1: Scientific Notation, Exponents, and Irrational Numbers** Topic E: Irrational Numbers Lesson 21: Approximating Values of Roots and π^2 Lesson 23: Ordering Irrational Numbers Lesson 24: Revisiting Equations with Squares and Cubes	
	8.EE.A.1	**Module 1: Scientific Notation, Exponents, and Irrational Numbers** Topic B: Properties and Definitions of Exponents Lesson 5: Products of Exponential Expressions with Whole-Number Exponents Lesson 6: More Properties of Exponents Lesson 7: Making Sense of the Exponent of 0 Lesson 8: Making Sense of Integer Exponents Lesson 9: Writing Equivalent Expressions Lesson 10: Evaluating Numerical Expressions by Using Properties of Exponents (Optional)	

Real Numbers (cont.)	**8.EE.A.2**	**Module 1: Scientific Notation, Exponents, and Irrational Numbers** Topic D: Perfect Squares, Perfect Cubes, and the Pythagorean Theorem Lesson 16: Perfect Squares and Perfect Cubes Lesson 17: Solving Equations with Squares and Cubes Lesson 20: Square Roots Lesson 24: Revisiting Equations with Squares and Cubes
	8.EE.A.3	**Module 1: Scientific Notation, Exponents, and Irrational Numbers** Topic A: Introduction to Scientific Notation Lesson 1: Large and Small Positive Numbers Lesson 2: Comparing Large Numbers Lesson 3: Time to Be More Precise—Scientific Notation Lesson 4: Adding and Subtracting Numbers Written in Scientific Notation **Module 1: Scientific Notation, Exponents, and Irrational Numbers** Topic B: Properties and Definitions of Exponents Lesson 7: Making Sense of the Exponent of 0 **Module 1: Scientific Notation, Exponents, and Irrational Numbers** Topic C: Applications of the Properties and Definitions of Exponents Lesson 11: Small Positive Numbers in Scientific Notation
	8.EE.A.4	**Module 1: Scientific Notation, Exponents, and Irrational Numbers** Topic A: Introduction to Scientific Notation Lesson 2: Comparing Large Numbers Lesson 4: Adding and Subtracting Numbers Written in Scientific Notation **Module 1: Scientific Notation, Exponents, and Irrational Numbers** Topic C: Applications of the Properties and Definitions of Exponents Lesson 12: Operations with Numbers in Scientific Notation Lesson 13: Applications with Numbers in Scientific Notation Lesson 14: Choosing Units of Measurement Lesson 15: Get to the Point

Pythagorean Theorem	**8.EE.A.2**	**Module 1: Scientific Notation, Exponents, and Irrational Numbers** Topic D: Perfect Squares, Perfect Cubes, and the Pythagorean Theorem Lesson 16: Perfect Squares and Perfect Cubes Lesson 17: Solving Equations with Squares and Cubes Lesson 20: Square Roots Lesson 24: Revisiting Equations with Squares and Cubes	**7 days**
	8.G.B.6	**Module 2: Rigid Motions and Congruent Figures** Topic D: Congruent Figures and the Pythagorean Theorem Lesson 17: Proving the Pythagorean Theorem Lesson 18: Proving the Pythagorean Theorem Lesson 19: Using the Pythagorean Theorem and Its Converse	
	8.G.B.7	**Module 2: Rigid Motions and Congruent Figures** Topic D: Congruent Figures and the Pythagorean Theorem Lesson 19: Using the Pythagorean Theorem and Its Converse Lesson 21: Applying the Pythagorean Theorem Lesson 22: On the Right Path	
	8.G.B.8	**Module 2: Rigid Motions and Congruent Figures** Topic D: Congruent Figures and the Pythagorean Theorem Lesson 20: Distance in the Coordinate Plane Lesson 22: On the Right Path	
Congruence and Similarity	**8.G.A.1**	**Module 2: Rigid Motions and Congruent Figures** Topic A: Rigid Motions and Their Properties Lesson 1: Motions of the Plane Lesson 2: Translations Lesson 3: Reflections Lesson 5: Rotations **Module 2: Rigid Motions and Congruent Figures** Topic B: Rigid Motions and Congruent Figures Lesson 7: Working Backward Lesson 8: Sequencing the Rigid Motions	**33 days**

Congruence and Similarity (cont.)	**8.G.A.2**	**Module 2: Rigid Motions and Congruent Figures** Topic B: Rigid Motions and Congruent Figures Lesson 7: Working Backward Lesson 8: Sequencing the Rigid Motions Lesson 9: Ordering Sequences of Rigid Motions Lesson 10: Congruent Figures Lesson 11: Showing Figures Are Congruent **Module 2: Rigid Motions and Congruent Figures** Topic C: Angle Relationships Lesson 12: Lines Cut by a Transversal	
	8.G.A.3	**Module 2: Rigid Motions and Congruent Figures** Topic A: Rigid Motions and Their Properties Lesson 4: Translations and Reflections on the Coordinate Plane Lesson 6: Rotations on the Coordinate Plane **Module 2: Rigid Motions and Congruent Figures** Topic B: Rigid Motions and Congruent Figures Lesson 9: Ordering Sequences of Rigid Motions **Module 3: Dilations and Similar Figures** Topic A: Dilations Lesson 1: Exploring Dilations Lesson 2: Enlargements Lesson 3: Reductions and More Enlargements Topic B: Properties of Dilations Lesson 4: Using Lined Paper to Explore Dilations Lesson 5: Figures and Dilations Lesson 6: The Shadowy Hand Lesson 7: Dilations on a Grid Lesson 8: Dilations on the Coordinate Plane	

Congruence and Similarity (cont.)		**Module 3: Dilations and Similar Figures** Topic C: Similar Figures Lesson 9: Describing Dilations Lesson 10: Sequencing Transformations **Module 3: Dilations and Similar Figures** Topic D: Applications of Similar Figures Lesson 16: Similar Right Triangles	
	8.G.A.4	**Module 2: Rigid Motions and Congruent Figures** Topic C: Angle Relationships Lesson 12: Lines Cut by a Transversal Lesson 13: Angle Sum of a Triangle Lesson 14: Showing Lines Are Parallel Lesson 15: Exterior Angles of Triangles Lesson 16: Find Unknown Angle Measures **Module 3: Dilations and Similar Figures** Topic C: Similar Figures Lesson 11: Similar Figures Lesson 12: Exploring Angles in Similar Triangles Lesson 13: Similar Triangles **Module 3: Dilations and Similar Figures** Topic D: Applications of Similar Figures Lesson 17: Similar Triangles on a Line	
	8.G.A.5	**Module 2: Rigid Motions and Congruent Figures** Topic D: Congruent Figures and the Pythagorean Theorem Lesson 17: Proving the Pythagorean Theorem Lesson 18: Proving the Pythagorean Theorem Lesson 19: Using the Pythagorean Theorem and Its Converse Lesson 20: Distance in the Coordinate Plane Lesson 21: Applying the Pythagorean Theorem Lesson 22: On the Right Path	

Congruence and Similarity (cont.)		**Module 3: Dilations and Similar Figures** Topic C: Similar Figures Lesson 12: Exploring Angles in Similar Triangles Lesson 13: Similar Triangles **Module 3: Dilations and Similar Figures** Topic D: Applications of Similar Figures Lesson 14: Using Similar Figures to Find Unknown Side Lengths Lesson 15: Applications of Similar Figures Lesson 16: Topic D Lesson 16: Similar Right Triangles	
Linear Relationships	**8.EE.B.5**	**Module 4: Linear Equations in One and Two Variables** Topic D: Slope of a Line Lesson 15: Comparing Proportional Relationships Lesson 16: Proportional Relationships and Slope	**37 days**
	8.EE.B.6	**Module 3: Dilations and Similar Figures** Topic D: Applications of Similar Figures Lesson 17: Similar Triangles on a Line **Module 4: Linear Equations in One and Two Variables** Topic C: Linear Equations in Two Variables Lesson 12: Solutions to Linear Equations in Two Variables Lesson 13: The Graph of a Linear Equation in Two Variables Lesson 14: Lines with Special Characteristics **Module 4: Linear Equations in One and Two Variables** Topic D: Slope of a Line Lesson 16: Proportional Relationships and Slope Lesson 17: Slopes of Rising Lines Lesson 18: Slopes of Falling Lines Lesson 19: Using Coordinates to Find Slope	

Linear Relationships (cont.)		**Module 4: Linear Equations in One and Two Variables** Topic E: Linear Equations in One and Two Variables Lesson 20: Slope-Intercept Form of the Equation of a Line Lesson 21: Slope and Parallel Lines Lesson 22: Point-Slope Form of the Equation of a Line Lesson 23: Comparing Equations in Different Forms **Module 4: Linear Equations in One and Two Variables** Topic F: Graphing and Writing Linear Equations Lesson 24: The Patterns, the Pops, and the Pastries Lesson 25: Lines, Lines, and More Lines Lesson 26: Linear Equations from Word Problems Lesson 27: Get to Work	
	8.EE.C.7	**Module 4: Linear Equations in One and Two Variables** Topic A: Linear Equations in One Variable Lesson 1: Equations Lesson 2: Solving Linear Equations Lesson 3: Solving Linear Equations with Rational Coefficients Lesson 4: Using Linear Equations to Solve Problems Lesson 5: An Interesting Application of Linear Equations, Part 1 Lesson 6: An Interesting Application of Linear Equations, Part 2 **Module 4: Linear Equations in One and Two Variables** Topic B: The Structure of Linear Equations in One Variable Lesson 7: Linear Equations with More Than One Solution Lesson 8: Another Possible Number of Solutions Lesson 9: Writing Linear Equations Lesson 10: Using Linear Equations to Solve Real-World Problems Lesson 11: Planning a Trip	
	8.F.A.1	**Module 6: Functions and Bivariate Statistics** Topic A: Functions Lesson 1: Motion and Speed	

Linear Relationships (cont.)		Lesson 2: Definition of a Function Lesson 4: More Examples of Functions Lesson 5: Graphs of Functions and Equations	
	8.F.A.2	**Module 6: Functions and Bivariate Statistics** Topic B: Linear and Nonlinear Functions Lesson 7: Interpreting Rate of Change and Initial Value Lesson 8: Comparing Functions	
	8.F.A.3	**Module 6: Functions and Bivariate Statistics** Topic A: Functions Lesson 3: Linear Functions and Proportionality **Module 6: Functions and Bivariate Statistics** Topic B: Linear and Nonlinear Functions Lesson 6: Linear Functions and Rate of Change Lesson 10: Graphs of Nonlinear Functions	
	8.F.B.4	**Module 6: Functions and Bivariate Statistics** Topic B: Linear and Nonlinear Functions Lesson 6: Linear Functions and Rate of Change Lesson 7: Interpreting Rate of Change and Initial Value	
	8.F.B.5	**Module 6: Functions and Bivariate Statistics** Topic B: Linear and Nonlinear Functions Lesson 9: Increasing and Decreasing Functions Lesson 10: Graphs of Nonlinear Functions	
Systems of Linear Relationships	**8.EE.C.7**	**Module 4: Linear Equations in One and Two Variables** Topic A: Linear Equations in One Variable Lesson 1: Equations Lesson 2: Solving Linear Equations Lesson 3: Solving Linear Equations with Rational Coefficients Lesson 4: Using Linear Equations to Solve Problems Lesson 5: An Interesting Application of Linear Equations, Part 1 Lesson 6: An Interesting Application of Linear Equations, Part 2	**14 days**

Systems of Linear Relationships (cont.)		**Module 4: Linear Equations in One and Two Variables** Topic B: The Structure of Linear Equations in One Variable Lesson 7: Linear Equations with More Than One Solution Lesson 8: Another Possible Number of Solutions Lesson 9: Writing Linear Equations Lesson 10: Using Linear Equations to Solve Real-World Problems Lesson 11: Planning a Trip	
	8.EE.C.8	**Module 5: Systems of Linear Equations** Topic A: Solving Systems of Linear Equations Graphically Lesson 1: Solving Problems with Equations and Their Graphs Lesson 2: Introduction to Systems of Linear Equations Lesson 3: Identifying Solutions Lesson 4: More Than One Solution Lesson 5: Estimating Solutions **Module 5: Systems of Linear Equations** Topic B: Solving Systems of Equations Algebraically Lesson 6: Solving Systems of Linear Equations without Graphing Lesson 7: The Substitution Method Lesson 8: Using Tape Diagrams to Solve Systems of Equations (Optional) Lesson 9: Rewriting Equations to Solve a System of Equations Lesson 10: Choosing a Solution Method **Module 5: Systems of Linear Equations** Topic C: Writing and Solving Systems of Linear Equations Lesson 11: Writing and Solving Systems of Equations for Mathematical Problems Lesson 12: Solving Historical Problems with Systems of Equations Lesson 13: Writing and Solving Systems of Equations for Real-World Problems Lesson 14: Back to the Coordinate Plane	

Systems of Linear Relationships (cont.)	**8.F.A.2**	**Module 6: Functions and Bivariate Statistics** Topic B: Linear and Nonlinear Functions Lesson 7: Interpreting Rate of Change and Initial Value Lesson 8: Comparing Functions	
	8.F.B.4	**Module 6: Functions and Bivariate Statistics** Topic B: Linear and Nonlinear Functions Lesson 6: Linear Functions and Rate of Change Lesson 7: Interpreting Rate of Change and Initial Value	
Volume	**8.G.C.9**	**Module 6: Functions and Bivariate Statistics** Topic E: Volume Lesson 21: Volumes of Prisms and Pyramids Lesson 22: Volume of Cylinders Lesson 23: Volume of Cones Lesson 24: Volume of Spheres Lesson 25: Applications of Volume	**5 days**
Patterns in Data	**8.SP.A.1**	**Module 6: Functions and Bivariate Statistics** Topic C: Bivariate Numerical Data Lesson 11: Scatter Plots Lesson 12: Patterns in Scatter Plots	**10 days**
	8.SP.A.2	**Module 6: Functions and Bivariate Statistics** Topic C: Bivariate Numerical Data Lesson 13: Informally Fitting a Line to Data Lesson 15: Linear Models Lesson 16: Using the Investigative Process Lesson 17: Analyzing the Model	
	8.SP.A.3	**Module 6: Functions and Bivariate Statistics** Topic C: Bivariate Numerical Data Lesson 14: Determining an Equation of a Line Fit to Data Lesson 15: Linear Models Lesson 16: Using the Investigative Process Lesson 17: Analyzing the Model	

Patterns in Data (cont.)	**8.SP.A.4**	**Module 6: Functions and Bivariate Statistics** Topic D: Bivariate Categorical Data Lesson 18: Bivariate Categorical Data Lesson 19: Association in Bivariate Categorical Data Lesson 20: Analyzing Bivariate Categorical Data	

Eureka Math^2 Scope and Sequence: Year at a Glance

Level 8: Ratios and Linearity

If a district uses this resource to implement the state model curriculum for grade 8, the following scope and sequence should be followed to ensure alignment and attention to the progressions of mathematics.

Module 1

Scientific Notation, Exponents, and Irrational Numbers

Topic A: Introduction to Scientific Notation

Lesson 1: Large and Small Positive Numbers

- Write very large and very small numbers in a form that uses exponents to prepare students for scientific notation.
- Approximate very large and very small quantities.

8.EE.A.3, MP2, 8.Mod1.AD8

Lesson 2: Comparing Large Numbers

- Write numbers as a single digit times a power of 10 in exponential form to approximate quantities.
- Compare large and small positive numbers by using *times as much as* language.

8.EE.A.3, 8.EE.A.4, MP7, 8.Mod1.AD9, 8.Mod1.AD11, 8.Mod1.AD12

Module 2

Rigid Motions and Congruent Figures

Topic A: Rigid Motions and Their Properties

Lesson 1: Motions of the Plane

- Informally describe how to map a figure to its image.
- Demonstrate that the distance between two points stays the same under rigid motions.

8.G.A.1, 8.G.A.1.a, 8.G.A.1.b, 8.G.A.1.c, MP5, 8.Mod2.AD1

Lesson 2: Translations

- Apply translations to the plane.
- Identify the basic properties of translations.

8.G.A.1, 8.G.A.1.a, 8.G.A.1.b, 8.G.A.1.c, MP6, 8.Mod2.AD1

Lesson 3: Reflections

- Apply reflections to the plane.
- Identify the basic properties of reflections.

8.G.A.1, 8.G.A.1.a, 8.G.A.1.b, 8.G.A.1.c, MP8, 8.Mod2.AD1

Module 3

Dilations and Similar Figures

Topic A: Dilations

Lesson 1: Exploring Dilations

- Informally describe the effects of dilations.
- Classify a dilation as a transformation that is not a rigid motion.

8.G.A.3, MP8, 8.Mod3.AD2

Lesson 2: Enlargements

- Apply a dilation with a whole-number scale factor greater than 1.
- Describe the effects of a dilation with a whole-number scale factor greater than 1.

8.G.A.3, MP6, 8.Mod3.AD2

Lesson 3: Reductions and More Enlargements

- Apply a dilation with a scale factor greater than 0.
- Describe the effects of a dilation with a scale factor greater than 0.

8.G.A.3, MP8, 8.Mod3.AD2

Module 4

Linear Equations in One and Two Variables

Topic A: Linear Equations in One Variable

Lesson 1: Equations

- Analyze an equation to make sense of how to solve it.
- Identify whether an equation is a linear equation.

8.EE.C.7.b, MP7, 8.Mod4.AD11

Lesson 2: Solving Linear Equations

- Identify the properties of equality.
- Solve multi-step linear equations in one variable with variables on both sides of the equations.

8.EE.C.7, 8.EE.C.7.b, MP6, 8.Mod4.AD9, 8.Mod4.AD11

Lesson 3: Solving Linear Equations with Rational Coefficients

- Solve multi-step linear equations in one variable with rational coefficients.

8.EE.C.7, 8.EE.C.7.b, MP7, 8.Mod4.AD9, 8.Mod4.AD11

Module 5

Systems of Linear Equations

Topic A: Solving Systems of Linear Equations Graphically

Lesson 1: Solving Problems with Equations and Their Graphs

- Formulate a problem from a context.
- Apply different mathematical tools to model, analyze, and answer a real-world question.

8.EE.C.8.a, 8.EE.C.8.b, 8.EE.C.8.c, MP4, 8.Mod5.AD1, 8.Mod5.AD3, 8.Mod5.AD5

Lesson 2: Introduction to Systems of Linear Equations

- Graph a system of linear equations to identify the solution.
- Recognize that the ordered pair representing the intersection point of the lines is the solution to the system of linear equations.

8.EE.C.8.a, MP6, 8.Mod5.AD1

Module 6

Functions and Bivariate Statistics

Topic A: Functions

Lesson 1: Motion and Speed

- Calculate the average speed of linear and nonlinear motion.
- Understand that a function is a special type of rule.

8.F.A.1, MP8, 8.Mod6.AD1

Lesson 2: Definition of a Function

- Determine that a function is a rule that assigns to each input one and only one output.
- Identify functions that can be represented by an equation and those that cannot.

8.F.A.1, MP2, 8.Mod6.AD1

Lesson 3: Linear Functions and Proportionality

- Write equations that represent linear functions.
- Determine what inputs make sense in the context of a linear function.

8.F.A.3, MP2, 8.Mod6.AD3

Module 1

Lesson 3: Time to Be More Precise—Scientific Notation

- Write numbers given in standard form in scientific notation.

8.EE.A.3, MP3, 8.Mod1.AD8

Lesson 4: Adding and Subtracting Numbers Written in Scientific Notation

- Add and subtract numbers written in scientific notation.
- Rewrite sums and differences in scientific notation.

8.EE.A.4, MP6, 8.Mod1.AD10, 8.Mod1.AD12

Topic B: Properties and Definitions of Exponents

Lesson 5: Products of Exponential Expressions with Whole-Number Exponents

- Apply understanding of exponential notation to write equivalent expressions for $x^m \cdot x^n$.

8.EE.A.1, MP8, 8.Mod1.AD5

Lesson 6: More Properties of Exponents

- Encounter and apply properties of exponents, including raising powers to powers, raising products to powers, and raising quotients to powers.

8.EE.A.1, 8.Mod1.AD5

Module 2

Lesson 4: Translations and Reflections on the Coordinate Plane

- Apply translations and reflections on the coordinate plane.
- Use coordinates to describe the location of an image under a translation or a reflection.

8.G.A.3, MP6, 8.Mod2.AD4

Lesson 5: Rotations

- Apply rotations to the plane.
- Identify the basic properties of rotations.

8.G.A.1, 8.G.A.1.a, 8.G.A.1.b, 8.G.A.1.c, MP6, 8.Mod2.AD1

Lesson 6: Rotations on the Coordinate Plane

- Apply rotations around the origin on the coordinate plane.
- Use coordinates to describe the location of an image under a rotation around the origin.

8.G.A.3, MP8, 8.Mod2.AD4

Topic B: Rigid Motions and Congruent Figures

Lesson 7: Working Backward

- Precisely describe the rigid motion required to map an image back onto its original figure.

8.G.A.1, 8.G.A.1.a, 8.G.A.1.b, 8.G.A.1.c, 8.G.A.2, MP8, 8.Mod2.AD1, 8.Mod2.AD3

Module 3

Topic B: Properties of Dilations

Lesson 4: Using Lined Paper to Explore Dilations

- Draw the image of a segment under a dilation.
- Learn the properties of dilations.

8.G.A.3, MP8, 8.Mod3.AD2

Lesson 5: Figures and Dilations

- Draw images of figures under dilations with various scale factors.

8.G.A.3, MP5, 8.Mod3.AD2

Lesson 6: The Shadowy Hand

- Use a mathematical model to explain a real-world situation.
- Apply properties of dilations to make and test predictions.

8.G.A.3, MP4, 8.Mod3.AD2

Lesson 7: Dilations on a Grid

- Apply dilations on a grid.

8.G.A.3, MP7, 8.Mod3.AD2

Lesson 8: Dilations on the Coordinate Plane

- Apply dilations centered at the origin on the coordinate plane.
- Determine the scale factor of a dilation centered at the origin.

8.G.A.3, MP8, 8.Mod3.AD2, 8.Mod3.AD3

Topic C: Similar Figures

Lesson 9: Describing Dilations

- Precisely describe a dilation given a figure and its image.

8.G.A.3, MP8, 8.Mod3.AD2

Module 4

Lesson 4: Using Linear Equations to Solve Problems

- Define variables and write equations that represent a given situation.

8.EE.C.7, MP1, 8.Mod4.AD9

Lesson 5: An Interesting Application of Linear Equations, Part 1

- Informally show that every rational number has a decimal form that repeats or terminates.
- Use linear equations to write the fraction form of a decimal with one repeating digit.

8.NS.A.1, 8.EE.C.7.b, MP8, 8.Mod4.AD1, 8.Mod4.AD11

Lesson 6: An Interesting Application of Linear Equations, Part 2

- Use linear equations to write the fraction form of any repeating decimal.

8.NS.A.1, 8.EE.C.7.b, MP8, 8.Mod4.AD1, 8.Mod4.AD11

Topic B: The Structure of Linear Equations in One Variable

Lesson 7: Linear Equations with More Than One Solution

- Identify that linear equations in one variable with infinitely many solutions are equivalent to the equation $a = a$.
- Solve linear equations in one variable that have only one solution or infinitely many solutions.

8.EE.C.7.a, 8.EE.C.7.b, MP7, 8.Mod4.AD10, 8.Mod4.AD11

Module 5

Lesson 3: Identifying Solutions

- Recognize that a system of linear equations that represents parallel lines has no solution.
- Analyze a system of linear equations to determine whether a solution exists.

8.EE.C.8.a, 8.EE.C.8.b, MP7, 8.Mod5.AD1, 8.Mod5.AD4

Lesson 4: More Than One Solution

- Recognize that a system of linear equations that represents the same line has infinitely many solutions.
- Analyze whether a system of linear equations has only one solution, no solution, or infinitely many solutions.

8.EE.C.8.a, 8.EE.C.8.b, MP7, 8.Mod5.AD1, 8.Mod5.AD3, 8.Mod5.AD4

Lesson 5: Estimating Solutions

- Recognize and describe the limitations of solving a system of linear equations by graphing.

8.EE.C.8.a, 8.EE.C.8.b, MP1, 8.Mod5.AD1, 8.Mod5.AD3

Topic B: Solving Systems of Linear Equations Algebraically

Lesson 6: Solving Systems of Linear Equations without Graphing

- Solve systems of linear equations by using the substitution method to write the systems as linear equations in one variable.

8.EE.C.8.b, MP6, MP8, 8.Mod5.AD2

Module 6

Lesson 4: More Examples of Functions

- Determine that not all functions have numerical inputs and outputs.
- Determine what inputs make sense for a variety of functions.

8.F.A.1, MP7, 8.Mod6.AD1

Lesson 5: Graphs of Functions and Equations

- Determine that if a function can be represented by an equation, then the graph of the function is the same as or some part of the graph of the equation.
- Determine whether a given graph represents a function.

8.F.A.1, MP6, 8.Mod6.AD1

Topic B: Linear and Nonlinear Functions

Lesson 6: Linear Functions and Rate of Change

- Calculate rates on a given interval to determine whether a function is a linear function.
- Determine the rate of change for a linear function and interpret the rate of change in context.

8.F.A.3, 8.F.A.4, 8.SP.A.3, MP2, 8.Mod6.AD3, 8.Mod6.AD4, 8.Mod6.AD5

Lesson 7: Interpreting Rate of Change and Initial Value

- Interpret the rate of change and initial value of a linear function in context.
- Use rate of change to compare two linear functions.

8.F.A.2, 8.F.A.4, 8.SP.A.3, MP2, 8.Mod6.AD2, 8.Mod6.AD4, 8.Mod6.AD5

Module 1

Lesson 7: Making Sense of the Exponent of 0

- Define x^0 by confirming that the definition upholds the properties of exponents.
- Evaluate powers with an exponent of 0.

8.EE.A.1, 8.EE.A.3, MP3, 8.Mod1.AD5, 8.Mod1.AD8

Lesson 8: Making Sense of Integer Exponents

- Explore and develop an understanding of negative exponents.
- Write equivalent expressions given an expression of the form $\frac{x^m}{x^n}$.

8.EE.A.1, MP6, 8.Mod1.AD5

Lesson 9: Writing Equivalent Expressions

- Write equivalent expressions by using all the properties and definitions of exponents.

8.EE.A.1, MP7, 8.Mod1.AD5

Lesson 10: Evaluating Numerical Expressions by Using Properties of Exponents (Optional)

- Simplify and evaluate exponential expressions by using the properties and definitions of exponents.

8.EE.A.1, MP3, 8.Mod1.AD5

Module 2

Lesson 8: Sequencing the Rigid Motions

- Describe a sequence of rigid motions that maps one figure onto another.
- Determine that the properties of individual rigid motions also apply for a sequence of rigid motions.

8.G.A.1, 8.G.A.1.a, 8.G.A.1.b, 8.G.A.1.c, 8.G.A.2, MP1, 8.Mod2.AD1, 8.Mod2.AD3

Lesson 9: Ordering Sequences of Rigid Motions

- Determine whether the order in which a sequence of rigid motions is applied matters.

8.G.A.2, 8.G.A.3, MP8, 8.Mod2.AD2, 8.Mod2.AD4

Lesson 10: Congruent Figures

- Describe a sequence of rigid motions that maps one figure onto a congruent figure.

8.G.A.2, MP6, 8.Mod2.AD3

Lesson 11: Showing Figures Are Congruent

- Show figures are congruent by describing a sequence of rigid motions that maps one figure onto the other.

8.G.A.2, MP1, 8.Mod2.AD2

Module 3

Lesson 10: Sequencing Transformations

- Apply sequences of transformations.
- Recognize a sequence that involves a dilation and a translation as a single dilation.

8.G.A.3, MP1, 8.Mod3.AD2

Lesson 11: Similar Figures

- Describe a sequence of rigid motions or dilations, or both, to show that two figures are similar.
- Identify properties of similar figures.

8.G.A.4, MP6, 8.Mod3.AD4, 8.Mod3.AD5

Lesson 12: Exploring Angles in Similar Triangles

- Recognize that triangles with two pairs of congruent angles are similar.

8.G.A.4, 8.G.A.5, MP7, 8.Mod3.AD4, 8.Mod3.AD5, 8.Mod3.AD6

Lesson 13: Similar Triangles

- Determine whether two triangles are similar by the angle–angle criterion.

8.G.A.4, 8.G.A.5, MP3, 8.Mod3.AD4, 8.Mod3.AD6

Topic D: Applications of Similar Figures

Lesson 14: Using Similar Figures to Find Unknown Side Lengths

- Use properties of similar figures to find unknown side lengths.

8.G.A.5, MP1, 8.Mod3.AD6

Module 4

Lesson 8: Another Possible Number of Solutions

- Identify that linear equations in one variable with no solution are equivalent to the equation $a = b$, where a and b are different numbers.
- Solve linear equations in one variable that have only one solution, infinitely many solutions, or no solution.

8.EE.C.7.a, 8.EE.C.7.b, MP7, 8.Mod4.AD10, 8.Mod4.AD11

Lesson 9: Writing Linear Equations

- Write equations with only one solution, infinitely many solutions, or no solution.
- Classify equations based on their number of solutions.

8.EE.C.7.a, MP7, 8.Mod4.AD10

Lesson 10: Using Linear Equations to Solve Real-World Problems

- Solve real-world problems by using linear equations in one variable.

8.EE.C.7, 8.EE.C.7.a, 8.EE.C.7.b, MP2, 8.Mod.4.AD9, 8.Mod4.AD10, 8.Mod4.AD11

Lesson 11: Planning a Trip

- Solve a real-world problem by using linear equations in one variable.

8.EE.C.7, 8.EE.C.7.b, MP4, 8.Mod.4.AD9, 8.Mod4.AD11

Module 5

Lesson 7: The Substitution Method

- Solve a system of linear equations by using the substitution method.
- Apply the multiplication property of equality as part of the substitution method.

8.EE.C.8.a, 8.EE.C.8.b, MP1, 8.Mod5.AD1, 8.Mod5.AD2

Lesson 8: Using Tape Diagrams to Solve Systems of Equations (Optional)

- Find the solution to a system of linear equations by using tape diagrams.
- Create tape diagrams to represent a system of linear equations.

8.EE.C.8.b, MP7, 8.Mod5.AD2,

Lesson 9: Rewriting Equations to Solve a System of Equations

- Solve a system of linear equations by using the substitution method.

8.EE.C.8.b, MP7, 8.Mod5.AD2, 8.Mod5.AD4

Lesson 10: Choosing a Solution Method

- Analyze graphs and systems of equations to determine the number of solutions.
- Construct and critique arguments about the most efficient solution method.

8.EE.C.8.a, 8.EE.C.8.b, MP3, MP5, 8.Mod5.AD1, 8.Mod5.AD2, 8.Mod5.AD4

Module 6

Lesson 8: Comparing Functions

- Compare two functions represented in different ways.

8.F.A.2, MP5, 8.Mod6.AD2

Lesson 9: Increasing and Decreasing Functions

- Describe qualitative features of a function by analyzing a graph.
- Sketch the graph of a function given a description.

8.F.B.5, MP6, 8.Mod6.AD6, 8.Mod6.AD7

Lesson 10: Graphs of Nonlinear Functions

- Sketch the graph of a function with certain qualitative features based on a description.
- Classify linear and nonlinear functions given a context, an equation, or a graph.

8.F.A.3, 8.F.B.5, MP3, 8.Mod6.AD3, 8.Mod6.AD6, 8.Mod6.AD7

Topic C: Bivariate Numerical Data

Lesson 11: Scatter Plots

- Construct scatter plots and identify those that show an association between two variables.
- Describe the difference between an association and a cause and effect relationship for numerical variables.

8.SP.A.1, MP2, 8.Mod6.AD8

Module 1

Topic C: Applications of the Properties and Definitions of Exponents

Lesson 11: Small Positive Numbers in Scientific Notation
- Write small positive numbers in scientific notation.
- Order numbers written in scientific notation.

8.EE.A.3, MP3, 8.Mod1.AD8

Lesson 12: Operations with Numbers in Scientific Notation
- Interpret numbers in scientific notation displayed on digital devices.
- Operate with numbers written in scientific notation.

8.EE.A.4, MP5, 8.Mod1.AD10, 8.Mod1.AD11, 8.Mod1.AD14

Lesson 13: Applications with Numbers in Scientific Notation
- Operate with numbers written in standard form and scientific notation.

8.EE.A.4, MP1, 8.Mod1.AD10, 8.Mod1.AD11

Lesson 14: Choosing Units of Measurement
- Choose appropriate units of measurement and convert units of measurement.

8.EE.A.4, MP2, 8.Mod1.AD13

Lesson 15: Get to the Point
- Model a situation by operating with numbers in scientific notation.

8.EE.A.4, MP4, 8.Mod1.AD12

Module 2

Topic C: Angle Relationships

Lesson 12: Lines Cut by a Transversal
- Use informal arguments to establish facts about the angles created when pairs of lines are cut by a transversal.

8.G.A.2, 8.G.A.5, MP6, 8.Mod2.AD2, 8.Mod2.AD3, 8.Mod2.AD6

Lesson 13: Angle Sum of a Triangle
- Use informal arguments to verify that the sum of the interior angle measures of a triangle is $180°$.

8.G.A.5, MP3, 8.Mod2.AD5

Lesson 14: Showing Lines Are Parallel
- Use informal arguments to conclude that lines cut by a transversal are parallel when angle pairs are congruent.

8.G.A.5, MP3, 8.Mod2.AD6

Lesson 15: Exterior Angles of Triangles
- Use informal arguments to establish facts about the exterior angles of triangles.
- Determine the unknown measure of an interior or exterior angle of a triangle.

8.G.A.5, MP7, 8.Mod2.AD5, 8.Mod2.AD6

Lesson 16: Find Unknown Angle Measures
- Use facts about angle relationships to write and solve equations.

8.G.A.5, MP1, 8.Mod2.AD5, 8.Mod2.AD6

Module 3

Lesson 15: Applications of Similar Figures
- Use properties of similar figures to solve problems.

8.G.A.5, MP2, 8.Mod3.AD6

Lesson 16: Similar Right Triangles
- Apply dilations to create similar right triangles.
- Find unknown side lengths in similar right triangles.

8.G.A.3, 8.G.A.5, 8.G.B.7, MP7, 8.Mod3.AD2, 8.Mod3.AD6, 8.Mod3.AD7

Lesson 17: Similar Triangles on a Line
- Determine that right triangles with horizontal and vertical legs and with hypotenuses that lie on the same line are similar triangles.

8.EE.B.6, 8.G.A.4, MP8, 8.Mod3.AD1, 8.Mod3.AD3

Module 4

Topic C: Linear Equations in Two Variables

Lesson 12: Solutions to Linear Equations in Two Variables
- Find solutions to linear equations in two variables.
- Graph the solutions in the coordinate plane.

8.EE.B, MP8, 8.Mod4.AD3

Lesson 13: The Graph of a Linear Equation in Two Variables
- Identify that the graph of a linear equation of the form $Ax + By = C$ is a line.

8.EE.B, MP6, 8.Mod4.AD2, 8.Mod4.AD3

Lesson 14: Lines with Special Characteristics
- Graph linear equations of the form $Ax = C$ and $By = C$ where A and B are nonzero.

8.EE.B, MP8, 8.Mod4.AD2, 8.Mod4.AD3

Topic D: Slope of a Line

Lesson 15: Comparing Proportional Relationships
- Graph two proportional relationships and use unit rate to compare the steepness of each line.
- Compare proportional relationships represented in different ways.

8.EE.B.5, MP2, 8.Mod4.AD6

Module 5

Topic C: Writing and Solving Systems of Linear Equations

Lesson 11: Writing and Solving Systems of Equations for Mathematical Problems
- Write and solve systems of linear equations for mathematical problems.

8.EE.C.8.b, 8.EE.C.8.c, MP2, 8.Mod5.AD2, 8.Mod5.AD5

Lesson 12: Solving Historical Problems with Systems of Equations
- Write and solve a system of linear equations given a historical situation.

8.EE.C.8.b, 8.EE.C.8.c, MP2, 8.Mod5.AD2, 8.Mod5.AD5

Lesson 13: Writing and Solving Systems of Equations for Real-World Problems
- Write and solve a system of linear equations given a real-world situation.

8.EE.C.8.b, 8.EE.C.8.c, MP2, 8.Mod5.AD2, 8.Mod5.AD5

Lesson 14: Back to the Coordinate Plane
- Write and solve systems of linear equations when given information about two lines to identify intersection points.

8.EE.C.8.a, 8.EE.C.8.b, 8.EE.C.8.c, MP1, 8.Mod5.AD1, 8.Mod5.AD2, 8.Mod5.AD3

Module 6

Lesson 12: Patterns in Scatter Plots
- Identify and describe patterns of association between two variables represented in scatter plots.
- Identify and describe outliers and clusters in context.

8.SP.A.1, MP2, 8.Mod6.AD8

Lesson 13: Informally Fitting a Line to Data
- Informally fit a line to data displayed in a scatter plot.
- Make predictions based on the graph of a line fit to data.

8.SP.A.2, MP3, 8.Mod6.AD9

Lesson 14: Determining an Equation of a Line Fit to Data
- Determine an equation of a line informally fit to data displayed in a scatter plot and interpret the slope and y-intercept in context.

8.SP.A.3, MP6, 8.Mod6.AD10

Lesson 15: Linear Models
- Use a linear function to model the association between two numerical variables.
- Informally assess the fit of a line to data in a scatter plot by judging the closeness of the data points to the line.

8.SP.A.2, 8.SP.A.3, MP7, 8.Mod6.AD9, 8.Mod6.AD10

Lesson 16: Using the Investigative Process
- Use the investigative process to explore claims about proportional relationships in the human body.

8.SP.A.2, 8.SP.A.3, MP4, 8.Mod6.AD9, 8.Mod6.AD10

Module 1	Module 2	Module 3	Module 4	Module 5	Module 6
Topic D: Perfect Squares, Perfect Cubes, and the Pythagorean Theorem **Lesson 16:** Perfect Squares and Perfect Cubes • Recognize perfect squares from 1 to 225 and perfect cubes from 1 to 125. • Determine all numbers that square or cube to a given number. **8.EE.A.2, MP8, 8.Mod1.AD7** **Lesson 17:** Solving Equations with Squares and Cubes • Solve equations of the forms $x^2 = p$ and $x^3 = p$, where p is a rational number and the solutions are rational numbers. **8.EE.A.2, MP3, 8.Mod1.AD6, 8.Mod1.AD7** **Lesson 18:** The Pythagorean Theorem • Describe the Pythagorean theorem and the conditions required to use it. **8.G.B.7, 8.Mod1.AD15** **Lesson 19:** Using the Pythagorean Theorem • Apply the Pythagorean theorem to find the unknown length of the hypotenuse of a right triangle. • Find two consecutive whole numbers which the length of the hypotenuse is between when the length is not rational. • Use square root notation to express lengths that are not rational. **8.G.B.7, MP2, 8.Mod1.AD15**	**Topic D: Congruent Figures and the Pythagorean Theorem** **Lesson 17:** Proving the Pythagorean Theorem • Explain a proof of the Pythagorean theorem. **8.G.B.6, MP3, 8.Mod2.AD7** **Lesson 18:** Proving the Converse of the Pythagorean Theorem • Explain a proof of the converse of the Pythagorean theorem. **8.G.B.6, MP3, 8.Mod2.AD7** **Lesson 19:** Using the Pythagorean Theorem and Its Converse • Use the converse of the Pythagorean theorem to determine whether a triangle is a right triangle. • Use the Pythagorean theorem to find unknown side lengths of right triangles. **8.G.B.6, 8.G.B.7, MP7, 8.Mod2.AD7, 8.Mod2.AD8** **Lesson 20:** Distance in the Coordinate Plane • Find the distance between two points in the coordinate plane by using the Pythagorean theorem. **8.G.B.8, MP7, 8.Mod2.AD9** **Lesson 21:** Applying the Pythagorean Theorem • Apply the Pythagorean theorem to solve real-world and mathematical problems. • Evaluate square roots. **8.G.B.7, MP2, 8.Mod2.AD8**		**Lesson 16:** Proportional Relationships and Slope • Relate the unit rate of a proportional relationship to the slope of the associated line. • Find the slope of a line through the origin. **8.EE.5, 8.EE.6, MP6, 8.Mod4.AD5, 8.Mod4.AD7** **Lesson 17:** Slopes of Rising Lines • Find slopes of rising lines by using slope triangles. • Graph a rising line given the slope and a point on the line. **8.EE.B.6, MP1, 8.Mod4.AD7** **Lesson 18:** Slopes of Falling Lines • Find slopes of falling lines by using slope triangles. • Graph a falling line given the slope and a point on the line. **8.EE.B.6, MP3, 8.Mod4.AD7** **Lesson 19:** Using Coordinates to Find Slope • Develop a formula for the slope of a line. • Find the slope of a line given the coordinates of at least two points on the line. **8.EE.B.6, MP8, 8.Mod4.AD7** **Topic E: Different Forms of Linear Equations** **Lesson 20:** Slope-Intercept Form of the Equation of a Line • Use similar triangles to develop the slope-intercept form of the equation of a line.		**Lesson 17:** Analyzing the Model • Present the results of a statistical investigation. • Critique the statistical investigations presented by others. **8.SP.A.2, 8.SP.A.3, MP2, 8.Mod6.AD9, 8.Mod6.AD10** **Topic D: Bivariate Categorical Data** **Lesson 18:** Bivariate Categorical Data • Construct and interpret a two-way table summarizing a bivariate categorical data set. **8.SP.A.4, MP7, 8.Mod6.AD11** **Lesson 19:** Association in Bivariate Categorical Data • Determine whether there is evidence of an association between categorical variables that have two possible values. • Compare and contrast evidence of an association represented in two-way tables and segmented bar graphs. **8.SP.A.4, MP6, 8.Mod6.AD11, 8.Mod6.AD12** **Lesson 20:** Analyzing Bivariate Categorical Data • Determine whether there is evidence of an association between categorical variables that have two or more possible values. • Describe the difference between an association and a cause and effect relationship for categorical variables. **8.SP.A.4, MP5, 8.Mod6.AD11, 8.Mod6.AD12**

Lesson 20: Square Roots
- Place square roots on a number line.

8.EE.A.2, 8.G.B.7, MP8, 8.Mod1.AD6, 8.Mod1.AD15

Topic E: Irrational Numbers

Lesson 21: Approximating Values of Roots and π^2
- Approximate values of square roots, cube roots, and π^2.

8.NS.A.2, 8.Mod1.AD3, 8.Mod1.AD4

Lesson 22: Familiar and Not So Familiar Numbers
- Identify numbers as rational, irrational, and real by their decimal form.
- Compare the characteristics of rational and irrational numbers.

8.NS.A.1, 8.EE.A.2, MP3, 8.Mod1.AD1

Lesson 23: Ordering Irrational Numbers
- Order irrational numbers.
- Approximate the value of expressions with irrational numbers.

8.NS.A.2, MP7, 8.Mod1.AD2, 8.Mod1.AD3, 8.Mod1.AD4

Lesson 24: Revisiting Equations with Squares and Cubes
- Solve equations of the forms $x^2 = p$ and $x^3 = p$, where p is a rational number and the solutions are real numbers.

8.EE.A.2, MP6, 8.Mod1.AD6

Lesson 22: On the Right Path
- Model a situation by using the Pythagorean theorem and the distance on a grid to solve a problem.

8.G.B.7, 8.G.B.8, MP4, 8.Mod2.AD8, 8.Mod2.AD9

- Write equations in slope-intercept form from graphs and graph equations given in slope-intercept form.

8.EE.B, 8.EE.B.6, MP7, 8.Mod4.AD2, 8.Mod4.AD8

Lesson 21: Slope and Parallel Lines
- Determine the relationship between slope and parallel lines.
- Determine whether lines are parallel.

8.EE.B, MP3, 8.Mod4.AD2

Lesson 22: Point-Slope Form of the Equation of a Line
- Use similar triangles to develop the point-slope form of the equation of a line.
- Graph equations given in point-slope form and write equations in point-slope form given graphs.

8.EE.B, MP7, 8.Mod4.AD2

Lesson 23: Comparing Equations in Different Forms
- Determine whether linear equations in different forms represent the same line.
- Write linear equations from tables.

8.EE.B, MP7, 8.Mod4.AD2

Topic F: Graphing and Writing Linear Equations

Lesson 24: The Patterns, the Pops, and the Pastries
- Write an equation of a line given a graph.
- Write an equation of a line given information about the line.

8.EE.B, MP1, 8.Mod4.AD2

Topic E: Volume

Lesson 21: Volumes of Prisms and Pyramids
- Find the volume of prisms.
- Develop and use the formula for the volume of a pyramid.

8.G.C.9, MP6, 8.Mod6.AD13

Lesson 22: Volume of Cylinders
- Develop and use the formula for the volume of a cylinder.
- Find volumes of oblique cylinders and prisms.

8.G.C.9, MP8, 8.Mod6.AD13

Lesson 23: Volume of Cones
- Develop and use the formula for the volume of a cone.
- Solve problems involving volumes of cylinders, cones, prisms, and pyramids.

8.G.C.9, MP7, 8.Mod6.AD13

Lesson 24: Volume of Spheres
- Develop and use the formula for the volume of a sphere.
- Solve problems involving volumes of cylinders, cones, and spheres.

8.G.C.9, MP6, 8.Mod6.AD13

Lesson 25: Applications of Volume
- Use functions to solve problems involving volumes of cylinders, cones, and spheres.

8.F.B.4, 8.G.C.9, MP1, 8.Mod6.AD4, 8.Mod6.AD13

Module 1	Module 2	Module 3	Module 4	Module 5	Module 6
			Lesson 25: Lines, Lines, and More Lines • Graph linear equations given in various forms. **8.EE.B, MP5, 8.Mod4.AD2** **Lesson 26:** Linear Equations from Word Problems • Use linear equations to solve problems with real-world contexts. **8.EE.B, MP2, 8.Mod4.AD4** **Lesson 27:** Get to Work • Model a real-world situation with linear equations and use the equations to answer questions about the situation. • Interpret the meaning of different components of the linear equations in context. **8.EE.B, MP1, 8.Mod4.AD4**		

Year-Long Curriculum Overview: Levels 6–8

Trimester and quarter indicators are provided as a guide for pacing. A few optional lessons in each grade level are included in total number of lessons. About thirty additional days are allotted at each level for assessment and responsive teaching.

STORY OF RATIOS

		Level 6 Ratios and Rates	Level 7 Ratios and Proportionality	Level 8 Ratios and Linearity
Trimester 1	Quarter 1	**Module 1: Ratios, Rates, and Percents** 5 Topics | 26 Lessons	**Module 1: Ratios and Proportional Relationships** 3 Topics | 20 Lessons	**Module 1: Scientific Notation, Exponents, and Irrational Numbers** 5 Topics | 24 Lessons
		Module 2: Operations with Fractions and Multi-Digit Numbers 6 Topics | 24 Lessons	**Module 2: Operations with Rational Numbers** 5 Topics | 26 Lessons	**Module 2: Rigid Motions and Congruent Figures** 4 Topics | 22 Lessons
Trimester 2	Quarter 2	**Module 3: Rational Numbers** 4 Topics | 17 Lessons	**Module 3: Expressions, Equations, and Inequalities** 4 Topics | 23 Lessons	**Module 3: Dilations and Similar Figures** 4 Topics | 17 Lessons
	Quarter 3	**Module 4: Expressions and One-Step Equations** 5 Topics | 25 Lessons	**Module 4: Geometry** 5 Topics | 26 Lessons	**Module 4: Linear Equations in One and Two Variables** 6 Topics | 27 Lessons
Trimester 3		**Module 5: Area, Surface Area, and Volume** 4 Topics | 19 Lessons	**Module 5: Percent and Applications of Percent** 5 Topics | 24 Lessons	**Module 5: Systems of Linear Equations** 3 Topics | 14 Lessons
	Quarter 4	**Module 6: Statistics** 4 Topics | 22 Lessons	**Module 6: Probability and Populations** 4 Topics | 19 Lessons	**Module 6: Functions and Bivariate Statistics** 5 Topics | 25 Lessons
		TOTAL: **28 Topics | 133 Lessons**	**TOTAL:** **26 Topics | 138 Lessons**	**TOTAL:** **27 Topics | 129 Lessons**

Providing Culturally Responsive Instruction

Eureka Math² values the funds of knowledge that students bring into the classroom and acknowledges that deep learning happens when all students are able to leverage their diverse life experiences while learning mathematics.

One of the ways *Eureka Math²* invites students into mathematics and celebrates the diversity present in every classroom is by highlighting for teachers those specific lesson moments that can be tailored to bring students' experiences from their home and communities into the classroom. For example, a strategically placed Universal Design for Learning (UDL) margin note in grade 7 module 5 lesson 15 highlights that providing students with a restaurant menu allows them to choose the meal they would like to order and promotes relevance because students can draw on their own experiences to understand the problem.

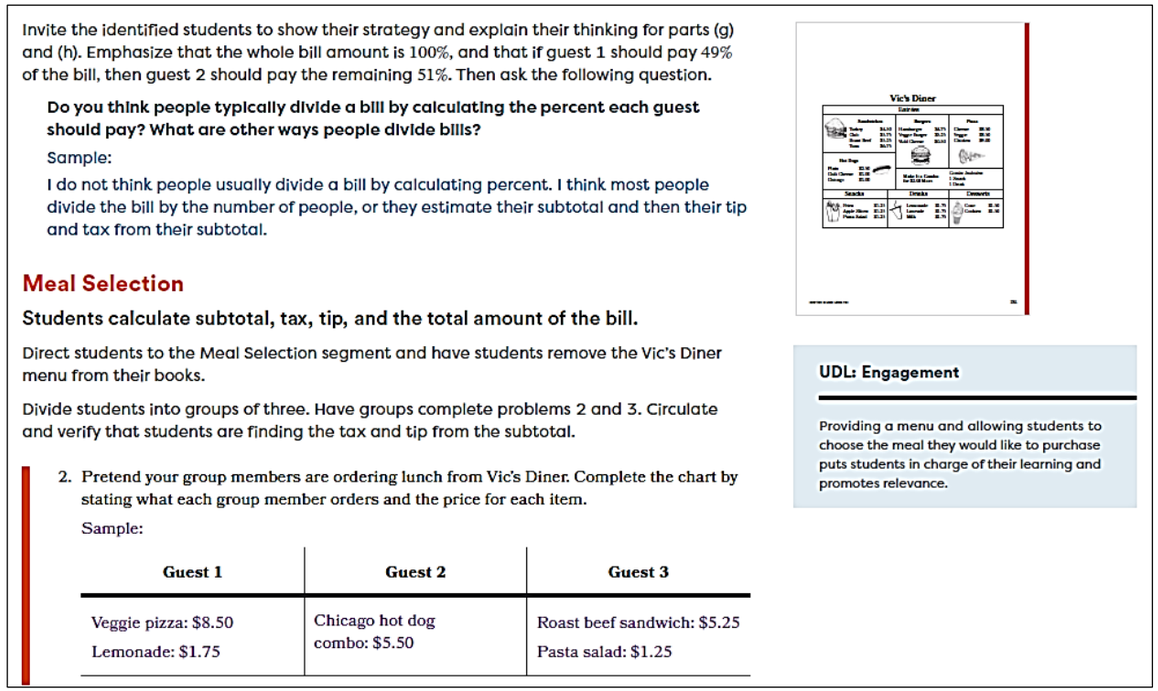
In grade 6 module 6 lesson 6, students work in pairs to choose a statistical question and decide how to display their data set. They create a poster and participate in a gallery walk to provide feedback to their peers. This UDL margin note suggests that teachers promote relevance by leveraging students' life experiences and allowing them to choose the context for the statistical question.

UDL: Engagement

Including a variety of data set contexts provides an opportunity for student choice. Allowing students to select a statistical question they find interesting and challenging puts them in charge of their learning and promotes relevance.

In grade 6 module 1 lesson 4, students complete a digital lesson in which they use tape diagrams to understand how to make specific color batches of paint. This content provides the teacher with the opportunity to connect to students' home lives and learn more about the experiences they've had with painting.

Students are diverse, and any one classroom can have students from either an individualist frame of reference or a collectivist frame of reference. The teacher-writers of *Eureka Math²* considered both frames of reference in intentionally balancing activities that build off individualism as well as collectivism.



Invite the identified students to show their strategy and explain their thinking for parts (g) and (h). Emphasize that the whole bill amount is 100%, and that if guest 1 should pay 49% of the bill, then guest 2 should pay the remaining 51%. Then ask the following question.

Do you think people typically divide a bill by calculating the percent each guest should pay? What are other ways people divide bills?

Sample:

I do not think people usually divide a bill by calculating percent. I think most people divide the bill by the number of people, or they estimate their subtotal and then their tip and tax from their subtotal.

Meal Selection

Students calculate subtotal, tax, tip, and the total amount of the bill.

Direct students to the Meal Selection segment and have students remove the Vic's Diner menu from their books.

Divide students into groups of three. Have groups complete problems 2 and 3. Circulate and verify that students are finding the tax and tip from the subtotal.

2. Pretend your group members are ordering lunch from Vic's Diner. Complete the chart by stating what each group member orders and the price for each item.

Sample:

Guest 1	Guest 2	Guest 3
Veggie pizza: $8.50 Lemonade: $1.75	Chicago hot dog combo: $5.50	Roast beef sandwich: $5.25 Pasta salad: $1.25

UDL: Engagement

Providing a menu and allowing students to choose the meal they would like to purchase puts students in charge of their learning and promotes relevance.

Example of placed UDL margin note

In her book *Culturally Responsive Teaching and the Brain*, Zaretta Hammond references collectivism as emphasizing relationships, interdependence within a community, and cooperative learning (page 25). In *Eureka Math²*, a collectivist approach to learning mathematics is present in the embedded cooperative learning structures in open-middle and open-ended tasks. Specifically, the instructional routines Numbered Heads and Co-construction are rooted in students working cooperatively in groups to deepen their mathematical conceptual understanding. See grade 6 module 6 lesson 16 for an example of how students use the Co-construction routine to write statistical questions.

Beyond the instructional routines, *Eureka Math²* leverages the power of student relationships and interdependence through frequent partner and group work. For any partner or group work referenced in the instructional materials, teachers may make use of strategic, flexible groupings that build off students' strengths, including home language. A Language Support margin note in the first lesson of every module serves to remind teachers to leverage students' cultural perspectives when strategically placing students in partners.

Hammond references individualism as emphasizing individual achievement and independence (page 25). In *Eureka Math²*, an individualist approach to learning mathematics may be seen in the embedded systems for independent practice in every lesson, such as Exit Tickets and Practice Sets. Additionally, the instructional routines Critique a Flawed Response and Take a Stand both start with students working on a math problem individually before engaging in student discourse. See grade 7 module 1 lesson 4 for an example of students engaging in the Take a Stand routine to discuss whether the statement "Graphed lines represent proportional relationships" is always, sometimes, or never true.

Beyond balancing individualism and collectivism, *Eureka Math²* activities and problems provide students with mirrors in which to see their own cultural perspectives reflected, as well as windows through which to view others' cultural perspectives.

Eureka Math² is an inclusive mathematics curriculum that represents diverse doers of math. The curriculum's images, fine art, and pictures of people represent diversity through problems and exercises related to real-life experiences, perspectives, and contributions of people from various cultures, ethnicities, and gender identities. These representations affirm student identities while rejecting the stereotypes and biases that have excluded many students from mathematical learning in favor of a more robust and inclusive perspective. Representing a diverse array of doers of mathematics in the curriculum inspires all students to think of themselves as mathematicians.

For example, *Eureka Math²* includes various mathematical activities that involve counting on hands or simulating a number line with one's fingers. In images throughout the curriculum, care was taken to include a variety of body types and skin tones.

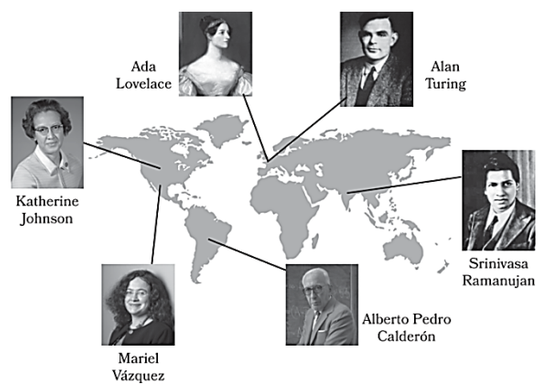
The names used in word problems and for sample students in the lesson vignettes are intentionally diverse to represent the wide variety of students who use the curriculum. The names in student-facing word problems are also designed for readability to ensure that they are not a barrier to accessing the math.

***Story of Ratios*® and *Story of Functions*®**

Logan, Ava, Noor, Nora, So-chee, Tiah, Zara, Fin, Huan, Kadir, Lucas, Riku, Bahar, Maya, Ali, Haru, Pia, Yooni, Amir, Ji-ho, Kota, Marco, Preet, Theo

According to CAST, "individuals are engaged by information and activities that are relevant and valuable to their interests and goals." (UDL Guidelines, Engagement, Checkpoint 7.2) *Eureka Math²* also leverages students' experiences, goals, and interests through Math Pasts (described below), art connections, and wordless context videos.

To honor the diverse contributions to the development of the field of mathematics, to build knowledge about our shared math history, and to empower every child to see themselves as able to do mathematics, nearly every module in *Eureka Math²* includes a feature called Math Past. Each Math Past tells the history of some big ideas in the module, recounting the story of the mathematics through artifacts, discoveries, and other contributions from cultures around the world. Math Past also provides ideas about how to engage students in the history of mathematics. Math Past counters the traditional Eurocentric perspective and celebrates the many contributions of Black, Indigenous, and People of Color communities to the history of mathematics.



Lovelace – "Portrait of Ada Lovelace, 1836/Wikimedia Commons"
Turing – "famouspeople/Alamy Stock Photo"
Vazquez – "University of California Davis. Photo by Gregory Urquiaga"
Calderon – "Photograph Courtesy of the University of Chicago"

For example, in grade 6 module 5, students are highly engaged in studying area by examining a sketch from the Codex Vergara, a document written around 1540 CE to show the landholdings of families in Aztec villages. Students decode the symbols to determine the side lengths, perimeters, and areas

of the fields. Students then work in pairs to draw polygons composed of rectangles in the coordinate plane. Partners find more than one way to determine the area of various polygons shown in the grid. When students determine the area of a polygon by decomposing it into rectangles and apply their knowledge of the area of a rectangle, they look for and make use of structure, addressing a mathematical habit of mind. The Math Past Teacher Resource includes information about how the Aztecs recorded the perimeters and areas of fields. It also includes other ancient area problems for students to engage in and solve.

Later, in grade 8 module 5, students learn to write and solve systems of equations for problems that use ancient Chinese numbers. The problems in the lessons were translated from one of the most influential mathematical texts of all time: *Jiuzhang Suanshu,* translated as *Nine Chapters on the Mathematical Art*. The chapter titled "Fangcheng," or "Rectangular Arrays," contains 18 problems that address issues of trade, crop yield, number of animals, and other situations that can be solved with systems of linear equations. When students use systems of equations to represent real-world contexts involving comparison of weights and the trading of livestock, they reason abstractly and quantitatively (another mathematical habit of mind). The Math Past Teacher Resource guides teachers to prompt students to explore answers to questions such as the following: Are the techniques used today for solving systems of linear equations like those used in the past? What are some alternative ways to represent a system of linear equations? Are there alternative ways to solve systems of linear equations?

In a similar vein, *Eureka Math²* connects works of fine art to the standards of each grade level. Each *Teach* book opens with a stunning work of fine art that has a connection to the math learned in the grade. There is also a wide variety of additional pieces of art embedded in each grade's lessons. For example, in grade 8 module 3 lesson 13 (pages 248–270), students examine *Composition 8*, a piece by Wassily Kandinsky. Students hypothesize whether the figures in the painting are similar figures, and then use what they know about rigid motions and dilations to justify their thinking.

Wordless context-building videos highlight how we use math to solve problems in our everyday lives and make sense of the world around us. *Eureka Math²* lessons include more than 190 videos. The curriculum offers three types of highly engaging, wordless math context videos: character animation, collage animation, and live action.

Students can identify with the diverse set of actors and characters in the videos, which helps them visualize how math is part of everyday life. Through these videos, students will more readily realize that math surrounds them and that they, too, can engage in mathematical pursuits. The videos allow students to see themselves in the math problems they encounter, which lowers the barrier to engagement and makes the math classroom a more welcoming place.

Wordless videos in lessons serve many other purposes as well, such as the following:

- They make the context for a given problem come alive, putting all students on the same footing by giving them the requisite background knowledge.
- They remove any language and reading barriers to the written word problem.
- They raise the accessibility of mathematics through accurate and inclusive representation.
- They show the many ways in which we interact with math in the world around us and how these interactions spark curiosity and joy.
- They help students see the delight and wonder associated with being a mathematician.
- They create excitement and buzz in the classroom about the content of the new word problem.
- They invite students to tell the story of the math problem, to notice, to wonder, and to drive the discussion.
- Examples include:
    - Grade 6 module 1 lesson 3: Batches of Paint Part 1
    - Grade 7 module 1 lesson 4: Bulk Almonds Part 1
    - Grade 8 module 3 lesson 14: Mirror Height

Specific instructional prompts, engaging word problems, accessible and engaging tasks, art connections, Math Past connections, and context videos throughout *Eureka Math²* work together to create a powerful curriculum that welcomes all students and invites them to become doers of mathematics.

Addressing Learner Variance

To ensure success of all learners, every *Eureka Math*^{2} lesson includes Universal Design for Learning (UDL) strategies and scaffolds that address learner variance. These suggestions promote flexibility with engagement, representation, and action and expression, the three UDL principles described by CAST. These strategies and scaffolds are complements to the curriculum's overall alignment with the UDL Guidelines and were designed to support educators in effectively teaching students who experience difficulty in mathematics. The strategies are based on research specific to mathematics instruction.

UDL: Action & Expression

Before beginning the Scavenger Hunt, prompt students to engage in strategic planning by asking partners to recall the types of equations they have been solving and the strategies they have used.

- How can we solve equations that contain both fractions and decimals?
- What steps can we take to make the equation simpler before we use if–then moves?

UDL: Representation

To help students identify different ways they can group the treats, consider providing them with manipulatives to represent the lollipops and candies. Making the activity a concrete experience for students promotes conceptual understanding about the factors of each new expression and what the factors represent in the situation.

According to *Teaching Mathematics Meaningfully: Solutions for Reaching Struggling Learners, Second Edition*, (page 71) "Students who have learning difficulties that affect their ability to do well in mathematics come from a variety of backgrounds and experiences. Although each of these students is individual and unique, students often demonstrate one or more of the nine learning characteristics…" The nine learning characteristics described include: learned helplessness, passive learning, knowledge and skills gaps, math anxiety, memory disabilities, attention disabilities, metacognitive thinking disabilities, processing disabilities, and reading disabilities. Some of these characteristics can affect all students who may be struggling in math regardless of whether they have learning-related disabilities (learned helplessness, passive learning, knowledge and skills gaps, math anxiety). Other characteristics result from learning-related disabilities (memory disabilities, attention disabilities, metacognitive thinking disabilities, processing disabilities, and reading disabilities). These learning characteristics as well as curriculum factors can result in common mathematics performance traits of students who struggle in mathematics.

According to Allsopp et. al (2018), "Mathematics visuals appear to be most effective when used in conjunction with other effective instructional practices. An example of this is the use of explicit instruction techniques in conjunction with visuals. (page 192)." "Explicit cueing techniques can be utilized with visuals in ways that help students attend to the visual's most important features and its representation of the mathematical idea. Simple techniques, such as color-coding, using directional arrows, and highlighting, can help students focus on what is most relevant." An example of this is found in grade 7 module 5 lesson 7.

A variety of other strategies suggested in the literature are the foundation of all UDL margin notes found in *Eureka Math*^{2}. Each margin note is aligned to a strategy found to minimize the impacts of one of the nine learning characteristics listed above. Strategies include, but are not limited to:

- Break down tasks into manageable chunks.
- Demonstrate the belief that students can be successful.
- Visually organize to cue student to important aspects of concept.
- Teach students to change their frame of thinking.
- Embed math in relevant contexts.
- Help students make connections to prior knowledge
- Engage students by addressing interests.
- Celebrate progress and success.
- Cultivate a growth mindset.
- Relate math to students' lives.
- Use concrete materials
- Associate content with meaningful context.
- Use a variety (visual, auditory, tactile or kinesthetic) of strategies.
- Provide visual organizers.
- Provide think alouds.
- Use novel learning contexts.
- Help students focus on what is important rather than on things that are irrelevant.

UDL: Representation

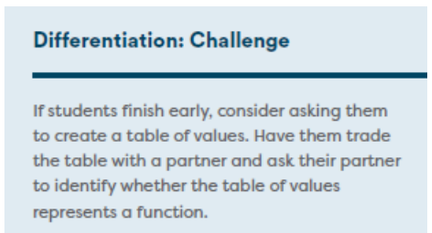
To activate students' prior knowledge about ratios, rates, and percents, consider using the following prompts:

- How do you know whether a relationship is a ratio relationship?
- What is the value of the ratio and how do you find it?
- What is speed and how do you determine it?
- What strategies can you use to determine the percent of a number?

In problem 3, consider drawing attention to the fact that the coefficient of p in the expression $3.5p$ is the value of the ratio.

Eureka Math² embeds differentiation through the simple-to-complex sequencing of lesson and Practice problems. This logical sequence gradually reduces scaffolds and builds in complexity, allowing teachers to differentiate assignments for either individual or small-group work. For all students, including those working above grade level, the gradual reduction of support and increase in complexity builds independent thinking and encourages productive struggle. Problems toward the end of the Problem Set (a lesson's daily independent practice) are often open-ended, at Depth of Knowledge (DOK) levels 2 and 3, and integrate two or more standards and/or Standards for Mathematical Practice. Teachers can assign problems of different complexities to students according to their needs or allow students to select problems in the 10-minute (approximate) timeframe. Lessons provide differentiation suggestions at the point of instruction to support a wide variety of learners. Differentiation margin notes found in the *Teach* book offer guidance for adapting instruction so that all students can successfully access grade-level content. There are two types of Differentiation margin notes: Support and Challenge. Challenge boxes suggest ways to keep students working at a more advanced level engaged by providing opportunities for extension.

In this example from grade 8 module 6 lesson 2 the Differentiation margin note offers a suggestion for students to interact with the purpose of the Learn segment of determining whether tables represent functions at a deeper level of complexity by having students create their own tables and trade with a partner.



Supporting Multilanguage Learners

Eureka Math² writers relied on language development research to outline and build in the language support needed for multilanguage learners to engage with the language-rich lessons. With the goal of supporting the clear, concise, and precise use of reading, writing, speaking, and listening in English, *Eureka Math²* supports multilanguage learners through each lesson's instructional design. It does this by including instructional best practices, support for mathematical discourse, and support for the different tiers of terminology. Additionally, Language Support margin notes provide just-in-time, targeted instructional recommendations to support multilanguage learners.

Instructional Best Practices

The following table outlines the instructional best practices included in *Eureka Math²*.

Practice	Eureka Math²
Activate prior knowledge (mathematics content, terminology, contexts)	The daily Fluency and Launch lesson components activate prior knowledge to prepare students for new learning. Context videos demonstrate math concepts in a concrete or real-world context.
Provide multiple entry points to the mathematics	Recurring Notice and Wonder routines and frequent open-middle and open-ended tasks provide multiple points of entry for students to participate. The inclusion of fine art and Math Past history components engages students with math in the real world.
Use clear, concise student-facing language	Readability guidelines ensure that words are never an obstacle to math learning.
Provide strategic active processing time	Frequent mathematical discourse, core instructional routines, and the 10/2 principle expand opportunities for students to synthesize and process new information.
Illustrate multiple modes and formats	Varied physical and visual models, such as digital interactives, context videos, and graphic organizers, help students make connections and deepen understanding.
Provide opportunities for strategic review	Daily fluency activities, distributed practice Remember problems, Exit Tickets, and comprehensive assessments provide frequent opportunities for strategic review.

Mathematical Discourse

To support all learners, lessons provide ample authentic and engaging opportunities for students to read, write, speak, and listen. *Eureka Math²* supports teachers in creating language-rich classrooms by modeling teacher-student discourse and by providing suggestions for supported student-to-student discourse. Because curricula in general have an abundance of receptive language experiences (reading and listening), *Eureka Math²* focuses specific supports on language production (speaking and writing) in mathematics.

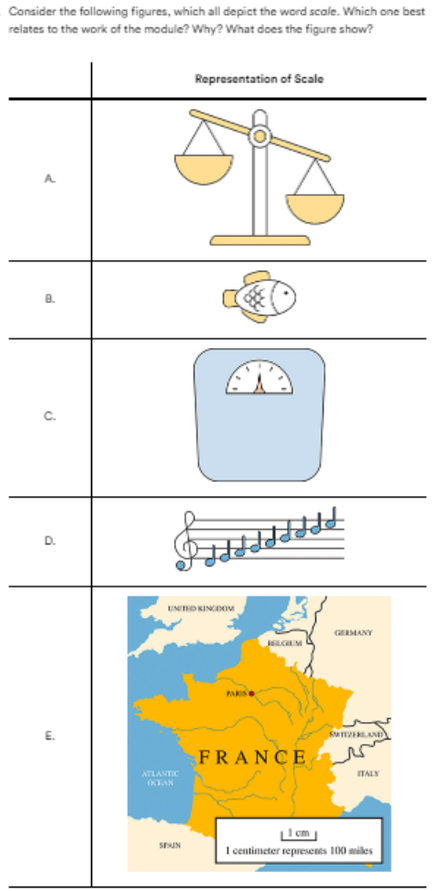
The instructional routines that promote discourse are aligned with Stanford's Language Design Principles of supporting sense-making, optimizing output, cultivating conversation, and maximizing linguistic and cognitive meta-awareness.

Eureka Math² periodically includes Language Support notes that suggest specific sentence frames and sentence starters to support multilanguage learners in student-to-student discussions, such as those used in instructional routines. General sentence frames and sentence starters are provided in the Talking Tool which is referenced often during times of student-to-student discourse.

Terminology

Eureka Math² lessons give students experience with a new mathematical concept before naming it with a precise mathematical term. Students may see a mathematical concept come to life in a digital interactive, manipulate counters in groups, or use an instructional routine to engage in mathematical discourse before the teacher gives that concept a name. In addition, teachers are provided with educative guidance, either in the body of the lesson or in a Language Support margin note, to support students in pairing the written term with a visual representation. *Eureka Math²* highlights domain-specific terms from previous lessons in the current lesson, along with instructional recommendations for supporting those terms. These instructional recommendations focus on previewing the meaning of the terms before students are expected to interact with them in the mathematics of the lesson. Additionally, domain-specific terms from previous lessons are also supported by pairing the written term with a visual representation. For each grade, the academic verbs needed to engage with the mathematics were considered. Each grade in *Eureka Math²* offers a carefully curated list of targeted academic verbs that appear in the lessons for students to preview before they are expected to understand and use the language. For example, before students are asked to *verify* in grade 8, lessons preview the meaning of the academic verb, supporting the meaning of the term in a class discussion emphasizing the use of synonyms of that verb.

Multiple-meaning terms encompass homophones like *very* and *vary*, and homographs, like *scale* and *scale*, (see image from grade 7 module 1 lesson 19) and other pronunciation-based challenges, like the difference between *approximate* (as an adjective, as in, "What is the approximate value?") and *approximate* (as a verb, as in, "Approximate the sum."). Lessons call out multiple-meaning terms that could affect multilanguage learners' understanding of the mathematics. Lessons also include Language Support notes to preview the meaning of the term in the lesson. These previews include pairing the term with a visual, with real items, or with a video to highlight the different meanings of the term and emphasize the specific meaning used in the lesson.



Language Support Boxes

A Language Support margin note appears in the first lesson of every module to prompt teachers to consider using strategic, flexible grouping in each activity of the module to support multilanguage learners. These grouping suggestions invite teachers to use students' knowledge and home language by pairing students in different ways. Each of these different ways of pairing students has specific benefits for multilanguage learners. The Language Support margin notes highlight either discourse, language or terminology supports.

To learn more, please visit the Great Minds MLL blog: https://gm.greatminds.org/how-to-support-multilingual-learners-in-engaging-in-math-conversations-in-the-classroom

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