

## 8th Grade Math Unit Plans and Spectrum

### FOCUS STANDARDS FOR 8<sup>th</sup> GRADE

Teachers should focus on emphasizing lessons that cover the major work of 8th grade (green below). Supporting lessons (dark blue) and additional lessons (light blue) can be added to units if students progress quickly or demonstrate mastery. The most important concepts and skills for 8th graders to know before moving to 9th grade is :

- Linear algebra and Linear Functions
- Congruence and Similarity
- Operations with Exponents

If you had to select one topic to spend the most time on, it should be linear equations and linear functions and developing student mastery of solving one-step equations, two-step equations, and systems of equations.

In the Unit Plan and Spectrum document there is a:

- [8th Grade General Lesson Spectrum](#) if you are creating your own unit plan
- [Sample 8th Grade Lower Level Unit Plan](#)
- [Sample 8th Grade Higher Level Unit Plan](#)

Unit	Topic	CCSS	Objective
MAJOR WORK TO EMPHASIZE	Congruence and Similarity <b>(Geometry)</b>	8.G.A	Understand congruence and similarity using physical models, transparencies, or geometry software.
	Congruence and Similarity <b>(Geometry)</b>	8.G.B	Understand and apply the Pythagorean Theorem
	Functions <b>(Function)</b>	8.F.A	Define, evaluate, and compare functions
	Functions <b>(Function Unit)</b>	8.F.B	Use functions to model relationships between quantities.
	Exponents	8.EE.A	Work with radicals and integer exponents.

	<b>(Expressions and Equations)</b>		
	Proportional vs Linear Relationships <b>(Ratio and Proportions)</b>	8.EE.B	Understand the connections between proportional relationships, lines, and linear equations.
	Linear Equations <b>(Expressions and Equations)</b>	8.EE.C	Analyze and solve linear equations and pairs of simultaneous linear equations.
SUPPORTING WORK	Bivariate Data <b>(Data and Statistics)</b>	8.SP.A	Investigate patterns of association in bivariate data.
ADDITIONAL WORK IF TIME	Volume of cylinders, cones, and spheres. <b>(Geometry)</b>	8.G.C	Solve Real-world and mathematical problems involving volume of cylinders, cones, and spheres.

**8TH GRADE LESSON SPECTRUM**  
(Use as reference if you are creating your own unit plan)

CODE:	Descriptions
<b>GREEN</b>	<p><b>Priority Lessons to Emphasize, Major Work of Grade.</b></p> <ul style="list-style-type: none"> <li>Your Objective Map should include as many of these lessons as possible.</li> <li>For above average or advanced groups, some of these lessons can be skipped if the pre-test or RenSTAR data shows that they have mastered these skills.</li> <li>Note that for below average or below grade level groups, some of these lessons may needed to be broken into two days.</li> </ul>
<b>BLUE</b>	<p><b>Supporting Lessons, Secondary Work of Grade</b></p> <ul style="list-style-type: none"> <li>For average or above average groups, you may have time to include these additional lessons.</li> <li><b>Dark Blue</b> Lessons - More important to emphasize than <b>light blue</b> lessons</li> </ul>

<b>PURPLE</b>	<p><b>Advanced Lessons</b></p> <ul style="list-style-type: none"> <li>• These lessons will help students prepare for the major work in next grade level.</li> <li>• If your RenSTAR report shows that students are performing above grade level or if you know you have a more advanced group, or mixed grade level group, incorporate some of these additional lessons into your objective map.</li> </ul>
<b>ORANGE</b>	<p><b>Prerequisite Lessons</b></p> <ul style="list-style-type: none"> <li>• For below grade level groups, they may need these additional lessons as a review or to prepare them for grade level (<b>green lessons</b>).</li> <li>• Use your RenSTAR report to get a feel of student prerequisite knowledge and whether these lessons will be necessary. Focus on looking at their Number and Operations Domain Scores.</li> </ul>

**Establishing a Culture of Learning (2 lessons)  
(Foundational Skills)**

Unit	Topic	CCSS	Objective
Setting Expectations (2 lessons)	Classroom Routines and Expectations	N/A	Today you will help create a set of classroom expectations by brainstorming ways to create a positive learning environment.
	Word Problem Strategies	N/A	Today you will help generate a class set of word problem strategies by creating a poster that demonstrates one of the strategies.

**Number Sense (11 lessons)**

Unit	Topic	CCSS	Objective
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Adding and Subtracting Rational Numbers  (6 lessons)	Distances on a Number Line	6.NS.C.6 6.NS.C.7	Today you will compare, locate, and find distances of rational numbers on a number line.
	Adding Integers Using a Number Line	7.NS.A.1	Today you will add integers by using horizontal arrows on a number line.
	Adding Integers Using Absolute Value	7.NS.A.1	Today you will add integers by using addition rules based on absolute value.
	Subtracting Integers	7.NS.A.1	Today you will subtract integers by adding the additive inverse.
	Addition and Subtraction of Rational Numbers	7.NS.A.1	Today you will add and subtract rational numbers by using addition and subtraction rules based on absolute value.
	Real-World Application: Addition and Subtraction of Rational Numbers	7.NS.A.1	Today you will use apply what you know about adding and subtracting rational numbers to real-world situations involving money.
Multiplying and Dividing Rational Numbers  (4 lessons)	Multiplication of Signed Numbers	7.NS.A.2	Today you will discover and apply the rules for multiplying integers by connecting multiplication to repeated addition.
	Division of Signed Numbers	7.NS.A.2	Today you will discover and apply the rules for dividing integers by recognizing that division is the reverse process of multiplication.
	Converting Rational Numbers to Decimals Using Long Division	7.NS.A.2	Today you will represent rational numbers as either terminating or repeating decimals by using the long division algorithm.
Operations Involving Rational Numbers  (1 lesson)	Order of Operations	7.NS.A.1 7.NS.A.2	Today you will evaluate rational expressions involving several operations by using the order of operations.

### Ratios and Proportions (4 lessons)

Unit	Topic	CCSS	Objective
Proportions (4 lessons)	Identifying Proportional Relationships (Tables)	7.RP.A.2	Today you will determine whether two quantities are in a proportional relationship by testing for constants of proportionality in tables.
	Identifying Proportional Relationships (Graphs)	7.RP.A.2	Today you will determine whether two quantities are in a proportional relationship by testing for constants of proportionality in graphs.
	Representing Proportional Relationships with Equations	7.RP.A.2	Today you will write equations that represent proportional relationships by finding the constant of proportionality.
	Interpreting Graphs of Proportional Relationships	7.RP.A.2	Today you will interpret graphs of proportional relationships by analyzing what points on a graph of a proportional relationship mean in the context of the problem.

### Expressions and Equations (19 lessons)

Unit	Topic	CCSS	Objective
Expressions (2 lessons)	Equivalent Expressions	7.EE.1	Today you will identify equivalent expressions by combining like terms, using the distributive property, and factoring using the GCF.
	Seeing Structure in Expressions	HSA.SSE.A	Today you will identify equivalent expressions by using the structure of expressions.

Solving Linear Equations (5 lessons)	One-step Equations	8.EE.7b HSA.REI.A	Today you will solve one-step equations by using inverse operations to isolate the variable.
	Two-step Equations	8.EE.7b HSA.REI.A	Today you will solve two-step equations by using inverse operations.
	Multi-step Equations	8.EE.7b HSA.REI.A	Today you will solve multi-step equations by combining like terms and using the distributive property.
	Equations with Variables on Both Sides	8.EE.7b	Today you will solve multi-step equations with variables on both sides by using the additive inverse of the variable coefficients.
	Solving Multi-Step Equations (Applications)	8.EE.7b	Today you will analyze cell phone plans by writing and solving equations that model their monthly cost.
Systems of Equations (5 lessons)	Solving Systems of Equations by Graphing	8.EE.8b HSA.REI.C	Today you will determine how many solutions a system of equations has by comparing the slope and y-intercept of lines.
	Solving Systems of Equations by Elimination	8.EE.8b HSA.REI.C	Today you will solve systems of equations by using addition and subtraction to eliminate a variable.
	Solving Systems of Equations Using Multiplicative Elimination	8.EE.8b HSA.REI.C	Today you will solve systems of equations by using multiplication to eliminate a variable.
	Solving Systems of Equations Using Substitution	8.EE.8b HSA.REI.C	Today you will solve a system of equations by substituting expressions.
	Applications Involving Solving Systems of Equations	8.EE.8c HSA.REI.C	Today you will solve linear systems applications by translating word problems into equations.

Exponential Expressions and Equations (7 lessons)	Scientific Notation	8.EE.4	Today you will express large and small numbers in scientific notation by using the powers of 10.
	Properties of Integer Exponents (Multiplication Properties)	8.EE.1	Today you will generate equivalent expressions by applying the multiplication and power properties of exponents.
	Properties of Integer Exponents (Division, Negative, and Zero Properties)	8.EE.1	Today you will rewrite expressions by applying the division, negative, and zero properties of integer exponents.
	Properties of Rational Exponents (Radicals)	HSN. RN. A. 2	Today you will rewrite expressions involving radicals and rational exponents using the properties of exponents.
	Operations on Numbers in Scientific Notation	8.EE.1 8.EE.4	Today you will solve real-world problems involving numbers by performing operations on numbers in scientific notation.
	Linear versus Exponential Models	HSF.LEA.1	Today you will distinguish between situations that can be modeled with linear functions and exponential functions.
	Exponential Growth and Decay	HS.F.LE.A	Today you will solve real-world problems involving exponential growth and decay by translating real-world scenarios into exponential equations.

### Functions (7 lessons)

Unit	Topic	CCSS	Objective
Introduction to Functions (7 lessons)	The Coordinate Plane	6.G.A.3	Today you will graph and identify ordered pairs on a plane by using the horizontal and vertical coordinates of a point.
	Introduction to Relations	8.F.1	Today you will interpret relations in tables, graphs, and mappings by finding the ordered pairs, the domain/range, and the inverse of a relation.
	Introduction to Functions	8.F.1	Today you will determine if a relation is a function by analyzing the input and outputs of coordinates, graphs, tables, and mappings.
	Identifying Functions	8.F.1	Today you identify functions by determining if a relation in a graph or a table is a function.

	Graphing Functions	8.F.4	Today you will graph a linear function by making a table of input/output values and graphing the coordinates.
	Writing Function Rules from Graphs	8.F.4 HSF.BF.1	Today you will find function rules on a graph by finding the slope and the y-intercept of linear data.
	Modeling Real-World Functions	8.F.4 HS.ID.C.7	Today you will model real-world data by writing and graphing function rules. Interpreting the slope (rate of change) and the intercept (constant term) of a linear model in the context of data.

### Geometry (16 lessons)

Unit	Topic	CCSS	Objective
Area, Volume, Surface Area (1 lesson)	Volume of cylinders, cones, and spheres.	8.G.C	Today you will solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.
Congruence/ Similarity (8 lessons)	Introduce to Congruency	8.G.2 8.G.3	Today you will apply the definition of congruent polygons by finding missing side/angle measures on congruent polygons.
	Transformations-Translations	8.G.2 8.G.3	Today you will translate points on a coordinate plane by using ordered pair rules to translate a polygon.
	Transformations-Reflections	8.G.2 8.G.3	Today you will reflect points on a coordinate plane by using ordered pair rules to reflect a polygon.
	Transformations- Rotations	8.G.2 8.G.3	Today you will rotate points on a coordinate plane by using ordered pair rules to rotate a polygon about the origin.
	Similar Polygons	8.G.4 HSG.SRT	Today you will apply the definition of similar polygons by finding missing side and angle measures on similar polygons.
	Dilations and Scale Factor	7.G.1 8.G.4	Today you will use the scale factor of dilations to solve application problems involving similar figures or objects.

	Scale Drawings	7.G.A.1	Today you will compute lengths and areas of a scale drawing and reproduce a scale drawing at a different scale.
	Similarity, Congruence, Transformations	8.G.A HSG.SRT.B HSG.CO.A	Today you will determine if shapes are similar or congruent using your knowledge of transformations and their properties.
Angles and Lines (2 lessons)	Unknown Angles	7.G.B.5	Use facts about supplementary, complementary, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure.
	Prove Theorems about lines and angles	HSG.CO.C 7.G.B.5	Prove theorems about lines and angles (including vertical angles, alternate interior angles, corresponding angles)
Pythagorean Theorem (5 lessons)	The Pythagorean Theorem	8.G.6	Today you will apply the Pythagorean Theorem by finding missing side lengths of right triangles and using a diagram to justify the relationship between the sides of a right triangle.
	Converse of the Pythagorean Theorem	8.G.6	Today you will apply the converse of the Pythagorean Theorem by determining if triangles with known side lengths are right triangles.
	Pythagorean Theorem Word Problems	8.G.7	Today you will apply the Pythagorean Theorem to solve real-world problems by creating and solving your own word problems.
	The Distance Formula	8.G.8	Today you will derive and use the distance formula to find the distance between points on the coordinate plane by generalizing the Pythagorean Theorem to form a right triangle between two points.
	Equation of a Circle	8.G.8	Today you will derive and apply the equation of a circle by generalizing the Pythagorean Theorem to form a right triangle between the center of a circle and a point on the circle (*advanced).

**SAMPLE LOWER LEVEL 8<sup>th</sup> GRADE UNIT PLAN**

The below unit plan contains 20 lessons. Orange lessons are prerequisite lessons that students may not need, use diagnostic data and RenStar reports to determine student prerequisite skills. Light blue lessons are additional practice day lessons to incorporate if you feel students have not mastered the skill. Dark blue lessons can be potentially removed if short on time.

Solving Linear Equations (5 lessons)	Day 1: One-step Equations	8.EE.7b HSA.REI.A	Today you will solve one-step equations by using inverse operations to isolate the variable.
	Day 2: Two-step Equations	8.EE.7b HSA.REI.A	Today you will solve two-step equations by using inverse operations.
	Day 3: Multi-step Equations	8.EE.7b HSA.REI.A	Today you will solve multi-step equations by combining like terms and using the distributive property.
	Day 4: Equations with Variables on Both Sides	8.EE.7b	Today you will solve multi-step equations with variables on both sides by using the additive inverse of the variable coefficients.
	Day 5: Solving Multi-Step Equations (Applications)	8.EE.7b	Today you will analyze cell phone plans by writing and solving equations that model their monthly cost.
	Additional Practice Day: Solving Linear Equations	8.EE.7b	Provide additional practice day if needed
Systems of Equations (5 lessons)	(Optional) The Coordinate Plane	6.G.A.3	Today you will graph and identify ordered pairs on a plane by using the horizontal and vertical coordinates of a point.  *Incorporate this lesson if diagnostic data shows that students have not mastered this skill.
	Day 6: Solving Systems of Equations by Graphing	8.EE.8b HSA.REI.C	Today you will determine how many solutions a system of equations has by comparing the slope and y-intercept of lines.
	Day 7: Solving Systems of Equations by Elimination	8.EE.8b HSA.REI.C	Today you will solve systems of equations by using addition and subtraction to eliminate a variable.
	Day 8: Solving Systems of Equations Using Multiplicative Elimination	8.EE.8b HSA.REI.C	Today you will solve systems of equations by using multiplication to eliminate a variable.

	Day 9: Solving Systems of Equations Using Substitution	8.EE.8b HSA.REI.C	Today you will solve a system of equations by substituting expressions.
	Additional Practice Day Solving Systems of Equations Algebraically	8.EE.8b HSA.REI.C	Provide additional practice day if needed solving systems of equations with either of the algebraic methods (elimination or substitution)
	Day 10: Applications Involving Solving Systems of Equations	8.EE.8c HSA.REI.C	Today you will solve linear systems applications by translating word problems into equations.
Introduction to Functions (6 lessons)	Day 11: Introduction to Relations	8.F.1	Today you will interpret relations in tables, graphs, and mappings by finding the ordered pairs, the domain/range, and the inverse of a relation.
	Day 12: Introduction to Functions	8.F.1	Today you will determine if a relation is a function by analyzing the input and outputs of coordinates, graphs, tables, and mappings.
	Day 13: Identifying Functions	8.F.1	Today you identify functions by determining if a relation in a graph or a table is a function.
	Day 14: Graphing Functions	8.F.4	Today you will graph a linear function by making a table of input/output values and graphing the coordinates.
	Day 15: Writing Function Rules from Graphs	8.F.4 HSF.BF.1	Today you will find function rules on a graph by finding the slope and the y-intercept of linear data.
	Additional Practice Day Graphing and Writing Function Rules	8.F.4	Provide additional practice day/ review if needed.
	Day 16: Modeling Real-World Functions	8.F.4 HS.ID.C.7	Today you will model real-world data by writing and graphing function rules. Interpreting the slope (rate of change) and the intercept (constant term) of a linear model in the context of data.

\*The below lessons should be incorporated if time, but the above lessons and providing enough practice opportunities for students to master the above skills should take priority

Exponential Expressions and Equations (4 lessons)	Day 17: Properties of Integer Exponents (Multiplication Properties)	8.EE.1	Today you will generate equivalent expressions by applying the multiplication and power properties of exponents.
	Day 18: Properties of Integer Exponents (Division, Negative, and Zero Properties)	8.EE.1	Today you will rewrite expressions by applying the division, negative, and zero properties of integer exponents.
	Additional Practice Day with Exponents	8.EE.1.4	Provide additional practice day/ review if needed.
	Day 19: Scientific Notation	8.EE.4	Today you will express large and small numbers in scientific notation by using the powers of 10.
	Day 20: Operations on Numbers in Scientific Notation	8.EE.1 8.EE.4	Today you will solve real-world problems involving numbers by performing operations on numbers in scientific notation.

### SAMPLE HIGHER LEVEL 8<sup>th</sup> GRADE UNIT PLAN

The below unit plan contains 21 lessons. Blue lessons can be eliminated if short on time. If students' RenSTAR reports or diagnostic data shows that they have already mastered a skill, feel free to remove any of these lessons and incorporate lessons from the general lesson spectrum or create opportunities for projects. For more advanced groups, you may choose to use the lower level 9th grade unit plan.

Solving Linear Equations (4 lessons)	Day 1: Two-step Equations	8.EE.7b HSA.REI.A	Today you will solve two-step equations by using inverse operations.
	Day 2: Multi-step Equations	8.EE.7b HSA.REI.A	Today you will solve multi-step equations by combining like terms and using the distributive property.
	Day 3: Equations with Variables on Both Sides	8.EE.7b	Today you will solve multi-step equations with variables on both sides by using the additive inverse of the variable coefficients.
	Day 4: Solving Multi-Step Equations (Applications)	8.EE.7b	Today you will analyze cell phone plans by writing and solving equations that model their monthly cost.
Systems of Equations (5 lessons)	Day 5: Solving Systems of Equations by Graphing	8.EE.8b HSA.REI.C	Today you will determine how many solutions a system of equations has by comparing the slope and y-intercept of lines.
	Day 6: Solving Systems of Equations by Elimination	8.EE.8b HSA.REI.C	Today you will solve systems of equations by using addition and subtraction to eliminate a variable.
	Day 7: Solving Systems of Equations Using Multiplicative Elimination	8.EE.8b HSA.REI.C	Today you will solve systems of equations by using multiplication to eliminate a variable.
	Day 8: Solving Systems of Equations Using Substitution	8.EE.8b HSA.REI.C	Today you will solve a system of equations by substituting expressions.
	Day 9: Applications Involving Solving Systems of Equations	8.EE.8c HSA.REI.C	Today you will solve linear systems applications by translating word problems into equations.
Introduction to Functions (6 lessons)	Day 10: Introduction to Relations	8.F.1	Today you will interpret relations in tables, graphs, and mappings by finding the ordered pairs, the domain/range, and the inverse of a relation.
	Day 11: Introduction to Functions	8.F.1	Today you will determine if a relation is a function by analyzing the input and outputs of coordinates, graphs, tables, and mappings.

	Day 12: Identifying Functions	8.F.1	Today you identify functions by determining if a relation in a graph or a table is a function.
	Day 13: Graphing Functions	8.F.4	Today you will graph a linear function by making a table of input/output values and graphing the coordinates.
	Day 14: Writing Function Rules from Graphs	8.F.4 HSF.BF.1	Today you will find function rules on a graph by finding the slope and the y-intercept of linear data.
	Day 15: Modeling Real-World Functions	8.F.4 HS.ID.C.7	Today you will model real-world data by writing and graphing function rules. Interpreting the slope (rate of change) and the intercept (constant term) of a linear model in the context of data.
Exponential Expressions and Equations (3 lessons)	Day 16: Properties of Integer Exponents (Multiplication Properties)	8.EE.1	Today you will generate equivalent expressions by applying the multiplication and power properties of exponents.
	Day 17: Properties of Integer Exponents (Division, Negative, and Zero Properties)	8.EE.1	Today you will rewrite expressions by applying the division, negative, and zero properties of integer exponents.
	Day 18: Properties of Rational Exponents (Radicals)	HSN. RN. A. 2	Today you will rewrite expressions involving radicals and rational exponents using the properties of exponents.
Similarity and Congruence (3 lessons)	Day 19: Similar Polygons	8.G.4 HSG.SRT	Today you will apply the definition of similar polygons by finding missing side and angle measures on similar polygons.
	Day 20: Dilations and Scale Factor	8.G.4	Today you will use the scale factor of dilations to solve application problems involving similar figures or objects.

	Similarity, Congruence, Transformations	8.G.A HSG.SRT.B HSG.CO.A	Today you will determine if shapes are similar or congruent using your knowledge of transformations and their properties.
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