8th Grade Resource Math Curriculum

Course Summary: In Grade 8, instructional time will focus on three critical areas: (1) formulating and reasoning about expressions and equations, including modeling and association in bivariate data with a linear equation, and solving linear equations and systems of linear equations; (2) grasping the concept of a function and using functions to describe quantitative relationships; (3) analyzing two- and three-dimensional space and figures using distance, angle, similarity, and congruence, and understanding and applying the Pythagorean Theorem.

Scope and Sequence:

Time Frame	Unit
16 Blocks	Expressions and Equations
17 Blocks	Transformations, Angles and Triangles
29 Blocks	Functions and Linear Relationships
19 Blocks	Applications of Exponential Properties

Key:
Yellow Highlight: Standards/lessons included in 8th grade resource math curriculum
Blue Highlight: Lessons included in 8th grade resource math curriculum if time allows

Unit 1: Expressions & Equations

Subject: Mathematics
Grade: 8th grade
Name of Unit: Expressions & Equations
Length of Unit: 16 (blocks)
Overview of Unit: Students will build upon their previous understanding of solving one and two step equations to solve linear equations with rational number coefficients, which may include collecting like terms.

Priority Standards for unit:

- 8.EE.I.C Analyze and solve linear equations and inequalities and pairs of simultaneous linear equations.
- 8.EEI.C.7 Solve linear equations and inequalities in one variable.
    a. Create and identify linear equations with one solution, infinitely many solutions or no solutions.
    b. Solve linear equations and inequalities with rational number coefficients, including equations and inequalities whose solutions require expanding expressions using the distributive property and combining like terms.

Standard	Unwrapped Concepts (Students need to know)	Unwrapped Skills (Students need to be able to do)	Bloom's Taxonomy Levels	Webb's DOK
8.EE.I.C	Linear equations and inequalities and pairs of simultaneous linear equations.	Analyze	Analyze	4
8.EE.I.C	Linear equations and inequalities and pairs of simultaneous linear equations.	Solve	Apply	2
8.EEI.C.7	Linear equations in one variable	Solve	Apply	2
8.EEI.C.7	Linear equations with one solution, infinitely many solutions or no solution	Create	Create	4
8.EEI.C.7	Linear equations with one solution, infinitely many solutions or no solution	Identify	Knowledge	2
8.EEI.C.7	Linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and combining like terms.	Solve	Apply	2

Essential Questions:

1. How do you solve multi-step equations?
2. How do you solve equations with variables on both sides of the equation?

3. How to you rewrite a literal equation?
4. How do algebraic processes help solve real world problems?

Enduring Understanding/Big Ideas:

1. To solve multi-step equations, use inverse operations to isolate the variable.
2. To solve equations with variables on both sides, collect the variable terms on one side and the constant on the other side.
3. To rewrite a literal equation, solve for one variable in terms of the other variable(s).
4. Translating real world problems into algebraic equations allows you to solve problems in an accurate and efficient manner.

Unit Vocabulary:

Academic Cross-Curricular Words	Content/Domain Specific
Inverse Negative	**Chapter 1** Order of Operations Expressions Equations Variables Constants Coefficients Integer Literal Equation

Resources for Vocabulary Development:

Chapter 1

Big Ideas Textbook: definition of "literal equation" - p. 26

Other

Big Ideas Textbook: Graphic Organizers - p. 32

Big Ideas Online: Vocabulary Flash Cards ch 1

Big Ideas Chapter 1: Equations

Standard	Topic & Section	Suggested # of Blocks	Notes
	Add/Subtract/Multiply/Divide Integers	**2* if needed**	Skills Review Topic 7.1 (p. 40)
	Add/Subtract/Multiply/Divide Fractions	**2.5**	Skills Review Topic 9 (p. 48 - 51) & Skills Review Topic 16 (p. 52 - 59)
	Distributive Property **Combining Like Terms** **Expressions and Equations**	**5.5**	Skills Review Topic 16 (p. 86 - 89)
	STEAM Video/Performance Task **Getting Ready for Ch 1**	**0.5**	
8.EEI.C.7	**1.1 Solving Simple Equations**	**1**	
8.EEI.C.7	**1.2 Solving Multi-Step Equations**	**1**	
8.EEI.C.7	**1.3 Solving Equations with Variables on Both Sides**	**1.5**	
8.EEI.C.7	**1.4 Rewriting Equations and Formulas**	**1**	OPTIONAL - Additional Topic
	Connecting Concepts	**0.5**	
	Chapter Review	**0.5**	
	Chapter Test	**0.5**	

Unit 2: Transformations, Angles & Triangles

Subject: Mathematics
Grade: 8th
Name of Unit: Transformations, Angles & Triangles
Length of Unit: 16 (Blocks)
Overview of Unit: Students will understand the concepts of identifying similar figures and translating those figures on the coordinate plane. Students will find missing angle measures created by the intersection of lines.

Priority Standards for unit:

- 8.GM.A Understand congruence and similarity using physical models, transparencies or geometry software.
- 8.GM.A.1 Verify experimentally the congruence properties of rigid transformations.
    - a. Verify that angle measure, betweenness, collinearity and distance are preserved under rigid transformations.
    - b. Investigate if orientation is preserved under rigid transformations.
- 8.GM.A.2 Understand that two-dimensional figures are congruent if a series of rigid transformations can be performed to map the preimage to the image.
    - a. Describe a possible sequence of rigid transformations between two congruent figures.
- 8.GM.A.3 Describe the effect of dilations, translations, rotations and reflections on two-dimensional figures using coordinates.
- 8.GM.A.4 Understand that two-dimensional figures are similar if a series of transformations (rotations, reflections, translations and dilations) can be performed to map the pre-image to the image.
    - a. Describe a possible sequence of transformations between two similar figures.
- 8.GM.A.5 Explore angle relationships and establish informal arguments.
    - a. Derive the sum of the interior angles of a triangle.
    - b. Explore the relationship between the interior and exterior angles of a triangle.
    - c. Construct and explore the angles created when parallel lines are cut by a transversal.
    - d. Use the properties of similar figures to solve problems.

Supporting Standards for unit:

- ISTE-COMPUTATIONAL THINKER.5: Students develop and employ strategies for understanding and solving problems in ways that leverage the power of technological methods to develop and test solutions.
    - **a.** Students formulate problem definitions suited for technology-assisted methods such as data analysis, abstract models and algorithmic thinking in exploring and finding solutions.
    - **b.** Students collect data or identify relevant data sets, use digital tools to analyze them, and represent data in various ways to facilitate problem-solving and decision-making.

c. Students break problems into component parts, extract key information, and develop descriptive models to understand complex systems or facilitate problem-solving.
d. Students understand how automation works and use algorithmic thinking to develop a sequence of steps to create and test automated solutions.

Standard	Unwrapped Concepts (Students need to know)	Unwrapped Skills (Students need to be able to do)	Bloom's Taxonomy Levels	Webb's DOK
8.GM.A	Congruence and similarity using physical models, transparencies or geometry software.	Understand	Understand	2
8.GM.A.1	Experimentally the congruence properties of rigid transformations	Verify	Knowledge	1
8.GM.A.1	That angle measure, betweenness, collinearity and distance are preserved under rigid transformations.	Verify	Knowledge	1
8.GM.A.1	If orientation is preserved under rigid transformations	Investigate	Analyze	3
8.GM.A.2	Two-dimensional figures are congruent if a series of rigid transformations can be performed to map the preimage to the image.	Understand	Understand	2
8.GM.A.2	A possible sequence of rigid transformation between two congruent figures.	Describe	Understand	2
8.GM.A.3	The effect of dilations, translations, rotations and reflections on two-dimensional figures using coordinates.	Describe	Understand	2
8.GM.A.4	Two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations	Understand	Understand	2
8.GM.A.4	A possible sequence of rigid transformations between two congruent figures	Describe	Understand	2
8.GM.A.5	Angle relationships and establish informal arguments.	Explore	Analyze	3
8.GM.A.5	The sum of the interior angles of a triangle	Derive	Analyze	2
8.GM.A.5	The relationship between the interior and exterior angles of a triangle	Explore	Analyze	2
8.GM.A.5	The angles created when parallel lines are cut by a transversal	Construct	Create	4
8.GM.A.5	The properties of similar figures to solve problems	Use	Apply	1

Essential Questions:

1. How can one determine if two figures are identical?
2. How do I complete a transformation in the coordinate plane?
3. How do you know if two figures are similar?
4. How do I know if angles are congruent?
5. How do I find the angle measures of a triangle and a polygon?

Enduring Understanding/Big Ideas:

1. Two figures are identical if you can map one to the other by a sequence of rigid motions, such as translations, reflections, and rotations.
2. To complete transformations in the coordinate plane:
    a. To translate a figure *a* units horizontally and *b* units vertically in a coordinate plane, add *a* to the x-coordinates and *b* to the y-coordinates of the vertices. Positive values a and b represent translations up and right. Negative values of *a* and *b* represent translations down and left.
    b. To reflect a figure in the x-axis, take the opposite of the y-coordinate. To reflect a figure in the y-axis, take the opposite of the x-coordinate.
    c. When a point (x, y) is rotated counterclockwise about the origin, the following are true.
        i. For a rotation of 90°, (x, y) ⟶ (-y, x).
        ii. For a rotation of 180°, (x, y) ⟶ (-x, -y).
        iii. For a rotation of 270°, (x, y) ⟶ (y, -x).
    d. For a rotation of 90°, (x, y) ⟶ (To dilate a figure with respect to the origin, multiply the coordinates of each vertex by the scale factor of k.
3. When two figures are similar:
    a. The value of the ratio of their perimeters is equal to the value of the ratio of their corresponding side lengths.
    b. The value of the ratio of their areas is equal to the *square* of the value of the ratio of their corresponding side lengths

    Similar figures have the same shape but not necessarily the same size
4. The following angles are congruent when a transversal intersects parallel lines:
    a. alternate interior angles
    b. alternate exterior angles.
    c. corresponding angles
5. I can find the angle measures of triangles and polygons:
    a. The sum of the interior angle measures of a triangle is 180°.
    b. The measure of an exterior angle of a triangle is equal to the sum of the measures of the two nonadjacent interior angles.
    c. The sum S of the interior angle measures of a polygon with n sides is S = (n - 2) ● 180

Unit Vocabulary:

Academic Cross-Curricular Words	Content/Domain Specific
Enlarge Shrink Increase Decrease Similar Corresponding Interior Exterior Clockwise Counterclockwise	**Chapter 2** Congruent Figures Image Reflection Rigid Motion Rotation Transformation Translation Dilation Enlargement Reduction Scale Factor Similar Figures Alternate Interior Angles Corresponding Angles Deductive reasoning Exterior angle of a triangle Transversal **Chapter 3** Interior Angles of a Polygon Exterior Angles of a Polygon Regular Polygon Quadrants Congruent Figures Congruent Angles Congruent Sides

Resources for Vocabulary Development:

Chapter 2

Big Ideas Textbook: definition of "transformation, image, translation" - p. 44
Big Ideas Textbook: definition of "reflection, line of reflection" - p. 50
Big Ideas Textbook: definition of "rotation, center of rotation, angle of rotation" - p. 56
Big Ideas Textbook: definition of "rigid motion, congruent figures, congruent angles, congruent sides" - p. 64
Big Ideas Textbook: definition of "dilation, center of dilation, scale factor" - p. 70
Big Ideas Textbook: definition of "similarity transformation, similar figures" - p. 78
Big Ideas Textbook: definition of "transversal" - p. 104

Chapter 3

Big Ideas Textbook: definition of “interior angles, exterior angles” - p. 105
Big Ideas Textbook: definition of “interior angles of a polygon, exterior angles of a polygon” - p. 112
Big Ideas Textbook: definition of “regular polygon” - p. 120
Big Ideas Textbook: definition of “indirect measurement” - p. 126

Other

Big Ideas Online: Vocabulary Flash Cards ch 2 and 3
Big Ideas Textbook: Graphic Organizers - p. 90 and p. 130

Big Ideas Chapter 2: Transformations

Standard	Topic & Section	Suggested # of Blocks	Notes
	STEAM Video/Performance Task **Getting Ready for Ch 2**	**1**	
8.GM.A.1 ISTE 5a, 5d	**2.1 Translations** • **Desmos Tool**	**1**	
8.GM.A.1 ISTE 5a, 5d	**2.2 Reflections** • **Desmos Tool**	**1**	
8.GM.A.1 ISTE 5a, 5d	**2.3 Rotations** • **Desmos Tool**	**1**	
8.GM.A.2	**2.4 Congruent Figures**	**1**	
8.GM.A.3 ISTE 5a, 5b, 5c, 5d	**2.5 Dilations** • **Desmos Tool**	**1-2**	
8.GM.A.4	**2.6 Similar Figures**	**1**	*consider discussing this before 2.5
8.GM.A.4 ISTE 5a, 5c, 5d	**2.7 Perimeters and Areas of Similar Figures** • **Desmos Tool**	**1**	
	Connecting Concepts	**0.5**	
	Chapter Review	**0.5**	
	Chapter Test ***consider doing a performance task or project instead of an assessment**	**0.5** ***2-3**	

Big Ideas Chapter 3: Angles and Triangles

Standard	Topic & Section	Suggested # of Blocks	Notes
	STEAM Video/Performance Task **Getting Ready for Ch 3**	**1**	
8.GM.A.5 ISTE 5a, 5c	**3.1 Parallel Lines and Transversals** • **Desmos Tool**	**1**	
8.GM.A.5 ISTE 5a, 5b	**3.2 Angles of Triangles** • **Desmos Geometry Tool**	**1**	
8.GM.A.5	**3.3 Angles of Polygons**	**1**	OPTIONAL - Additional Topic
8.GM.A.5 IST 5a, 5b	**3.4 Using Similar Triangles** • **Desmos Geometry Tool**	**1**	
	Connecting Concepts	**0.5**	
	Chapter Review	**0.5**	
	Chapter Test	**0.5**	

Unit 3: Functions and Linear Relationships

Subject: Mathematics
Grade: 8th Grade
Name of Unit: Functions and Linear Relationships
Length of Unit: 35 (Blocks)
Overview of Unit: Students will understand the concepts related to identifying, creating, manipulating and solving functions and systems of equations. Students will also understand the concepts of using and creating systems of categorical data.

Priority Standards for unit:

- 8.EEI.B Understand the connections between proportional relationships, lines and linear equations.
- 8.EEI.B.5 Graph proportional relationships.
    a. Interpret the unit rate as the slope of the graph.
    b. Compare two different proportional relationships.
- 8.EEI.B.6 Apply concepts of slope and y-intercept to graphs, equations and proportional relationships.
    a. Explain why the slope (m) is the same between any two distinct points on a non-vertical line in the Cartesian coordinate plane.
    b. Derive the equation $y = mx$ for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at b.
- 8.EEI.C.8 Analyze and solve pairs of simultaneous linear equations.
    a. Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously.
    b. Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection.
    c. Solve real-world and mathematical problems leading to two linear equations in two variables.
- 8.DSP.A Investigate patterns of association in bivariate data.
- 8.DSP.A.1 Construct and interpret scatter plots of bivariate measurement data to investigate patterns of association between two quantities.
- 8.DSP.A.2 Generate and use a trend line for bivariate data, and informally assess the fit of the line.
- 8.DSP.A.3. Interpret the parameters of a linear model of bivariate measurement data to solve problems.
- 8.DSP.A.4 Understand the patterns of association in bivariate categorical data displayed in a two-way table.
    a. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects.

b. Use relative frequencies calculated for rows or columns to describe possible association between the two variables.

- 8.F.A Define, evaluate and compare functions.
- 8.F.A.1 Explore the concept of functions. (The use of function notation is not required.)
  - a. Understand that a function assigns to each input exactly one output.
  - b. Determine if a relation is a function.
  - c. Graph a function.
- 8.F.A.2 Compare characteristics of two functions each represented in a different way.
- 8.F.A.3 Investigate the differences between linear and nonlinear functions.
  - a. Interpret the equation y = mx + b as defining a linear function, whose parameters are the slope (m) and the y-intercept (b).
  - b. Recognize that the graph of a linear function has a constant rate of change
  - c. Give examples of nonlinear functions.
- 8.F.B Use functions to model relationships between quantities.
- 8.F.A.4 Use functions to model linear relationships between quantities.
  - a. Explain the parameters of a linear function based on the context of a problem.
  - b. Determine the parameters of a linear function.
  - c. Determine the x-intercept of a linear function.
- 8.F.A.5 Describe the functional relationship between two quantities from a graph or a verbal description.

Supporting Standards for unit:

- 8.EEI.C.7 Solve linear equations and inequalities in one variable.
  - a. Create and identify linear equations with one solution, infinitely many solutions or no solutions.
  - b. Solve linear equations and inequalities with rational number coefficients, including equations and inequalities whose solutions require expanding expressions using the distributive property and combining like terms
  - c. Explain why the slope (m) is the same between any two distinct points on a non-vertical line in the Cartesian coordinate plane.
  - d. Derive the equation y = mx for a line through the origin and the equation y = mx + b for a line intercepting the vertical axis at b.
- ISTE-COMPUTATIONAL THINKER.5: Students develop and employ strategies for understanding and solving problems in ways that leverage the power of technological methods to develop and test solutions.
  - **a.** Students formulate problem definitions suited for technology-assisted methods such as data analysis, abstract models and algorithmic thinking in exploring and finding solutions.
  - **b.** Students collect data or identify relevant data sets, use digital tools to analyze them, and represent data in various ways to facilitate problem-solving and decision-making.
  - **c.** Students break problems into component parts, extract key information, and develop descriptive models to understand complex systems or facilitate problem-solving.

d. Students understand how automation works and use algorithmic thinking to develop a sequence of steps to create and test automated solutions.

Standard	Unwrapped Concepts (Students need to know)	Unwrapped Skills (Students need to be able to do)	Bloom's Taxonomy Levels	Webb's DOK
8.EEI.B	The connections between proportional relationships, lines and linear equations.	Understand	Understand	2
8.EEI.B.5	Proportional relationships	Graph	Apply	2
8.EEI.B.5	Unit rate as the slope of the graph.	Interpret	Understand	2
8.EEI.B.5	Two different proportional relationships.	Compare	Analyze	4
8.EEI.6	Concepts of slope and y-intercept to graphs, equations and proportional relationships.	Apply	Apply	2
8.EEI.B.6	Why the slope (m) is the same between any two distinct points on a non-vertical line in the Cartesian coordinate plane.	Explain	Understand	2
8.EEI.B.6	Derive the equation $y = mx$ for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at b.	Derive	Apply	3
8.EEI.C.8	Graph systems of linear equations and recognize the intersection as the solution to the system.	Analyze	Analyze	4
8.EEI.C.8	That solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both points simultaneously.	Understand	Understand	2
8.EEI.C.8	Systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations.	Solve	Analyze	4
8.EEI.C.8	Simple cases by inspection	Solve	Analyze	4
8.EEI.C.8	Real-world and mathematical problems leading to two linear equations in two variables	Solve	Apply	2
8.DSP.A	Patterns of association in bivariate data	Investigate	Analyze	3
8.DSP.A.1	Scatter plots of bivariate measurement data to investigate patterns of association between two quantities.	Construct	Create	4
8.DSP.A.1	Scatter plots of bivariate measurement data to investigate patterns of association between two quantities.	Interpret	Analyze	2

8.DSP.A.2	Trend line for bivariate data, and informally assess the fit of the line.	Generate	Apply	3
8.DSP.A.3	Parameters of a linear model of bivariate measurement data to solve problems.	Interpret	Understand	2
8.DSP.A	The patterns of association in bivariate categorical data displayed in a two-way table	Understand	Understand	2
8.DSP.A.4	A two-way table summarizing data on two categorical variables collected from the same subjects.	Construct	Apply	2
8.DSP.A.4	Interpret a two-way table summarizing data on two categorical variables collected from the same subjects.	Interpret	Analyze	2
8.DSP.A.4	Relative frequencies calculated for rows or columns to describe possible association between the two variables.	Use	Apply	2
8.F.A	Functions	Define	Knowledge	1
8.F.A	Functions	Evaluate	Evaluate	3
8.F.A	A function	Graph	Apply	2
8.F.A.1	The concept of functions (the use of function notation is not required)	Explore	Knowledge	1
8.F.A.1	Function assigns to each input exactly one output.	Understand	Understand	2
8.F.A.1	Relation is a function.	Determine	Apply	1
8.F.A.1	Function.	Graph	Apply	1
8.F.A.2	Characteristics of two functions each represented in a different way	Compare	Analyze	3
8.F.A.3	The differences between linear and nonlinear functions	Investigate	Knowledge	1
8.F.A.3	Equation y = mx + b as defining a linear function, whose parameters are the slope (m) and the y-intercept (b).	Interpret	Understand	2
8.F.A.3	Graph of a linear function has a constant rate of change	Recognize	Knowledge	2
8.F.A.3	Examples of nonlinear functions.	Give	Knowledge	2
8.F.B	Functions to model relationships between quantities	Use	Knowledge	1
8.F.A.4	Functions to model linear relationships between quantities	Use	Knowledge	1
8.F.B.4	Parameters of a linear function based on the context of a problem.	Explain	Understand	2
8.F.B.4	Parameters of a linear function.	Determine	Analyze	3

8.F.B.4	X-intercept of a linear function	Determine	Analyze	3
8.F.B.5	Functional relationship between two quantities from a graph or a verbal description.	Describe	Analyze	4

Essential Questions:

1. How do I graph horizontal and vertical lines?
2. How do I find the slope of a line?
3. How do I determine the relation between parallel lines and slope?
4. How do I determine a proportional relationship?
5. How do I use intercepts?
6. How do I use the standard form of a linear equation?
7. How do I write a linear equation in point-slope form?
8. How do I know how many solutions a linear system has?
9. How do I use a scatter plot?
10. What are the different types of data displays and why would I use one over the other?
11. What are relations and mapping diagrams?
12. How do I use a function rule?
13. How can a function be represented?

Enduring Understanding/Big Ideas:

1. The graph of y = b is a horizontal line passing through through (0, b). The graph of x = a is a vertical line passing through (a, 0).
2. The slope *m* of a line is the value of the ratio of the change in the y (the rise) to the change in x (the run) between any two points (x_1, y_1) and (x_2, y_2), on the line. The slope of a line is a measure of the steepness of the line.
    a. Lines with positive slopes rise from left to right.
    b. Lines with negative slopes fall from left to right.
3. Lines n the same plane that do not intersect are parallel lines. Non-vertical parallel lines have the same slope. All vertical lines are parallel.
4. When two quantities *x* and *y* are proportional, the relationship can be represented by the equation y = mx, where *m* is the constant of proportionality.
5. The x-intercept of a line is the x-coordinate of the point where the line crosses the x-axis. It occurs when y = 0. The y-intercept of a line is the y-coordinate of the point where the line crosses the y-axis. It occurs when x = 0.
6. The standard form of a linear equation is Ax + By = C. Where A and B are both not zero.
7. A linear equation written in the form $y - y_1 = m(x - x_1)$ is in point-slope form. The line passes through the point (x_1, y_1), and the slope of the line is *m*.
8. A system of linear equations can have one solution, no solution, or infinitely many solutions.
    a. A system has one solution the lines will intersect. The slopes will be different.
    b. A system has no solution when the lines are parallel. The slopes will be the same and the lines will have different y-intercepts.

    c. A system has infinitely many solutions when the lines are the same. The slopes are the same and the y-intercepts are the same.

9. A scatter plot is a graph that shows the relationship between two data sets. The two sets of data are graphed as ordered pairs in a coordinate plane.

10.

Data Display	What does it do?
Pictograph	Shows data using pictures
Bar Graph	Shows data in specific categories
Circle Graph	Shows data as parts of a whole
Line Graph	Shows how data changes over time
Histogram	Shows frequencies of data values in intervals of the same size
Stem-and-Leaf Plot	Orders numerical data and shows how they are distributed
Box-and-Whisker Plot	Shows the variability of a data set by using quartiles
Dot Plot	Shows the number of times each value occurs in a data set
Scatter Plot	Shows the relationship between two data sets by using ordered pairs in a coordinate plane

11. A relation pars inputs with outputs. A relation can be represented by ordered pairs or a mapping diagram
12. A function rule is an equation that describes the relationship between inputs (independent variable) and outputs (dependent variable).
13. A function can be represented by words, an equation, an input-output table, a mapping diagram and by a graph.

Unit Vocabulary:

Academic Cross-Curricular Words	Content/Domain Specific
Scatter Plot Initial Values Trend Line Outlier Cluster Bivariate Data Independent Variable Dependent Variable Experiment Group Control Group Relationship	**Chapter 4** Linear Equation Solution of a Linear Equation Slope Rise Run X-intercept Y-intercept Slope Intercept Form of a Line Standard Form of a Line Point-Slope Form of a Line **Chapter 5** System of Linear Equations Solution of a System of Linear Equations **Chapter 6** Scatter Plot Line of Fit Line of Best Fit Two Way Table Joint Frequency Marginal Frequency **Chapter 7** Input Output Relation Mapping Diagram Function Function Rule Linear Function Non-Linear Function **Extra:** Initial Value Cluster Gap Outlier Trend Line Rate of Change Vertical Line Test

Resources for Vocabulary Development:

Chapter 4

Big Ideas Textbook: definition of “Linear Equation, Solution of a Linear Equation” - p. 142
Big Ideas Textbook: definition of “Rise, Run and Slope” - p. 148
Big Ideas Textbook: definition of “X and Y intercepts, and Slope Intercept Form of a Line” - p. 162
Big Ideas Textbook: definition of “Standard Form of a Line” - p. 168
Big Ideas Textbook: definition of “Point Slope Form of a Line” - p. 180

Chapter 5

Big Ideas Textbook: definition of “System of Linear Equations” - p. 200
Big Ideas Textbook: definition of “Solutions of Systems of Linear Equations” - p. 200
Big Ideas Textbook Graphic Organizer p. 226

Chapter 6

Big Ideas Textbook: definition of “Scatter Plot” - p. 238
Big Ideas Textbook: definition of “Line of Fit” - p. 244
Big Ideas Textbook: definition of “Line of Best Fit” - p. 245
Big Ideas Textbook: definition of “Two Way Table, Joint Frequency, and Marginal Frequency” - p. 250

Chapter 7

Big Ideas Textbook: definition of “Input, Output, Relation and Mapping Diagram” - p. 276
Big Ideas Textbook: definition of “Function” - p. 177
Big Ideas Textbook: definition of “Function Rule” - p. 282
Big Ideas Textbook: definition of “Linear Function” - p. 290
Big Ideas Textbook: definition of “Non-Linear Function” - p. 296

Other

Big Ideas Textbook Graphic Organizer p. 186, 226, 264 and 308
Big Ideas Online: Vocabulary Flash Cards ch 4, 5, 6, and 7

Big Ideas Chapter 4: Graphing and Writing Linear Equations

Standard	Topic & Section	Suggested # of Blocks	Notes
	STEAM Video/Performance Task **Getting Ready for Ch 4**	**1**	
8.EEI.B.1 ISTE 5a, 5b, 5c	**4.1 Graphing Linear Equations** ● **Desmos Tool**	**1**	
8.EEI.B.2 ISTE 5d ISTE 5a, 5d	**4.2 Slope of Line** ● **Desmos Tool** ● **Desmos Tool**	**1**	
8.EEI.B.1 ISTE 5a, 5c	**4.3 Graphing Proportional Relationships** ● **Desmos Tool**	**1**	
8.EEI.B.2	**4.4 Graphing Linear Equations in Slope-Intercept Form**	**1**	
8.EEI.B.2 ISTE 5c, 5d	**4.5 Graphing Linear Equations in Standard Form** ● **Desmos Tool**	**1**	OPTIONAL - Additional Topic
8.EEI.B.2	**4.6 Writing Equations in Slope-Intercept Form**	**1**	
8.EEI.B.2 ISTE 5a, 5c, 5d	**4.7 Writing Equations in Point-Slope Form** ● **Desmos Tool**	**1**	
	Connecting Concepts	**0.5**	
	Chapter Review	**0.5**	
	Chapter Test	**0.5**	

Big Ideas Chapter 5: System of Linear Equations

Standard	Topic & Section	Suggested # of Blocks	Notes
	STEAM Video/Performance Task **Getting Ready for Ch 5**	**1**	
	***Consider reviewing graphing equations to ensure that skill is fresh**	**1**	
8.EEI.C.2 ISTE 5b, 5d	**5.1 Solving Systems of Linear Equations by Graphing** ● **Desmos Tool**	**1**	
8.EEI.C.2	**5.2 Solving Systems of Linear Equations by Substitution**	**2**	
8.EEI.C.2	**5.3 Solving Systems of Linear Equations by Elimination**	**1**	
8.EEI.C.2 ISTE 5b, 5c	**5.4 Solving Special Types of Linear Equations** ● **Desmos Tool**	**1**	
	Connecting Concepts	**0.5**	
	Chapter Review	**1**	
	Chapter Test	**0.5**	

Big Ideas Chapter 6: Data Analysis and Displays

Standard	Topic & Section	Suggested # of Blocks	Notes
	STEAM Video/Performance Task **Getting Ready for Ch 6**	**1**	
8.DSP.A.1 ISTE 5a, 5b, 5c, 5d	**6.1 Scatter Plots** ● **Desmos Tool**	**1**	
8.DSP.A.2 ISTE 5a, 5b	**6.2 Lines of Fit** ● **Desmos Tool**	**1**	
8.DSP.A.4	**6.3 Two-Way Tables**	**1**	
8.DSP.A.4	**6.4 Choosing a Data Display**	**1**	OPTIONAL - Additional Topic
	Connecting Concepts	**0.5**	
	Chapter Review	**0.5**	
	Chapter Test ***Consider a performance task or project for assessment instead of a test**	**0.5** **1**	

Big Ideas Chapter 7: Functions

Standard	Topic & Section	Suggested # of Blocks	Notes
	STEAM Video/Performance Task **Getting Ready for Ch 7**	**1**	
8.F.A.1	**7.1 Relations and Functions**	**1**	
8.F.A.1	**7.2 Representations of Functions**	**1**	
8.EEI.B.2	**7.3 Linear Equations**	**1**	
8.F.A.2 ISTE 5a	**7.4 Comparing Linear and Nonlinear Functions** • **Desmos Tool**	**1**	
8.A.F.1	**7.5 Analyzing and Sketching Graphs**	**1**	
	Connecting Concepts	**0.5**	
	Chapter Review	**0.5**	
	Chapter Test	**0.5**	

Unit 4: Applications of Exponential Properties

Subject: Mathematics
Grade: 8th
Name of Unit: Applications of Exponential Properties
Length of Unit: 19 (Blocks)
Overview of Unit:
Students will understand that there are numbers which are not rational and approximate them by rational numbers.
Students will work with radicals and integer exponents and understand the concepts of geometric reasoning as it relates to the Pythagorean Theorem. Students will also solve real-world and mathematical problems involving volume.

Priority Standards for unit:

- 8.EEI.A Work with radicals and integer exponents.
- 8.EEI.A.1 Know and apply the properties of integer exponents to generate equivalent expressions.
- 8.EEI.A.2 Investigate concepts of square and cube roots.
    - a. Solve equations of the form x2 = p and x3 = p, where p is a positive rational number.
    - b. Evaluate square roots of perfect squares less than or equal to 625 and cube roots of perfect cubes less than or equal to 1000 ***with a calculator**
    - c. Recognize that square roots of non-perfect squares are irrational.
- 8.EEI.A.3 Express very large and very small quantities in scientific notation and approximate how many times larger one is than the other.
- 8.EEI.A.4 Use scientific notation to solve problems.
    - a. Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used.
    - b. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities.
- 8.NS.A Know that there are numbers that are not rational, and approximate them by rational numbers.
- 8.NS.A.1 Explore the real number system.
    - a. Know the differences between rational and irrational numbers.
    - b. Understand that all rational numbers have a decimal expansion that terminates or repeats.
    - c. Convert decimals which repeat into fractions and fractions into repeating decimals.
    - d. Generate equivalent representations of rational numbers.
- 8.NS.A.2 Estimate the value and compare the size of irrational numbers and approximate their locations on a number line.
- 8.GM.B Understand and apply the Pythagorean Theorem.
- 8.GM.B.6 Use models to demonstrate a proof of the Pythagorean Theorem and its converse.

- 8.GM.B.7 Use the Pythagorean Theorem to determine unknown side lengths in right triangles in problems in two- and three dimensional contexts.
- 8.GM.B.8 Use the Pythagorean Theorem to find the distance between points in a Cartesian coordinate system.
- 8.GM.C Solve problems involving volume of cones, pyramids and spheres.
- 8.GM.C.9 Solve problems involving surface area and volume.
    - a. Understand the concept of surface area and find surface area of pyramids.
    - b. Understand the concepts of volume and find the volume of pyramids, cones and spheres.

Supporting Standards for unit:

- ISTE-COMPUTATIONAL THINKER.5: Students develop and employ strategies for understanding and solving problems in ways that leverage the power of technological methods to develop and test solutions.
    - **a.** Students formulate problem definitions suited for technology-assisted methods such as data analysis, abstract models and algorithmic thinking in exploring and finding solutions.
    - **b.** Students collect data or identify relevant data sets, use digital tools to analyze them, and represent data in various ways to facilitate problem-solving and decision-making.
    - **c.** Students break problems into component parts, extract key information, and develop descriptive models to understand complex systems or facilitate problem-solving.
    - **d.** Students understand how automation works and use algorithmic thinking to develop a sequence of steps to create and test automated solutions.

Standard	Unwrapped Concepts (Students need to know)	Unwrapped Skills (Students need to be able to do)	Bloom's Taxonomy Levels	Webb's DOK
8.EEI.A	With radicals and integer exponents	Work	Knowledge	1
8.EEI.A.1	Properties of integer exponents to generate equivalent expressions.	Know	Remember	1
8.EEI.A.1	Properties of integer exponents to generate equivalent expressions	Apply	Apply	2
8.EEI.A.2	Concepts of square and cube roots	Investigate	Knowledge	1
8.EEI.A.2	Equations of the form x2 = p and x3 = p, where p is a positive rational number.	Solve	Apply	2
8.EEI.A.2	Square roots of perfect squares less than or equal to 625 and cube roots of perfect cubes less than or equal to 1000.	Evaluate	Apply	2
8.EEI.A.2	Square roots of non-perfect squares are irrational.	Recognize	Understand	1

8.EEI.A.3	Very large and very small quantities in scientific notation and approximate how many times larger one is than the other.	Express	Show	2
8.EEI.A.4	Scientific notation to solve problems	Use	Apply	3
8.EEI.A.4	Operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used.	Perform	Show	1
8.EEI.A.4	Scientific notation and choose units of appropriate size for measurements of very large or very small quantities.	Use	Apply	2
8.NS.A	That there are numbers that are not rational, and approximate them by rational numbers	Know	Knowledge	1
8.NS.A	The real number system	Explore	Analyze	2
8.NS.A.1	The differences between rational and irrational numbers	Know	Remember	1
8.NS.A.1	That all rational numbers have a decimal expansion that terminates or repeats	Understand	Understand	2
8.NS.A.1	Decimals which repeat into fraction sand fractions into repeating decimals	Convert	Apply	2
8.NS.A.1	Equivalent representations of rational numbers	Generate	Apply	2
8.NS.A.2	The value and compare the size of irrational numbers and approximate their locations on a number line	Estimate	Apply	2
8.GM.B	The Pythagorean Theorem	Understand	Understand	2
8.GM.B	The Pythagorean Theorem	Apply	Apply	2
8.GM.B.6	Models to demonstrate a proof of the Pythagorean Theorem and its converse.	Use	Apply	1
8.GM.B.7	The Pythagorean Theorem to determine unknown side lengths in right triangles in problems in two- and three dimensional contexts.	Use	Apply	2
8.GM.B.8	The Pythagorean Theorem to find the distance between points in a Cartesian coordinate system.	Use	Apply	2
8.GM.C.9	Concept of surface area and find surface area of pyramids.	Understand	Understand	2
8.GM.C.9	Concepts of volume and find the volume of pyramids, cones and spheres.	Understand	Understand	2

8.GM.B.8	The Pythagorean Theorem to find the distance between points in a Cartesian coordinate system	Use	Understand	2
8.GM.C	Problems involving volume of cones, pyramids and spheres	Solve	Apply	2
8.GM.C.9	The concept of surface area and find surface area of pyramids	Understand	Understand	2
8.GM.C.9	The concepts of volume and find the volume of pyramids, cones and spheres.	Understand	Understand	2

Essential Questions:

1. How can you use exponents to write and evaluate expressions?
2. How do you use the Product of Powers Property to simplify an expression?
3. How do you use the Power of a Power Property to simplify an expression?
4. How do you use the Power of a Product Property to simplify an expression?
5. How do you use the Quotient of Powers Property to simplify an expression?
6. How do you define zero exponents and negative exponents?
7. How do you write numbers in scientific notation?
8. How do you write numbers in standard form?
9. What is a square root?
10. What is a perfect square?
11. How do you use square roots in real life?
12. How do you use the Pythagorean Theorem to find the missing side length of a triangle?
13. How do you use the Pythagorean Theorem to find distance on the coordinate plane?
14. What is a cube root?
15. What is a perfect cube?
16. How do you convert between different forms of rational numbers?
17. What is an irrational number?
18. What are real numbers?
19. How can you approximate irrational numbers on a number line?
20. What is the converse of the Pythagorean Theorem?
21. How do you find volume of cylinder?
22. How do you find the volume of a cone?
23. How do you find the volume of a sphere?
24. What are similar solids?
25. How do I find a missing measure using similar solids?
26. How do you find the surface area of similar solids?
27. How do you find the volume of similar solids?

Enduring Understanding/Big Ideas:

1. You can write a power with a base and exponent, where the base is the repeated factor and the exponent indicates the number of times the factor is repeated.
2. To multiply powers with the same base, add their exponents.
3. To find the power of a power, multiply the exponents.
4. To find a power of a product, find the power of each factor and multiply.
5. To divide powers with the same base, subtract their exponents.
6. For any nonzero number a, a^0 = 1. The power 0^0 is undefined. For any integer n and any nonzero number a, a^ -n is the reciprocal of a^n.
7. Move the decimal point so it is located to the right of the leading non-zero digit. The number of places you moved the decimal point indicates the exponent of the power of 10.
8. The absolute value of the exponent indicates how many places to move the decimal point. If the exponent is negative, move the decimal point to the left. If the exponent is positive, move the decimal point to the right.
9. A square root of a number *p* is a number whose square is equal to *p.* So, a square root of a number *p* is a solution of the equation $x^2 = p$. Every positive number has a positive *and* a negative square root.
10. A perfect square is a number with integers as its square roots.
11. Example: The area of a crop circle is 45, 216 square feet. What is the radius of the crop circle?
12. Using $a^2 + b^2 = c^2$, where a and b are the legs and c is the hypotenuse (longest side), you can plug in information and solve for the missing variable.
13. You can use two points and connect them with a right triangle to form the hypotenuse of that right triangle. By using the distance of a and b (the legs) on the right triangle you can plug in the given information to find the missing hypotenuse, or distance between the two points.
14. A cube root of a number *p* is a number whose cube is equal to *p*. So, a cube root of a number *p* is a solution of the equation $x^3 = p$. The symbol $\sqrt[3]{}$ is used to represent a cube root.
15. A perfect cube is a number that can be written as the cube of an integer.
16. You can convert both repeating and terminating decimals to fractions by dividing by 10, 100, 100, etc. and fractions to decimals by dividing the numerator by the denominator.
17. An irrational number is a number that is not rational. So, an irrational number *cannot* be written as *a/b*, where *a* and *b* are integers and $b \neq 0$.
18. The real number system is made up of natural numbers, whole numbers, integers, and rational and irrational numbers. You can classify numbers in the real number system using these categories.
19. Using perfect squares you can choose the two perfect squares that the number you are approximating falls between. When you find the square root of the perfect squares (two whole numbers) you can place the non-perfect square (irrational number) on the number line between those two whole numbers.
20. The converse of the Pythagorean Theorem states that if the equation $a^2 + b^2 = c^2$ is true for the side lengths of a triangle, then the triangle is a right triangle.
21. The volume *V* of a cylinder is the product of the area of the base and the height of the cylinder, V=Bh, B=area of the base.

22. The volume *V* of a cone is one-third the product of the area of the base and the height of the cone, $V=1/3Bh$, B=area of the base.
23. The volume *V* of a sphere is the product of $4/3\pi$ and the cube of the radius of the sphere, $V=4/3\pi r^3$.
24. Similar solids are solids that have the same shape and proportional corresponding dimensions.
25. If solids are similar, you can set up proportions with corresponding measurements and solve to find the missing side length.
26. When two solids are similar, the value of the ratio of their surface areas is equal to the square of the value of the ratio of their corresponding linear measures.
27. When two solids are similar, the value of the ratio of their volumes is equal to the cube of the value of the ratio of their corresponding linear measures.

Unit Vocabulary:

Academic Cross-Curricular Words	**Content/Domain Specific**
Ratios Percents	**Chapter 8** Power Base Exponent Scientific Notation **Chapter 9** Square root Perfect Square Radical Sign Radicand Theorem Legs Hypotenuse Pythagorean Theorem Cube Root Perfect Cube Irrational Number Real Numbers **Chapter 10** Cone Sphere Hemisphere Similar Solids **Extra:** Repeating Decimal Square Root

	Terminating Decimal Proof Converse of Pythagorean Theorem Cylinder Height Radius Right Cone Right Cylinder Slant Height Surface Area Vertex Volume

Resources for Vocabulary Development:

Chapter 8

Big Ideas Textbook: definition of "Power, Base and Exponent" - p. 320

Big Ideas Textbook: definition of "Scientific Notation" - p. 350

Chapter 9

Big Ideas Textbook: definition of "Square Root, Perfect Square, Radical Sign and Radicand" - p. 374

Big Ideas Textbook: definition of "Theorem" - p. 381

Big Ideas Textbook: definition of "Legs, Hypotenuse, Pythagorean Theorem" - p. 382

Big Ideas Textbook: definition of "Cube Root, Perfect Cube" - p. 390

Big Ideas Textbook: definition of "Irrational Number and Real Numbers" - p. 402

Chapter 10

Big Ideas Textbook: definition of "Cone" - p. 433

Big Ideas Textbook: definition of "Sphere" - p. 439

Big Ideas Textbook: definition of "Hemisphere" - p. 442

Big Ideas Textbook: definition of "Similar Solids" - p. 446

Other

Big Ideas Textbook Graphic Organizer p. 362, 416 and 454

Big Ideas Online: Vocabulary Flash Cards ch 8, 9, 10

Big Ideas Chapter 8: Exponents and Scientific Notation

Standard	Topic & Section	Suggested # of Blocks	Notes
	STEAM Video/Performance Task **Getting Ready for Ch 8**	**1**	
8.EEI.A.1	**8.1 Exponents**	**1**	
8.EEI.A.1	**8.2 Product of Powers Property**	**1**	
8.EEI.A.1	**8.3 Quotient of Powers Property**	**1**	
8.EEI.A.1	**8.4 Zero and Negative Exponents**	**1**	
8.EEI.A.1	**8.5 Estimating Quantities**	**1**	
8.EEI.A.3	**8.6 Scientific Notation**	**1**	
8.EEI.A.3	**8.7 Operations in Scientific Notation**	**1**	
	Connecting Concepts	**0.5**	
	Chapter Review	**0.5**	
	Chapter Test	**0.5**	

Big Ideas Chapter 9: Real Numbers and the Pythagorean Theorem

Standard	Topic & Section	Suggested # of Blocks	Notes
	STEAM Video/Performance Task **Getting Ready for Ch 9**	**1**	
8.EEI.A.2	**9.1 Finding Square Roots**	**1**	
8.GM.B.1 8.GM.B.2	**9.2 The Pythagorean Theorem**	**1**	
8.EEI.A.1	**9.3 Finding Cube Roots**	**1**	
8.NS.A.1	**9.4 Rational Numbers**	**1**	
8.NS.A.2 ISTE 5a, 5d	**9.5 Irrational Numbers** ● **Desmos Tool**	**1**	
8.GM.B.1	**9.6 The Converse of the Pythagorean Theorem**	**1**	
	Connecting Concepts	**0.5**	
	Chapter Review	**0.5**	
	Chapter Test	**0.5**	

Big Ideas Chapter 10: Volume and Similar Solids

Standard	Topic & Section	Suggested # of Blocks	Notes
	STEAM Video/Performance Task **Getting Ready for Ch 10**	**1**	
8.GM.C.1 ISTE 5c, 5d	**10.1 Volume of Cylinders** ● **Desmos Tool**	**1**	
8.GM.C.1 ISTE 5c, 5d	**10.2 Volume of Cones** ● **Desmos Tool**	**1**	
8.GM.C.1 ISTE 5c, 5d	**10.3 Volume of Spheres** ● **Desmos Tool**	**1**	
8.GM.C.1 ISTE 5a, 5d	**10.4 Surface Areas and Volumes of Similar Solids** ● **Desmos Tool**	**1**	
	Connecting Concepts	**0.5**	
	Chapter Review	**0.5**	
	Chapter Test	**0.5**	

Unit of Study Terminology

Appendices: All Appendices and supporting material can be found in this course's shell course in the District's Learning Management System.

Assessment Leveling Guide: A tool to use when writing assessments in order to maintain the appropriate level of rigor that matches the standard.

Big Ideas/Enduring Understandings: Foundational understandings teachers want students to be able to discover and state in their own words by the end of the unit of study. These are answers to the essential questions.

Engaging Experience: Each topic is broken into a list of engaging experiences for students. These experiences are aligned to priority and supporting standards, thus stating what students should be able to do. An example of an engaging experience is provided in the description, but a teacher has the autonomy to substitute one of their own that aligns to the level of rigor stated in the standards.

Engaging Scenario: This is a culminating activity in which students are given a role, situation, challenge, audience, and a product or performance is specified. Each unit contains an example of an engaging scenario, but a teacher has the ability to substitute with the same intent in mind.

Essential Questions: Engaging, open-ended questions that teachers can use to engage students in the learning.

Priority Standards: What every student should know and be able to do. These were chosen because of their necessity for success in the next course, the state assessment, and life.

Supporting Standards: Additional standards that support the learning within the unit.

Topic: These are the main teaching points for the unit. Units can have anywhere from one topic to many, depending on the depth of the unit.

Unit of Study: Series of learning experiences/related assessments based on designated priority standards and related supporting standards.

Unit Vocabulary: Words students will encounter within the unit that are essential to understanding. Academic Cross-Curricular words (also called Tier 2 words) are those that can be found in multiple content areas, not just this one. Content/Domain Specific vocabulary words are those found specifically within the content.