5th Grade – Summary of Revisions and Planning Guidance - *Arizona Mathematics Standards - Adopted in 2016*

Additions	Deletions
• **5.OA.B.4**–Understand primes have only two factors and decompose numbers into prime factors.	**No Deletions**

Parameter Changes/Clarifications	
5.OA.A.1	Removed the use of braces in numerical expressions and added the terminology, "Order of Operations".
5.OA.B.4	**NEW STANDARD** [Portions of this standard were previously found in (2010) 4.OA.B.4]
5.NBT.A.1	Went from "Recognize the value of a digit" to "**Apply** concepts of place value, multiplication and division to understand…" This increases the cognitive demand expectations in this standard.
5.NBT.A.2	Removed the requirement to denote powers of 10 with exponents.
5.NBT.B.6	Replaced "find whole number quotients" to "**apply and extend understanding** of division to find…" This increases the cognitive demand expectations in this standard.
5.NBT.B.7	This standard was expanded to include the relationship between any set of operations rather than just addition and subtraction.
5.NF.A.1	The "in general" statement was removed to focus on understanding equivalent fractions rather than an algorithm.
5.NF.B.3	The e.g. was removed from this standard to allow for multiple instructional approaches.
5.NF.B.4	Changed multiply a fraction **or** a whole number by a fraction to **and** a whole number. Subsequently, each of these have their own subset in part a (fraction by whole #) and part b (fraction by fraction).
5.NF.B.6	Using a variety of representations including equations and models is now part of the standard rather than an e.g.
5.NF.B.7	It is stated in parts a and b to use the relationship between multiplication and division **to justify conclusions.** The examples were removed from all areas of this standard to allow for multiple instructional approaches.
5.MD.C.5	Part b went from "apply the formula" to "**understand and use** the formula". Notation for the area of the base (B) was clarified in the standard. Part c requires understanding volume as additive (rather than recognizing) increasing the cognitive demand of this standard.
5.G.A.1	This standard requires students to understand and describe the coordinate system rather than using axes to define the system, increasing the cognitive demand.

Fluency Expectations	
4th	**4.NBT.B.4 -** Fluently add and subtract multi-digit whole numbers using a standard algorithm.
5th	**5.NBT.B.5 -** Fluently multiply multi-digit whole numbers using a standard algorithm.
6th	**6.NS.B.2 -** Fluently divide multi-digit numbers using a standard algorithm. **6.NS.B.3 -** Fluently add, subtract, multiply, and divide multi-digit decimals using a standard algorithm for each operation. **6.EE.A.2 -** Write, read, and evaluate algebraic expressions.

Fluency Definition

Fluency standard instruction should begin in August and continue throughout the school year.

Wherever the word *fluently* appears in a content standard, the word includes ***efficiently, accurately, flexibly,*** *and* ***appropriately***. Being fluent means that students are able to choose flexibly among methods and strategies to solve contextual and mathematical problems, they understand and are able to explain their approaches, and they are able to produce accurate answers efficiently.

- **Efficiency**—carries out easily, keeps track of sub-problems, and makes use of intermediate results to solve the problem.
- **Accuracy**—reliably produces the correct answer.
- **Flexibility**—knows more than one approach, chooses a viable strategy, and uses one method to solve and another method to double-check.
- **Appropriately**—knows when to apply a particular procedure.

Defining Standards, Curriculum and Instruction

Standards – What a student needs to know, understand, and be able to do by the end of each grade. Standards build across grade levels in a progression of increasing understanding and through a range of cognitive demand levels. Standards are adopted at the state level by the State Board of Education.

Curriculum – The resources used for teaching and learning the standards. Curricula are adopted at a local level by districts and schools.

Instruction – The methods used by teachers to teach their students. Instructional techniques are employed by individual teachers in response to the needs of the students in their classes to help them progress through the curriculum in order to master the standards.

5th Grade Content Emphasis	
Operations and Algebraic Thinking (OA)	
▲	Write and interpret numerical expressions.
▲	Analyze patterns and relationships.
Number and Operations in Base Ten (NBT)	
●	Understand the place value system.
●	Perform operations with multi-digit whole numbers and with decimals to hundredths.
Number and Operations - Fractions (NF)	
●	Use equivalent fractions to add and subtract fractions.
●	Use previous understandings of multiplication and division to multiply and divide fractions.
Measurement and Data (MD)	
▲	Convert like measurement units within a given measurement system.
▲	Represent and interpret data.
●	Geometric measurement: understand concepts of volume and relate volume to multiplication and addition.
Geometry (G)	
▲	Graph points on the coordinate plane to solve mathematical problems as well as problems in real-world context.
▲	Classify two-dimensional figures into categories based on their properties.
● - Major Content ▲ - Supporting Content	

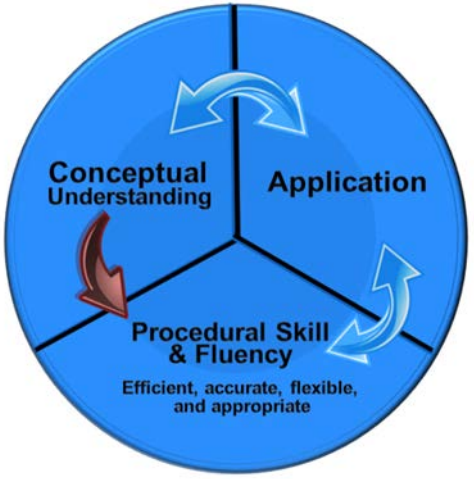
Major Content (●) from the content emphasis section should account for approximately 70% of instructional time.

The Standards for Mathematical Practice

The Standards for Mathematical Practice complement the content standards so that students increasingly engage with the subject matter as they grow in mathematical maturity and expertise throughout the elementary, middle, and high school years.

The Arizona Mathematics Standards now include narratives for each of the 8 Mathematical Practices.

Balance of Rigor in the Math Classroom



Changes in Cognitive Demand

There are times in which the standards were changed, resulting in an increase or decrease in cognitive demand expectations within the standards. This is an important aspect of the standard to examine, keeping in mind that cognitive demand refers to the complexity of thinking involved in which students interact with the content; it does **not** refer to difficulty.

Changes in Cognitive Demand in the 5th Grade Standards	
5.NBT.A.1	**5.NBT.B.6**
5.NF.B.7	**5.MD.C.5**

Comparison of Arizona Mathematics Standards – 2010 to 2016

Adopted 2010		Adopted 2016		
Operations and Algebraic Thinking (OA)		**Operations and Algebraic Thinking (OA)**		
5.OA.A	**Write and interpret numerical expressions.**			
	5.OA.A.1. Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols.	**5.OA.A** **Write and interpret numerical expressions.**	**5.OA.A.1**	Use parentheses and brackets in numerical expressions, and evaluate expressions with these symbols (Order of Operations).
	5.OA.A.2. Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them. *For example, express the calculation "add 8 and 7, then multiply by 2" as 2 ´ (8 + 7). Recognize that 3 ´ (18932 +921) is three times as large as 18932 + 921, without having to calculate the indicated sum or product.*		**5.OA.A.2**	Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them (e.g., express the calculation "add 8 and 7, then multiply by 2" as 2 x (8 + 7). Recognize that 3 x (18932 + 921) is three times as large as 18932 + 921, without having to calculate the indicated sum or product).
5.OA.B	**Analyze patterns and relationships.**			
	5.OA.B.3. Generate two numerical patterns using two given rules. Identify apparent relationships between corresponding terms. Form ordered pairs consisting of corresponding terms from the two patterns, and graph the ordered pairs on a coordinate plane. *For example, given the rule "Add 3" and the starting number 0, and given the rule "Add 6" and the starting number 0, generate terms in the resulting sequences, and observe that the terms in one sequence are twice the corresponding terms in the other sequence. Explain informally why this is so.*	**5.OA.B** **Analyze patterns and relationships.**	**5.OA.B.3**	Generate two numerical patterns using two given rules (e.g., generate terms in the resulting sequences). Identify and explain the apparent relationships between corresponding terms. Form ordered pairs consisting of corresponding terms from the two patterns, and graph the ordered pairs on a coordinate plane (e.g. given the rule "Add 3" and the starting number 0, and given the rule "Add 6" and the starting number 0, generate terms in the resulting sequences, and observe that the terms in one sequence are twice the corresponding terms in the other sequence).
			5.OA.B.4	Understand primes have only two factors and decompose numbers into prime factors.

Number and Operations in Base Ten (NBT)		Number and Operations in Base Ten (NBT)		
5.NBT.A	**Understand the place value system.**			
	5.NBT.A.1. Recognize that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and 1/10 of what it represents in the place to its left.	**5.NBT.A** **Understand the place value system.**	**5.NBT.A.1**	Apply concepts of place value, multiplication, and division to understand that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and 1/10 of what it represents in the place to its left.
	5.NBT.A.2. Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10.		**5.NBT.A.2**	Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10.
	5.NBT.A.3. Read, write, and compare decimals to thousandths. a. Read and write decimals to thousandths using base-ten numerals, number names, and expanded form, e.g., 347.392 = 3 x 100 + 4 x 10 + 7 x 1 + 3 x (1/10) + 9 x (1/100) + 2 x (1/1000). b. Compare two decimals to thousandths based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.		**5.NBT.A.3**	Read, write, and compare decimals to thousandths. a. Read and write decimals to thousandths using base-ten numerals, number names, and expanded form. b. Compare two decimals to thousandths based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.
	5.NBT.A.4. Use place value understanding to round decimals to any place.		**5.NBT.A.4**	Use place value understanding to round decimals to any place.

5.NBT.B	**Perform operations with multi-digit whole numbers and with decimals to hundredths.**			
	5.NBT.B.5. Fluently multiply multi-digit whole numbers using the standard algorithm.	**5.NBT.B** **Perform operations with multi-digit whole numbers and with decimals to hundredths.**	**5.NBT.B.5**	Fluently multiply multi-digit whole numbers using a standard algorithm.
	5.NBT.B.6. Find whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.		**5.NBT.B.6**	Apply and extend understanding of division to find whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors.
	5.NBT.B.7. Add, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.		**5.NBT.B.7**	Add, subtract, multiply, and divide decimals to hundredths, connecting objects or drawings to strategies based on place value, properties of operations, and/or the relationship between operations; relate the strategy to a written form.
Number and Operations—Fractions (NF)		**Number and Operations - Fractions (NF)**		
5.NF.A	**Use equivalent fractions as a strategy to add and subtract fractions.**			
	5.NF.A.1. Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators. For example, 2/3 + 5/4 = 8/12 + 15/12 = 23/12. (In general, a/b + c/d = (ad + bc)/bd.)	**5.NF.A** **Use equivalent fractions to add and subtract fractions.**	**5.NF.A.1**	Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators (e.g., 2/3 + 5/4 = 8/12 + 15/12 = 23/12).
	5.NF.A.2. Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators, e.g., by using visual fraction models or equations to represent the problem. Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers For example, recognize an incorrect result 2/5 + 1/2 = 3/7, by observing that 3/7 < 1/2.		**5.NF.A.2**	Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators by using a variety of representations, equations, and visual models to represent the problem. Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers (e.g. recognize an incorrect result 2/5 + 1/2 = 3/7, by observing that 3/7 < 1/2).

5.NF.B	**Apply and extend previous understandings of multiplication and division to multiply and divide fractions.**			
	5.NF.B.3. Interpret a fraction as division of the numerator by the denominator (a/b = a ÷ b). Solve word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers, e.g., by using visual fraction models or equations to represent the problem. For example, interpret 3/4 as the result of dividing 3 by 4, noting that 3/4 multiplied by 4 equals 3, and that when 3 wholes are shared equally among 4 people each person has a share of size 3/4. If 9 people want to share a 50-pound sack of rice equally by weight, how many pounds of rice should each person get? Between what two whole numbers does your answer lie?	**5.NF.B** **Use previous understandings of multiplication and division to multiply and divide fractions.**	**5.NF.B.3**	Interpret a fraction as the number that results from dividing the whole number numerator by the whole number denominator (a/b = a ÷ b). Solve word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers. *For example, interpret 3/4 as the result of dividing 3 by 4, noting that 3/4 multiplied by 4 equals 3, and that when 3 wholes are shared equally among 4 people, each person has a share of size 3/4. If 9 people want to share a 50-pound sack of rice equally by weight, how many pounds of rice should each person get? Between what two whole numbers does your answer lie?*
	5.NF.B.4. Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction. a. Interpret the product (a/b) x q as a parts of a partition of q into b equal parts; equivalently, as the result of a sequence of operations a x q ÷ b. For example, use a visual fraction model to show (2/3) x 4 = 8/3, and create a story context for this equation. Do the same with (2/3) x (4/5) = 8/15. (In general, (a/b) x (c/d) = ac/bd). b. Find the area of a rectangle with fractional side lengths by tiling it with unit squares of the appropriate unit fraction side lengths, and show that the area is the same as would be found by multiplying the side lengths. Multiply fractional side lengths to find areas of rectangles, and represent fraction products as rectangular areas.		**5.NF.B.4**	Apply and extend previous understandings of multiplication to multiply a fraction by a whole number and a fraction by a fraction. a. Interpret the product (a/b) x q as a parts of a partition of q into b equal parts. *For example, use a visual fraction model to show (2/3) x 4 = 8/3, and create a story context for this equation.* b. Interpret the product of a fraction multiplied by a fraction (a/b) x (c/d). Use a visual fraction model and create a story context for this equation. For example, use a visual fraction model to show (2/3) x (4/5) = 8/15, and create a story context for this equation. (In general, (a/b) x (c/d) = ac/bd.) c. Find the area of a rectangle with fractional side lengths by tiling it with unit squares of the appropriate unit fraction side lengths, and show that the area is the same as would be found by multiplying the side lengths. Multiply fractional side lengths to find areas of rectangles, and represent fraction products as rectangular areas.

	5.NF.B.5. Interpret multiplication as scaling (resizing), by: a. Comparing the size of a product to the size of one factor on the basis of the size of the other factor, without performing the indicated multiplication. b. Explaining why multiplying a given number by a fraction greater than 1 results in a product greater than the given number (recognizing multiplication by whole numbers greater than 1 as a familiar case); explaining why multiplying a given number by a fraction less than 1 results in a product smaller than the given number; and relating the principle of fraction equivalence a/b = (nxa)/(nxb) to the effect of multiplying a/b by 1.	**5.NF.B (cont.)**	**5.NF.B.5**	Interpret multiplication as scaling (resizing), by: a. Comparing the size of a product to the size of one factor on the basis of the size of the other factor, without performing the indicated multiplication. b. Explaining why multiplying a given number by a fraction greater than 1 results in a product greater than the given number; explaining why multiplying a given number by a fraction less than 1 results in a product smaller than the given number; and relating the principle of fraction equivalence $a/b = (n \times a)/(n \times b)$ to the effect of multiplying a/b by 1.
	5.NF.B.6. Solve real world problems involving multiplication of fractions and mixed numbers, e.g., by using visual fraction models or equations to represent the problem.		**5.NF.B.6**	Solve problems in real-world contexts involving multiplication of fractions, including mixed numbers, by using a variety of representations including equations and models.

	5.NF.B.7. Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions. (Students able to multiply fractions in general can develop strategies to divide fractions in general, by reasoning about the relationship between multiplication and division, but division of a fraction by a fraction is not a requirement at this grade.) a. Interpret division of a unit fraction by a non-zero whole number, and compute such quotients. For example, create a story context for (1/3) ÷ 4, and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that (1/3) ÷ 4 = 1/12 because (1/12) x 4 = 1/3. b. Interpret division of a whole number by a unit fraction, and compute such quotients. For example, create a story context for 4 ÷ (1/5), and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that 4÷(1/5) = 20 because 20 x (1/5) = 4. c. Solve real world problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions, e.g., by using visual fraction models and equations to represent the problem. For example, how much chocolate will each person get if 3 people share 1/2 lb of chocolate equally? How many 1/3-cup servings are in 2 cups of raisins?	**5.NF.B (cont.)**	**5.NF.B.7**	Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions. a. Interpret division of a unit fraction by a non-zero whole number, and compute such quotients. Use the relationship between multiplication and division to justify conclusions. b. Interpret division of a whole number by a unit fraction, and compute such quotients. *For example, create a story context for 4 ÷ (1/5), and use a visual fraction model to show the quotient.* Use the relationship between multiplication and division to justify conclusions (e.g., 4 ÷ (1/5) = 20 because 20 x (1/5) = 4). c. Solve problems in real-world context involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions, using a variety of representations.

Measurement and Data (MD)		Measurement and Data (MD)		
5.MD.A	**Convert like measurement units within a given measurement system.**			
	5.MD.A.1. Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real world problems.	**5.MD.A** **Convert like measurement units within a given measurement system.**	**5.MD.A.1**	Convert among different-sized standard measurement units within a given measurement system, and use these conversions in solving multi-step, real world problems.
5.MD.B	**Represent and interpret data.**			
	5.MD.B.2. Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Use operations on fractions for this grade to solve problems involving information presented in line plots. *For example, given different measurements of liquid in identical beakers, find the amount of liquid each beaker would contain if the total amount in all the beakers were redistributed equally.*	**5.MD.B** **Represent and interpret data.**	**5.MD.B.2.**	Make a line plot to display a data set of measurements in fractions of a unit (1/8, 1/2, 3/4). Use operations on fractions for this grade to solve problems involving information presented in line plots. *For example, given different measurements of liquid in identical beakers, find the amount of liquid each beaker would contain if the total amount in all the beakers were redistributed equally.*
5.MD.C	**Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition.**			
	5.MD.C.3. Recognize volume as an attribute of solid figures and understand concepts of volume measurement. a. A cube with side length 1 unit, called a "unit cube," is said to have "one cubic unit" of volume, and can be used to measure volume. b. A solid figure which can be packed without gaps or overlaps using n unit cubes is said to have a volume of n cubic units.	**5.MD.C** **Geometric measurement: Understand concepts of volume and relate volume to multiplication and to addition.**	**5.MD.C.3**	Recognize volume as an attribute of solid figures and understand concepts of volume measurement. a. A cube with side length 1 unit, called a "unit cube," is said to have "one cubic unit" of volume, and can be used to measure volume. b. A solid figure which can be packed without gaps or overlaps using n unit cubes is said to have a volume of *n* cubic units.
	5.MD.C.4. Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units.		**5.MD.C.4**	Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units.

	5.MD.C.5. Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume. a. Find the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes, and show that the volume is the same as would be found by multiplying the edge lengths, equivalently by multiplying the height by the area of the base. Represent threefold whole-number products as volumes, e.g., to represent the associative property of multiplication. b. Apply the formulas V = l x w x h and V = b x h for rectangular prisms to find volumes of right rectangular prisms with whole-number edge lengths in the context of solving real world and mathematical problems. c. Recognize volume as additive. Find volumes of solid figures composed of two non-overlapping right rectangular prisms by adding the volumes of the non-overlapping parts, applying this technique to solve real world problems	**5.MD.C (cont.)**	**5.MD.C.5**	Relate volume to the operations of multiplication and addition and solve mathematical problems and problems in real-world contexts involving volume. a. Find the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes, and show that the volume is the same as would be found by multiplying the edge lengths, equivalently by multiplying the height by the area of the base. Represent threefold whole-number products as volumes (e.g., to represent the associative property of multiplication). b. Understand and use the formulas $V = l \times w \times h$ and $V = B \times h$, where in this case B is the area of the base ($B = l \times w$), for rectangular prisms to find volumes of right rectangular prisms with whole-number edge lengths to solve mathematical problems and problems in real-world contexts. c. Understand volume as additive. Find volumes of solid figures composed of two non-overlapping right rectangular prisms, applying this technique to solve mathematical problems and problems in real-world contexts.

Geometry (G)		Geometry (G)		
5.G.A	**Graph points on the coordinate plane to solve real-world and mathematical problems.**			
	5.G.A.1. Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates. Understand that the first number indicates how far to travel from the origin in the direction of one axis, and the second number indicates how far to travel in the direction of the second axis, with the convention that the names of the two axes and the coordinates correspond (e.g., *x*-axis and *x*-coordinate, *y*-axis and *y*-coordinate).	**5.G.A** **Graph points on the coordinate plane to solve mathematical problems as well as problems in real-world context.**	**5.G.A.1**	Understand and describe a coordinate system as perpendicular number lines, called axes, that intersect at the origin (0 , 0). Identify a given point in the first quadrant of the coordinate plane using an ordered pair of numbers, called coordinates. Understand that the first number (*x*) indicates the distance traveled on the horizontal axis, and the second number (*y*) indicates the distance traveled on the vertical axis.
	5.G.A.2. Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation.		**5.G.A.2**	Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation.
5.G.B	**Classify two-dimensional figures into categories based on their properties.**			
	5.G.B.3. Understand that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category. *For example, all rectangles have four right angles and squares are rectangles, so all squares have four right angles.*	**5.G.B** **Classify two-dimensional figures into categories based on their properties.**	**5.G.B.3**	Understand that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category.
	5.G.B.4. Classify two-dimensional figures in a hierarchy based on properties.		**5.G.B.4**	Classify two-dimensional figures in a hierarchy based on properties.

Standards for Mathematical Practice

5.MP.1 Make sense of problems and persevere in solving them.

Mathematically proficient students explain to themselves the meaning of a problem, look for entry points to begin work on the problem, and plan and choose a solution pathway. While engaging in productive struggle to solve a problem, they continually ask themselves, “Does this make sense?" to monitor and evaluate their progress and change course if necessary. Once they have a solution, they look back at the problem to determine if the solution is reasonable and accurate. Mathematically proficient students check their solutions to problems using different methods, approaches, or representations. They also compare and understand different representations of problems and different solution pathways, both their own and those of others.

5.MP.2 Reason abstractly and quantitatively.
Mathematically proficient students make sense of quantities and their relationships in problem situations. Students can contextualize and decontextualize problems involving quantitative relationships. They contextualize quantities, operations, and expressions by describing a corresponding situation. They decontextualize a situation by representing it symbolically. As they manipulate the symbols, they can pause as needed to access the meaning of the numbers, the units, and the operations that the symbols represent. Mathematically proficient students know and flexibly use different properties of operations, numbers, and geometric objects and when appropriate they interpret their solution in terms of the context.

5.MP.3 Construct viable arguments, and critique the reasoning of others.
Mathematically proficient students construct mathematical arguments (explain the reasoning underlying a strategy, solution, or conjecture) using concrete, pictorial, or symbolic referents. Arguments may also rely on definitions, assumptions, previously established results, properties, or structures. Mathematically proficient students make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. Mathematically proficient students present their arguments in the form of representations, actions on those representations, and explanations in words (oral or written). Students critique others by affirming or questioning the reasoning of others. They can listen to or read the reasoning of others, decide whether it makes sense, ask questions to clarify or improve the reasoning, and validate or build on it. Mathematically proficient students can communicate their arguments, compare them to others, and reconsider their own arguments in response to the critiques of others.

5.MP.4 Model with mathematics.
Mathematically proficient students apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. When given a problem in a contextual situation, they identify the mathematical elements of a situation and create a mathematical model that represents those mathematical elements and the relationships among them. Mathematically proficient students use their model to analyze the relationships and draw conclusions. They interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

5.MP.5 Use appropriate tools strategically.
Mathematically proficient students consider available tools when solving a mathematical problem. They choose tools that are relevant and useful to the problem at hand. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful; recognizing both the insight to be gained and their limitations. Students deepen their understanding of mathematical concepts when using tools to visualize, explore, compare, communicate, make and test predictions, and understand the thinking of others.

5.MP.6 Attend to precision.
Mathematically proficient students clearly communicate to others using appropriate mathematical terminology, and craft explanations that convey their reasoning. When making mathematical arguments about a solution, strategy, or conjecture, they describe mathematical relationships and connect their words clearly to their representations. Mathematically proficient students understand meanings of symbols used in mathematics, calculate accurately and efficiently, label quantities appropriately, and record their work clearly and concisely.

5.MP.7 Look for and make use of structure.
Mathematically proficient students use structure and patterns to assist in making connections among mathematical ideas or concepts when making sense of mathematics. Students recognize and apply general mathematical rules to complex situations. They are able to compose and decompose mathematical ideas and notations into familiar relationships. Mathematically proficient students manage their own progress, stepping back for an overview and shifting perspective when needed.

5.MP.8 Look for and express regularity in repeated reasoning.
Mathematically proficient students look for and describe regularities as they solve multiple related problems. They formulate conjectures about what they notice and communicate observations with precision. While solving problems, students maintain oversight of the process and continually evaluate the reasonableness of their results. This informs and strengthens their understanding of the structure of mathematics which leads to fluency.