Arizona Mathematic Standards

Mathematics Curriculum Map

Fourth Grade

ARIZONA DEPARTMENT OF EDUCATION
HIGH ACADEMIC STANDARDS

Chandler Unified School District Standards
Fourth Grade – At a Glance

Curriculum Map			
*Use Quarter 4 standards as opening routines in Quarters 1-3 to ensure exposure to all standards prior to AZMerit.			
Quarter 1	**Quarter 2**	**Quarter 3**	**Quarter 4**
Operations & Algebraic Thinking Number & Operations in Base Ten	**Operations & Algebraic Thinking Number & Operations in Base Ten**	**Number & Operations - Fractions**	**Measurement and Data Geometry**
4.NBT.A.1 4.NBT.A.2 4.NBT.A.3 4.NBT.B.4 4.NBT.B.5 4.NBT.B.6 (My Math) 4.OA.A.1 4.OA.A.2 (My Math) 4.OA.A.3 4.OA.B.4 (My Math) 4.NBT.B.4 (Fluency Standard) 4.OA.C.6 – Embed all year	4.OA.A.2 (Go Math) 4.OA.A.3 4.OA.B.4 (Go Math) 4.OA.C.5 4.NBT.A.1 (My Math) 4.NBT.A.3 (My Math) 4.NBT.B.5 (My Math) 4.NBT.B.6 4.NF.A.1 (Go Math) 4.NF.A.2 (Go Math) 4.NBT.B.4 (Fluency Standard) 4.OA.C.6 – Embed all year	4.NF.A.1 (My Math) 4.NF.A.2 (My Math) 4.NF.B.3 4.NF.B.4 4.NF.C.5 4.NF.C.6 4.NF.C.7 4.NBT.B.4 (Fluency Standard) 4.OA.C.6 – Embed all year	4.G.A.1 4.G.A.2 4.G.A.3 4.MD.A.1 4.MD.A.2 4.MD.A.3 4.MD.B.4 4.MD.C.5 4.MD.C.6 4.MD.C.7 4.NBT.B.4 (Fluency Standard) 4.OA.C.6 – Embed all year
Mathematical Practices			
1. Make sense of problems and persevere in solving them.		5. Use appropriate tools strategically.	
2. Reason abstractly and quantitatively.		6. Attend to precision.	
3. Construct viable arguments and critique the reasoning of others.		7. Look for and make use of structure.	
4. Model with mathematics.		8. Look for and express regularity in repeated reasoning.	
All quarters will include the Mathematical Practices			

NOTE: Mathematical practices are interwoven and should be addressed throughout the year in as many different units and tasks as possible in order to stress the natural connections that exist among mathematical topics.

Grade 4 Key: OA = Operations and Algebraic Thinking, NBT = Number and Operations in Base Ten, NF = Number and Operations - Fraction, MD = Measurement and Data, G = Geometry

Fourth Grade Overview

Operations and Algebraic Thinking (OA)

- Use the four operations with whole numbers to solve problems.
- Gain familiarity with factors and multiples.
- Generate and analyze patterns.

Number and Operations in Base Ten (NBT)

Note: Grade 4 expectations in this domain are limited to whole numbers less than or equal to 1,000,000.

- Generalize place value understanding for multi-digit whole numbers.
- Use place value understanding and properties of operations to perform multi-digit arithmetic.

Number and Operations—Fractions (NF)

Note: Grade 4 expectations in this domain are limited to fractions with denominators 2, 3, 4, 5, 6, 8, 10, 12, and 100.

- Extend understanding of fraction equivalence and ordering.
- Apply and extend previous understanding of multiplication to multiply a whole number by a fraction.
- Understand decimal notation for fractions, and compare decimal fractions.

Measurement and Data (MD)

- Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.
- Represent and interpret data.
- Geometric measurement: Understand concepts of angle and measure angles.

Geometry (G)

- Draw and identify lines and angles, and classify shapes by properties of their lines and angles.

Standards for Mathematical Practices (MP)

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Fourth Grade Content Emphasis

	Fourth Grade Content Emphasis
	Operations and Algebraic Thinking (OA)
🔴	Use the four operations with whole numbers to solve problems.
🔺	Gain familiarity with factors and multiples.
🔺	Generate and analyze patterns.
	Number and Operations in Base Ten (NBT)
🔴	Generalize place value understanding for multi-digit whole numbers.
🔴	Use place value understanding and properties of operations to perform multi-digit arithmetic.
	Number and Operations – Fractions (NF)
🔴	Extend understanding of fraction equivalence and ordering.
🔴	Apply and extend previous understanding of multiplication to multiply a whole number by a fraction.
🔴	Understand decimal notation for fractions, and compare decimal fractions.
	Measurement and Data (MD)
🔺	Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.
🔺	Represent and interpret data.
🔺	Geometric measurement: understand concepts of angles and measure angles.
	Geometry (G)
🔺	Draw and identify lines and angles, and classify shapes by properties of their lines and angles.
	🔴 -Major Content 🔺 -Supporting Content
	Major content (🔴) from the content emphasis section should account for approximately 70% of instructional time.

Quarter 1

Essential Question(s):
- **How does place value help represent the value of numbers?**
- **What strategies can I use to add and subtract?**
- **How are multiplication and division related?**
- **How can I communicate multiplication?**

80% of instructional time should be based on core materials (My Math, Go Math, Saxon); 20% may be based on additional resources.

Topic	Arizona Mathematics Standards	Resources
Fluency Standard	*To be taught throughout the year:* 4.NBT.B.4 Fluently add and subtract multi-digit whole numbers using a standard algorithm.	
Place Value	4.NBT.A.1 Apply concepts of place value, multiplication, and division to understand that in a multi-digit whole number, a digit in one place represents ten times what it represents in the place to its right. 4.NBT.A.2 Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons. 4.NBT.A.3 Use place value understanding to round multi-digit whole numbers to any place.	My Math Chapter 1 **Additional Resources:** EngageNY Module 1 Topic A Topic B Topic C Illustrative Mathematics 4.NBT.A.1 Tasks 4.NBT.A.2 Tasks 4.NBT.A.3 Tasks Georgia Standards – Unit 1
Add and Subtract Whole Numbers	4.NBT.A.3 Use place value understanding to round multi-digit whole numbers to any place. 4.NBT.B.4 Fluently add and subtract multi-digit whole numbers using a standard algorithm. 4.OA.A.3 Solve multistep word problems using the four operations, including problems in which remainders must be interpreted. Understand how the remainder is a fraction of the divisor. Represent these problems using equations with a letter standing for the unknown quantity. 4.OA.C.6 When solving problems, assess the reasonableness of answers using mental computation and estimation strategies including rounding.	My Math Chapter 2 **Additional Resources:** EngageNY Module 1 Topic D Topic E Topic F Illustrative Mathematics 4.NBT.A.3 Tasks 4.OA.A.3 Tasks

Quarter 1

Essential Question(s):
- **How does place value help represent the value of numbers?**
- **What strategies can I use to add and subtract?**
- **How are multiplication and division related?**
- **How can I communicate multiplication?**

Add and Subtract Whole Numbers Continued		Georgia Standards – Unit 1 Inside Mathematics 4th Grade OA Tasks 4th Grade NBT Tasks
Understand Multiplication and Division	4.NBT.B.5 Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models. 4.NBT.B.6 Demonstrate understanding of division by finding whole-number quotients and remainders with up to four-digit dividends and one-digit divisors. 4.OA.A.1 Represent verbal statements of multiplicative comparisons as multiplication equations. Interpret a multiplication equation as a comparison (e.g., 35 is the number of objects in 5 groups, each containing 7 objects, and is also the number of objects in 7 groups, each containing 5 objects). 4.OA.A.2 Multiply or divide within 1000 to solve word problems involving multiplicative comparison (e.g., by using drawings and equations with a symbol for the unknown number to represent the problem, distinguishing multiplicative comparison from additive comparison). *See Table 2.* 4.OA.B.4 Find all factor pairs for a whole number in the range 1 to 100 and understand that a whole number is a multiple of each of its factors.	My Math Chapter 3 **Additional Resources:** Illustrative Mathematics 4.NBT.B.5 Tasks 4.NBT.B.6 Tasks 4.OA.A.1 Tasks 4.OA.A.2 Tasks 4.OA.B.4 Tasks Georgia Standards – Unit 2 Inside Mathematics 4th Grade OA Tasks 4th Grade NBT Tasks

Quarter 1

Essential Question(s):
- **How does place value help represent the value of numbers?**
- **What strategies can I use to add and subtract?**
- **How are multiplication and division related?**
- **How can I communicate multiplication?**

Multiply with One-Digit Numbers	4.NBT.A.1 Apply concepts of place value, multiplication, and division to understand that in a multi-digit whole number, a digit in one place represents ten times what it represents in the place to its right. 4.NBT.A.3 Use place value understanding to round multi-digit whole numbers to any place. 4.NBT.B.5 Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models. 4.OA.C.6 When solving problems, assess the reasonableness of answers using mental computation and estimation strategies including rounding.	My Math Chapter 4 **Additional Resources:** EngageNY Module 3 Topic A Topic B Topic C Illustrative Mathematics 4.NBT.A.1 Tasks 4.NBT.A.3 Tasks 4.NBT.B.5 Tasks

*The Standards for Mathematical Practices are to be embedded throughout every chapter.

Quarter 2

Essential Question(s):
- **How can I multiply by two-digit numbers?**
- **How does division affect numbers?**
- **How are patterns used in mathematics?**

80% of instructional time should be based on core materials (My Math, Go Math, Saxon); 20% may be based on additional resources.		
Topic	**Arizona Mathematics Standards**	**Resources**
Fluency Standard	*To be taught throughout the year:* 4.NBT.B.4 Fluently add and subtract multi-digit whole numbers using a standard algorithm.	
Multiply with Two-Digit Numbers	4.NBT.A.3 Use place value understanding to round multi-digit whole numbers to any place. 4.NBT.B.5 Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models. 4.OA.A.3 Solve multistep word problems using the four operations, including problems in which remainders must be interpreted. Understand how the remainder is a fraction of the divisor. Represent these problems using equations with a letter standing for the unknown quantity. 4.OA.C.6 When solving problems, assess the reasonableness of answers using mental computation and estimation strategies including rounding.	My Math Chapter 5 **Additional Resources:** EngageNY Module 3 Topic D Topic H Illustrative Mathematics 4.NBT.A.3 Tasks 4.NBT.B.5 Tasks 4.OA.A.3 Tasks Inside Mathematics 4th Grade OA Tasks
Divide by a One-Digit Number	4.NBT.A.1 Apply concepts of place value, multiplication, and division to understand that in a multi-digit whole number, a digit in one place represents ten times what it represents in the place to its right. 4.NBT.A.3 Use place value understanding to round multi-digit whole numbers to any place. 4.NBT.B.6 Demonstrate understanding of division by finding whole-number quotients and remainders with up to four-digit dividends and one-digit divisors. 4.OA.A.3 Solve multistep word problems using the four operations, including problems in which remainders must be interpreted. Understand how the remainder is a fraction of the divisor. Represent these problems using equations with a letter standing for the unknown quantity. 4.OA.C.6 When solving problems, assess the reasonableness of answers using mental computation and estimation strategies including rounding.	My Math Chapter 6 **Additional Resources:** EngageNY Module 3 Topic E Topic F Topic G Illustrative Mathematics 4.NBT.A.1 Tasks 4.NBT.A.3 Tasks 4.NBT.B.6 Tasks 4.OA.A.3 Tasks

Quarter 2

Essential Question(s):
- **How can I multiply by two-digit numbers?**
- **How does division affect numbers?**
- **How are patterns used in mathematics?**

Patterns and Sequences	4.OA.A.3 Solve multistep word problems using the four operations, including problems in which remainders must be interpreted. Understand how the remainder is a fraction of the divisor. Represent these problems using equations with a letter standing for the unknown quantity. 4.OA.C.5 Generate a number pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself and explain the pattern informally (e.g., given the rule "add 3" and the starting number 1, generate terms in the resulting sequence and observe that the terms appear to alternate between odd and even numbers).	My Math Chapter 7 **Additional Resources:** Illustrative Mathematics 4.OA.A.3 Tasks 4.OA.C.5 Tasks Georgia Standards – Unit 2 Inside Mathematics 4th Grade OA Tasks

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Quarter 3

Essential Question(s):
- **How can different fractions name the same amount?**
- **How can I use operations to model real-world fractions?**
- **How are fractions and decmials related?**

80% of instructional time should be based on core materials (My Math, Go Math, Saxon); 20% may be based on additional resources.

Topic	Arizona Mathematics Standards	Resources
Fluency Standard	*To be taught throughout the year:* 4.NBT.B.4 Fluently add and subtract multi-digit whole numbers using a standard algorithm.	
Fractions	4.OA.B.4 Find all factor pairs for a whole number in the range 1 to 100 and understand that a whole number is a multiple of each of its factors. 4.NF.A.1 Explain why a fraction *a/b* is equivalent to a fraction (*n* x *a*)/(*n* x *b*) by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to understand and generate equivalent fractions. 4.NF.A.2 Compare two fractions with different numerators and different denominators (e.g., by creating common denominators or numerators and by comparing to a benchmark fraction). a. Understand that comparisons are valid only when the two fractions refer to the same size whole. b. Record the results of comparisons with symbols >, =, or <, and justify the conclusions. 4.NF.B.3 Understand a fraction *a/b* with *a* > 1 as a sum of unit fractions (1/*b*). a. Understand addition and subtraction of fractions as joining and separating parts referring to the same whole. b. Decompose a fraction into a sum of fractions with the same denominator in more than one way (e.g., 3/8 = 1/8 + 1/8+1/8; 3/8 = 2/8 + 1/8; 2 1/8 = 1 + 1 + 1/8 + or 2 1/8 = 8/8 + 8/8 + 1/8).	My Math Chapter 8 **Additional Resources:** EngageNY Module 5 Topic A Topic B Topic C Illustrative Mathematics 4.NF.A.1 Tasks 4.NF.A.2 Tasks 4.NF.B.3 Tasks Georgia Standards – Unit 3 Inside Mathematics 4th Grade NF Tasks

Quarter 3

Essential Question(s):
- **How can different fractions name the same amount?**
- **How can I use operations to model real-world fractions?**
- **How are fractions and decmials related?**

| Operations with Fractions | 4.NF.B.3 Understand a fraction *a/b* with *a* > 1 as a sum of unit fractions (1/*b*).

a. Understand addition and subtraction of fractions as joining and separating parts referring to the same whole.

b. Decompose a fraction into a sum of fractions with the same denominator in more than one way (e.g., 3/8 = 1/8 + 1/8+1/8; 3/8 = 2/8 + 1/8; 2 1/8 = 1 + 1 + 1/8 + or 2 1/8 = 8/8 + 8/8 + 1/8).

c. Add and subtract mixed numbers with like denominators (e.g., by using properties of operations and the relationship between addition and subtraction and/or by replacing each mixed number with an equivalent fraction).

d. Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators.

4.NF.B.4 Build fractions from unit fractions.

a. Understand a fraction $\frac{a}{b}$ as a multiple of a unit fraction $\frac{1}{b}$. In general, $\frac{a}{b}$ = *a* x $\frac{1}{b}$.

b. Understand a multiple of $\frac{a}{b}$ as a multiple of a unit fraction $\frac{1}{b}$, and use this understanding to multiply a whole number by a fraction. In general, *n* x $\frac{a}{b}$ = $\frac{n \, x \, a}{b}$.

c. Solve word problems involving multiplication of a whole number by a fraction. *For example, if each person at a party will eat 3/8 of a pound of roast beef, and there will be 5 people at the party, how many pounds of roast beef will be needed? Between what two whole numbers does your answer lie?*

4.OA.C.6 When solving problems, assess the reasonableness of answers using mental computation and estimation strategies including rounding. | My Math Chapter 9

Additional Resources:

EngageNY Module 5
Topic D
Topic F
Topic G

Illustrative Mathematics
4.NF.B.3 Tasks
4.NF.B.4 Tasks

Georgia Standards – Unit 4

Inside Mathematics
4th Grade NF Tasks |

Quarter 3

Essential Question(s):
- **How can different fractions name the same amount?**
- **How can I use operations to model real-world fractions?**
- **How are fractions and decmials related?**

Fractions and Decimals	4.NF.C.5 Express a fraction with denominator 10 as an equivalent fraction with denominator 100, and use this technique to add two fractions with respective denominators 10 (tenths) and 100 (hundredths). *For example, express 3/10 as 30/100, and and 3/10 + 4/100 = 34/100.* (Note: Students who can generate equivalent fractions can develop strategies for adding fractions with unlike denominators in general. But addition and subtraction with unlike denominators, in general, is not a requirement at this grade.) 4.NF.C.6 Use decimal notation for fractions with denominators 10 (tenths) or 100 (hundredths), and locate these decimals on a number line. 4.NF.C.7 Compare two decimals to hundredths by reasoning about their size. Understand that comparisons are valid only when the two decimals refer to the same whole. Record the results of comparisons with the symbols >, =, or <.	My Math Chapter 10 **Additional Resources:** EngageNY Module 6 Topic A Topic B Topic C Topic D Illustrative Mathematics 4.NF.C.5 Tasks 4.NF.C.6 Tasks 4.NF.C.7 Tasks Georgia Standards – Unit 5

*The Standards for Mathematical Practices are to be embedded throughout every chapter.

Quarter 4

Essential Question(s):
- **Why do we convert measurements?**
- **How can conversion of measurements help solve real-world problems?**
- **Why is it important to measure perimeter and area?**
- **How are different ideas about geometry connected?**

80% of instructional time should be based on core materials (My Math, Go Math, Saxon); 20% may be based on additional resources.

Topic	Arizona Mathematics Standards	Resources
Fluency Standard	*To be taught throughout the year:* 4.NBT.B.4 Fluently add and subtract multi-digit whole numbers using a standard algorithm.	
Customary Measurement	4.MD.A.1 Know relative sizes of measurement units within one system of units which could include km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit and in a smaller unit in terms of a larger unit. *For example, know that 1 ft is 12 times as long as 1 in. Express the length of a 4 ft snake as 48 in. Generate a conversion table for feet and inches listing the number pairs (1,12), (2,24), (3,36).* 4.MD.A.2 Use the four operations to solve word problems and problems in real-world context involving distances, intervals of time (hr, min, sec), liquid volumes, masses of objects, and money, including decimals and problems involving fractions with like denominators, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using a variety of representations, including number lines that feature a measurement scale. 4.MD.B.4 Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Solve problems involving addition and subtraction of fractions by using information presented in line plots.	My Math Chapter 11 **Additional Resources:** Illustrative Mathematics 4.MD.A.1 Tasks 4.MD.A.2 Tasks 4.MD.B.4 Tasks Georgia Standards – Unit 7 Inside Mathematics 4th Grade MD Tasks
Metric Measurement	4.MD.A.1 Know relative sizes of measurement units within one system of units which could include km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit and in a smaller unit in terms of a larger unit. *For example, know that 1 ft is 12 times as long as 1 in. Express the length of a 4 ft snake as 48 in. Generate a conversion table for feet and inches listing the number pairs (1,12), 2,24), (3,36).* 4.MD.A.2 Use the four operations to solve word problems and problems in real-world context involving distances, intervals of time (hr, min, sec), liquid volumes, masses of objects, and money, including decimals and problems involving fractions with like denominators, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using a variety of representations, including number lines that feature a measurement scale.	My Math Chapter 12 **Additional Resources:** EngageNY Module 2 Topic A Topic B Illustrative Mathematics 4.MD.A.1 Tasks 4.MD.A.2 Tasks Georgia Standards – Unit 7 Inside Mathematics 4th Grade MD Tasks

Quarter 4

Essential Question(s):
- **Why do we convert measurements?**
- **How can conversion of measurements help solve real-world problems?**
- **Why is it important to measure perimeter and area?**
- **How are different ideas about geometry connected?**

Perimeter and Area	4.MD.A.3 Apply the area and perimeter formulas for rectangles in mathematical problems and problems in real-world contexts including problems with unknown side lengths. See *Table 2.* 4.OA.C.6 When solving problems, assess the reasonableness of answers using mental computation and estimation strategies including rounding.	My Math Chapter 13 **Additional Resources:** Illustrative Mathematics 4.MD.A.3 Tasks
Geometry	4.G.A.1 Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures. 4.G.A.2 Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of a specified size (e.g., understand right triangles as a category, and identify right triangles). 4.G.A.3 Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts. Identify line-symmetric figures and draw lines of symmetry. 4.MD.C.5 Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement: a. An angle is measured with reference to a circle with its center at the common endpoint of the rays, by considering the fraction of the circular arc between the points where the two rays intersect the circle. An angle that turns through 1/360 of a circle is called a "one-degree angle," and can be used to measure angles. b. An angle that turns through n one-degree angles is said to have an angle measure of n degrees. 5.MD.C.6 Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure. 5.MD.C.7 Understand angle measures as additive. (When an angle is decomposed into non-overlapping parts, the angle measure of the whole is the sum of the angle measures of the parts.) Solve addition and subtraction problems to find unknown angles on a diagram within mathematical problems as well as problems in real-world contexts.	My Math Chapter 14 **Additional Resources:** EngageNY Module 4 Topic A Topic B Topic C Topic D Illustrative Mathematics 4.G.A.1 Tasks 4.G.A.2 Tasks 4.G.A.3 Tasks 4.MD.C.6 Tasks 4.MD.C.7 Tasks Georgia Standards – Unit 6 Georgia Standards – Unit 7 Inside Mathematics 4th Grade MD Tasks 4th Grade G Tasks

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The Mathematical Practices: Narratives and Questions

Mathematics Practices		Narratives	Related Questions
Overarching habits of mind of a productive math thinker	**4.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.	• How would you describe the problem in your own words? • How would you describe what you are trying to find? • What do you notice about...? • What information is given in the problem? • Describe the relationship between the quantities. • Describe what you have already tried. What might you change? • Talk me through the steps you've used to this point. • What steps in the process are you most confident about? • What are some other strategies you might try? • What are some other problems that are similar to this one? • How might you use one of your previous problems to help you begin? • How else might you organize...represent... show...?
	4.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.	• What mathematical terms apply in this situation? • How did you know your solution was reasonable? • Explain how you might show that your solution answers the problem. • What would be a more efficient strategy? • How are you showing the meaning of the quantities? • What symbols or mathematical notations are important in this problem? • What mathematical language...,definitions..., properties can you use to explain...? • How could you test your solution to see if it answers the problem?

Actions and dispositions from NCSM Summer Leadership Academy, Atlanta, GA • Draft, June 22, 2011)
Most questions from all Grades Common Core State Standards Flip Book

Mathematics Practices		Narratives	Related Questions
Reasoning and Explaining	**4.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.	• What do the numbers used in the problem represent? • What is the relationship of the quantities? • How is _____ related to _____? • What is the relationship between _____and _____? • What does_____mean to you? (e.g. symbol, quantity, diagram) • What properties might we use to find a solution? • How did you decide in this task that you needed to use...? • Could we have used another operation or property to solve this task? Why or why not?
	4.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.	• What mathematical evidence would support your solution? • How can we be sure that...? / How could you prove that...? • Will it still work if...? • What were you considering when...? • How did you decide to try that strategy? • How did you test whether your approach worked? • How did you decide what the problem was asking you to find? • Did you try a method that did not work? Why didn't it work? Could it work? • What is the same and what is different about...? • How could you demonstrate a counter-example?

Actions and dispositions from NCSM Summer Leadership Academy, Atlanta, GA • Draft, June 22, 2011)
Most questions from all Grades Common Core State Standards Flip Book

The Mathematical Practices: Narratives and Questions

Mathematics Practices		Narratives	Related Questions
Modeling and Using Tools	**4.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.	• What number model could you construct to represent the problem? • What are some ways to represent the quantities? • What is an equation or expression that matches the diagram, number line, chart, table, and your actions with the manipulatives? • Where did you see one of the quantities in the task in your equation or expression? What does each number in the equation mean? • How would it help to create a diagram, graph, table...? • What are some ways to visually represent...? • What formula might apply in this situation?
	4.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.	• What mathematical tools can we use to visualize and represent the situation? • Which tool is more efficient? Why do you think so? • What information do you have? • What do you know that is not stated in the problem? • What approach are you considering trying first? • What estimate did you make for the solution? • In this situation would it be helpful to use...a graph..., number line..., ruler..., diagram..., calculator..., manipulative? • Why was it helpful to use...? • What can using a _____ show us that _____ may not? • In what situations might it be more informative or helpful to use...?

Actions and dispositions from NCSM Summer Leadership Academy, Atlanta, GA • Draft, June 22, 2011)
Most questions from all Grades Common Core State Standards Flip Book

Mathematics Practices		Narratives	Related Questions
Seeing structure and generalizing	**4.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.	• What observations do you make about...? • What do you notice when...? • What parts of the problem might you eliminate..., simplify...? • What patterns do you find in...? • How do you know if something is a pattern? • What ideas that we have learned before were useful in solving this problem? • What are some other problems that are similar to this one? • How does this relate to...? • In what ways does this problem connect to other mathematical concepts?
	4.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.	• Explain how this strategy works in other situations? • Is this always true, sometimes true or never true? • How would we prove that...? • What do you notice about...? • What is happening in this situation? • What would happen if...? • Is there a mathematical rule for...? • What predictions or generalizations can this pattern support? • What mathematical consistencies do you notice?

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Table 1. Common Addition and Subtraction Problem Types/Situations. [1]

	Result Unknown	**Change Unknown**	**Start Unknown**
Add to	Two bunnies sat on the grass. Three more bunnies hopped there. How many bunnies are on the grass now? $2 + 3 = ?$	Two bunnies were sitting on the grass. Some more bunnies hopped there. Then there were five bunnies. How many bunnies hopped over to the first two? $2 + ? = 5$	Some bunnies were sitting on the grass. Three more bunnies hopped there. Then there were five bunnies. How many bunnies were on the grass before? $? + 3 = 5$
Take from	Five apples were on the table. I ate two apples. How many apples are on the table now? $5 - 2 = ?$	Five apples were on the table. I ate some apples. Then there were three apples. How many apples did I eat? $5 - ? = 3$	Some apples were on the table. I ate two apples. Then there were three apples. How many apples were on the table before? $? - 2 = 3$
	Total Unknown	**Addend Unknown**	**Both Addends Unknown**[2]
Put together/Take Apart[3]	Three red apples and two green apples are on the table. How many apples are on the table? $3 + 2 = ?$	Five apples are on the table. Three are red and the rest are green. How many apples are green? $3 + ? = 5, 5 - 3 = ?$	Grandma has five flowers. How many can she put in her red vase and how many in her blue vase? $5 = 0 + 5, 5 = 5 + 0$ $5 = 1 + 4, 5 = 4 + 1$ $5 = 2 + 3, 5 = 3 + 2$
	Difference Unknown	**Bigger Unknown**	**Smaller Unknown**
Compare	("How many more?" version): Lucy has two apples. Julie has five apples. How many more apples does Julie have than Lucy? ("How many fewer?"): Lucy has two apples. Julie has five apples. How many fewer apples does Lucy have than Julie? $2 + ? = 5, 5 - 2 = ?$	(Version with "more"): Julie has three more apples than Lucy. Lucy has two apples. How many apples does Julie have? (Version with "fewer"): Lucy has three fewer apples than Julie. Lucy has two apples. How many apples does Julie have? $2 + 3 = ?, 3 + 2 = ?$	(Version with "more"): Julie has three more apples than Lucy. Julie has five apples. How many apples does Lucy have? (Version with "fewer"): Lucy has three fewer apples than Julie. Julie has five apples. How many apples does Lucy have? $5 - 3 = ?, ? + 3 = 5$

[1] Adapted from Box 2-4 of Mathematics Learning in Early Childhood, National Research Council (2009, pp. 32, 33).

[2] These take apart situations can be used to show all the decompositions of a given number. The associated equations, which have the total on the left of the equal sign, help children that the = sign does not always mean **makes** or **results in** but always does mean **is the same quantity as.**

[3] Either addend can be unknown, so there are three variations of these problem situations. Both Addends Unknown is a productive extension of the basic situation, especially for small numbers less than or equal to 10.

Table 2. Common Multiplication and Division Situations. [7]

	Unknown Product	Group Size Unknown ("How many in each group?" Division)	Number of Groups Unknown ("How many groups?" Division)
	3 x 6 = ?	3 x ? = 18, and 18 ÷ 3 = ?	? x 6 = 18, and 18 ÷ 6 = ?
Equal Groups	There are 3 bags with 6 plums in each bag. How many plums are there in all? *Measurements example:* You need 3 lengths of string, each 6 inches long. How much string will you need altogether?	If 18 plums are shared equally into 3 bags, then how many plums will be in each bag? *Measurement example:* You have 18 inches of string, which you will cut into 3 equal pieces. How long will each piece of string be?	If 18 plums are to be packed 6 to a bag, then how many bags are needed? *Measurement example:* You have 18 inches of string, which you will cut into pieces that are 6 inches long. How many pieces of string will you have?
Arrays [4]	There are 3 rows of apples with 6 apples in each row. How many apples are there? *Area example:* What is the area of a 3 cm by 6 cm rectangle?	If 18 apples are arranged into 3 equal rows, how many apples will be in each row? *Area example:* A rectangle has the area 18 square centimeters. If one side is 3 cm long, how long is a side next to it?	If 18 apples are arranged into equal rows of 6 apples, how many rows will there be? *Area example:* A rectangle has the area 18 square centimeters. If one side is 6 cm long, how long is a side next to it?
Compare (Grade 4 ONLY)	A blue hat costs $6. A red hat costs 3 times as much as the blue hat. How much does the red hat cost? *Measurement example:* A rubber band is 6 cm long. How long will the rubber band be when it is stretched to be 3 times as long?	A red hat costs $18 and that is 3 times as much as a blue hat costs. How much does a blue hat cost? *Measurement example:* A rubber band is stretched to be 18 cm long and that is 3 times as long as it was at first. How long was the rubber band at first?	A red hat costs $18 and a blue hat costs $6. How many times as much does the red hat cost as the blue hat? *Measurement example:* A rubber band was 6 cm long at first. Now it is stretched to be 18 cm long. How many times as long is the rubber band now as it was at first?
General	a x b = ?	a x ? = p, and p ÷ a = ?	? x b = p, and p ÷ b = ?

[7] The first examples in each cell are examples of discrete things. These are easier for students and should be given before the measurement examples.

[4] The language is the array examples shows the easiest form of array problems. A harder form is to use the terms rows and columns: The apples in the grocery window are in 3 rows and 6 columns. How many apples are in there? Both forms are valuable.