Grade: 4   **FCPS 2023 - 2024 Math Unit 2 Framework**   Unit 1 **Unit 2** Unit 3 Unit 4

Unit 2: Factors & Multiples, Whole Number Multiplication, Division & Order of Operations to Solve Problems

KY 4th grade Math Standards   Unit 2 framework google link   4th grade Math Priority Content & Prerequisite Skills

Unit 2 Title: Factors/Multiples, Whole Number Multiplication/Division/Order of Operations to Solve Problems   Estimated Time Frame: 50 days
Essential Standards: 4.NBT.5, 4.NBT.6, 4.OA.1, 4.OA.2, 4.OA.3, Supporting Standards: 4.OA.4
Big Idea(s)   CRA explanations for 4th grade Unit 2

- Multiplication may be used to find the total number of objects when objects are arranged in equal groups. Products may be calculated using invented strategies
- Unfamiliar multiplication problems may be solved by using known multiplication facts and properties of multiplication and division. For example, $8 \times 7 = (8 \times 2) + (8 \times 5)$ and $18 \times 7 = (10 \times 7) + (8 \times 7)$.
- Multiplication may be represented by rectangular arrays/area models.
- There are two common situations where division may be used: fair sharing (given the total amount and the number of equal groups, determine how many/much in each group) and measurement (given the total amount and the amount in a group, determine how many groups of the same size can be created).
- Some division situations will produce a remainder, but the remainder will always be less than the divisor. If the remainder is greater than the divisor, that means at least one more can be given to each group (fair sharing) or at least one more group of the given size (the dividend) may be created. How the remainder is explained depends on the problem situation.
- The dividend, divisor, quotient, and remainder are related in the following manner: dividend = divisor x quotient + remainder. The quotient remains unchanged when both the dividend and the divisor are multiplied or divided by the same number. Operations and Algebraic Thinking Progressions document
Number Operations in Base Ten Progressions document

Essential Question(s)	**Common Preconceptions/Misconceptions:**
- How can you multiply by 10, 100, and 1000? How can you estimate when you multiply? How can you use multiplication to solve problems? - How can you use a model to multiply? How can you	-Students often believe that skip counting is the most efficient way to recall facts and will not apply other thinking strategies. -To multiply students must realize groups must be equal as

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use the Distributive Property to multiply? ● How can mental math be used to divide? How can quotients be estimated? How can the steps for dividing be explained? ● How is comparing with multiplication different from comparing with addition? How can we use equations to solve multi-step problems?	unequal groups can only be added. -In arrays, the first factor is the row and the second factor is the column, arrays must be rectangular or square with equal rows and equal columns in order to multiply. -Students often consider multiplication and division to be separate rather than seeing the inverse relationship between the two operations. The Problem with Key Words
Standards for Mathematical Practice (**bolded** emphasized unit) *Math Practice Standards Posters*	**Kentucky Interdisciplinary Literacy Practices (KILP)**
MP.1. Make sense of problems and persevere in solving them. **MP.2. Reason abstractly and quantitatively.** **MP.3. Construct viable arguments and critique the reasoning of others.** **MP.4. Model with mathematics.** **MP.5. Use appropriate tools strategically.** MP.6. Attend to precision. **MP.7. Look for and make use of structure.** **MP.8. Look for and express regularity in repeated reasoning.**	1. Recognize that text is anything that communicates a message. 2. Employ, develop, and refine schema to understand and create text. 3. View literacy experiences as transactional, interdisciplinary and transformational. 4. Utilize receptive and expressive language arts to better understand self, others, and the world. **5. Apply strategic practices, with scaffolding and then independently, to approach new literacy tasks.** **6. Collaborate with others to create new meaning.** **7. Utilize digital resources to learn and share with others.** **8. Engage in specialized, discipline specific literacy practices.** **9. Apply high level cognitive processes to think deeply and critically about text.** 10. Develop a literacy identity that promotes lifelong learning.

Essential Standards: KAS Content Standards **CRA explanations for 4th grade Unit 2**	Prerequisite Skills & Essential Vocabulary	Sample Learning Intentions* & Sample Success Criteria*

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KY.4.NBT.5 Multiply whole numbers ● **Up to four digit number by a one-digit number** ● **Two-digit number by two-digit number Multiply 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.** **MP.3, MP.4, MP.8** Students use a variety of models (rectangular arrays and area models) and strategies to represent multi-digit factors times a one-digit factor and a two-digit number by a two-digit number. Students also connect their reasoning to a written equation. Some examples include: KY.3.OA.5 Coherence KY.3.NBT.3→ KY.4.NBT.5→KY.5.NBT.5 KY.3.MD.7	- Apply properties of operations as strategies to multiply and divide. -Multiply one-digit whole numbers by multiples of 10 in the range of 10–90 using strategies based on place value and properties of operations. . Commutative Property of Multiplication Associative Property of Multiplication Distributive Property Partial products Numerical expression Compensation	I am learning to multiply multi-digit numbers so… ● I can use place value strategies, properties of operations, and equations to model and solve multiplication problems. ● I can use place value strategies, partial products, and rectangular arrays/ area models to model and solve multiplication problems. ● I can multiply up to a 4-digit number by a 1-digit number and estimate to check if the product is reasonable. ● I can multiply two 2-digit numbers and estimate to check if the product is reasonable.

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KY.4.NBT.6 Divide up to four-digit dividends by one-digit divisors. Find whole number quotients and remainders using ● **strategies based on place value** ● **the properties of operations** ● **the relationship between multiplication and division.** **Illustrate and explain the calculation by using equations, rectangular arrays and/or area models.** **MP.3, MP.7, MP.8** Students use a variety of models (rectangular arrays and area models) and strategies to divide up to four-digit dividends by one-digit divisors. Note: By the end of grade 4 students should be able to model, write and explain division by a one-digit divisor. KY.3.OA.5 Coherence KY.3.OA.6→ KY.4.NBT.6→KY.5.NBT.6 KY.3.MD.7	-Apply properties of operations as strategies to multiply and divide. -Understand division as an unknown-factor problem. -Relate area to the operations of multiplication and addition symbol for unknown. Remainder Partial Quotients	I am learning to divide multi-digit numbers so… ● I can sort objects into equal-sized groups to divide. ● I can use place value and sharing to divide. ● I can use partial quotients and properties of operations to divide. ● I use place value, rectangular arrays/area models and equations to divide. ● I can show the inverse relationship between multiplication and division with numbers and area models.

	1,000	300	70	5	
4	1,000 x 4	300 x 4	70 x 4	5 x 4	1,000 300 70 + 5
	4,000	1,200	280	20	1,375

5,500 ÷ 4 = ?

Attending to the Standards for Mathematical Practice 4.NBT.4-4.NBT.6
Students select from their repertoire of strategies to solve multi-digit whole number addition or subtraction problems. For example, for the problem 345,402 – 67,087 =□, a student might choose to stack it and subtract using an algorithm. The same student seeing 56,708 – 9,998 = __, might notice how close the subtrahend (second value) is to 10,000 and decide to subtract 10,000 and add 2 onto the answer (MP.2). In general, students determine their approach based on the numbers in the

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problem seeking an efficient strategy. For multiplication and division, students recognize the relationship between area and multiplication and take advantage of rectangular arrays to model multiplication problems (MP.4). In creating such models and recording them as equations, students notice repetitive actions in computation and make generalizations to solve other similar problems (MP.8). Students explain how and why their selected models and/or algorithms work (MP.3).		
KY.4.OA.1 Interpret a multiplication equation as a comparison. Represent verbal statements of multiplicative comparisons as multiplication equations. MP.2, MP.4 Students interpret 35 = 5 × 7 as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Coherence KY.3.OA.1→ KY.4.OA.1→KY.5.NF.5	-Interpret and demonstrate products of whole numbers. multiplicative	I am learning to interpret multiplication equations so… ● I can represent verbal statements of comparisons with multiplication with equations.
KY.4.OA.2 Multiply or divide to solve word problems involving multiplicative comparisons by using drawings and equations with a symbol for the unknown number to represent the problem, distinguishing multiplicative comparison from additive comparison. MP.1, MP.2, MP.3 Students solve multiplicative comparison problems using drawings and equations to determine situations like the ones below (Table 2 in Appendix A) on which quantity is being multiplied and which factor is telling how many times.	- Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays and measurement quantities, by using drawings and equations with a symbol for the unknown number to represent the problem.	I am learning to solve word problems with multiplication and division comparisons so… ● I can use drawings or equations with a symbol for an unknown number to represent and solve multiplication or division problems. ● I can solve different kinds of comparison problems: unknown product, group size unknown or number of groups unknown.

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Common Comparison Problems for Multiplication and Division		
Unknown product	Group size unknown	Number of groups unknown
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 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? 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?
$a \times b = ?$	$a \times ? = p$ and $p \div a = ?$	$? \times b = p$ and $p \div b = ?$

Coherence KY.3.OA.3→ KY.4.OA.2→KY.5.NF.3

KY.4.OA.3 Solve multistep problems. **a. Perform operations in the conventional order when there are no parentheses to specify a particular order.** **b. Solve multistep word problems posed with whole numbers and having whole number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computations and estimation strategies including rounding. MP.1, MP.4** a. Students use their knowledge of order of operations even when there are no parentheses or brackets. 31 + 3 × 8 - 20 =	-Use various strategies to solve two-step word problems using the four operations (involving only whole numbers with whole number answers). Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies	I am learning to solve multi-step problems with whole numbers using the four operations so… ● I can solve multi-step problems by thinking about what the question is asking me to do as I complete each step. ● I can solve multi-step problems by breaking it down into which parts must be solved first (order of operations).

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b. For example, Mr. May's grade four class is collecting canned goods for a food drive. Their goal is to bring in 50 cans of food by Friday. So far, the students have brought in 10 on Monday and Tuesday, 14 cans on Wednesday and 13 on Thursday. How many more cans will the class need to bring in to reach their goal? $50 = 2 \times 10 + 14 + 13 + c$ $50 = 20 + 14 + 13 + c$ $50 = 47 + c$ $3 = c$ Note: Estimation skills include identifying when estimation is appropriate, determining method of estimation and verifying solutions or determining the reasonableness of situations using various estimation strategies. The skill of estimating within context allows students to further develop their number sense. Coherence KY.3.OA.8→ KY.4.OA.3→KY.7.NS.3 The focus in this standard is to have students use and discuss various strategies. It refers to estimation strategies including using compatible numbers (numbers that sum to 10 or 100) or rounding. Problems should be structured so that all acceptable estimation strategies will arrive at a reasonable answer. Students need many opportunities to solve multi-step story problems using all four operations. ***Need to supplement Order of Operations with this practice link: **4th grade Order of Operations Practice***	including rounding. conventional order order of operations Reasonableness	• I can make sense of problems and keep working if I get stuck by trying different strategies and representations.

Attending to the Standards for Mathematical Practice 4.OA.1-4.OA.3
Students recognize a number represents a specific quantity and connects the quantity to written symbols and creates a logical representation of the problem considering both the appropriate units involved and the meaning of quantities (MP2). In

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an equation such as 35= 5 x 7, students identify and verbalize which quantity is being multiplied and which number tells how many times, saying, "Sally is five years old. Her mom is seven times older. How old is Sally's Mom?" Students discover a pattern or structure (MP.7). For example, a student distinguishes an additive comparison by identifying this type of question asks, " How many more?" and a multiplicative comparison focuses on comparing two quantities by asking," How many times as much?" or "How many times as many?" Students solve contextual problems using models and equations using a symbol to represent the unknown (MP.4).

Supporting Standards:		
KY.4.OA.4 Find factors and multiples of numbers in the range 1-100. a. Find all factor pairs for a given whole number. b. Recognize that a whole number is a multiple of each of its factors. c. Determine whether a given whole number is a multiple of a given one-digit number. d. Determine whether a given whole number is prime or composite. MP.5, MP.7 Students extend their knowledge of multiplication and division facts by exploring patterns they have found by building conceptual understanding of prime numbers (numbers with exactly two factors) and composite numbers (numbers with more than two factors). Patterns include: Numbers that end in 0 have 10 as a factor. These are multiples of 10. Numbers that end in 0 or 5 as a factor. These are multiples of 5. Even numbers have 2 as a factor. These numbers are multiples of 2. Numbers that can be halved twice have 4 as a factor. These numbers are multiples of 4.	-Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division or properties of operations. Factor Multiple Prime Composite	I am learning to find factors and multiples of numbers so… ● I can find factors using arrays and other strategies. ● I can find multiples using patterns and other strategies. I am learning to determine if a given whole number is prime or composite so… ● I can determine if a whole number is prime or composite by looking at the number of arrays that can be made with that number of tiles and by looking at the number of factors for that number.

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Coherence KY.3.OA.7→ KY.4.OA.4→KY.6.NS.4		

Attending to the Standards for Mathematical Practice 4.OA.4

Students use the structure and pattern of the counting numbers to find factor pairs, recognizing once they reach a certain point they don't have to keep looking for factors (MP.7). Students build arrays with a given area and look for patterns such as numbers of possible arrays to identify if the number is prime or composite. For example, noticing the number 7 has only two possible arrays, 1 x 7 and 7 x 1, therefore, it is prime. The number 4 has more than two rectangular arrays, 1 x 4, 4 x 1 and 2 x 2 and therefore, it is composite.

*Disclaimer: Success Criteria is the evidence students must produce to demonstrate learning. These examples are not comprehensive.   (Sample Unit 2 Optional Assessment)

Practice Standards and Number Sense Resources:

Mathematics Practice Standards, Games and Routines *(Introduced in the first weeks and used throughout the year)* -**Math Practices & Problem Solving Handbook** Problem Solving Organizer The Problem with Key Words Numberless Word Problem Example Three Reads Strategy **4th grade number sense routines slides** (VA) *(use number routines 5-10 minutes daily all year in addition to math class time)* **Math Routines & Resources** **Sample Daily Math Routines** Additional: Number Routines used 5-10 minutes daily all year (MD) **51 Esti-Mysteries Splat**	*1ˢᵗ Semester Take-Home Games* -TheresaWills Online Games -EnVisionMathGames -Investigations Math Games -Investigations Math Words and Ideas -KDE Family Math Games Word Wall Cards -4th grade HomeLetters 4th grade additional practice **4th grade Anchor charts -1ˢᵗ Semester Teaching Tools** **4th grade Math FCPS Google Site of Resources**
Anchor Resources by enVision Topic	**Supplemental Resources by Standard**

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enVision Topic 7 – Factors and Multiples *4.OA.4* *(approximately one week)* *Use Hands-On or Online Manipulatives:* ***color tiles, Hundreds Board*** **-Topic 7 Review What You Know Prerequisite Skills** **-Topics 7 Vocabulary Cards** ****Number Puzzles Card Sort KDE Lesson** ****Fill-er Up 3 Act Math Task**	**4.OA.4** Identifying Multiples Multiples of 3, 6, and 7 Exploring Multiples Prime or Composite? Numbers in a Multiplication Table The Locker Game *Number Trains* The Factor Game online The Product Game online Factorize online -Number Puzzles Concept Card Sort slides
enVision Topic 3 – Use Strategies and Properties to Multiply by 1-Digit Numbers **4.NBT.5 4.OA.1** *May need 2 days for* lessons 3-3, 3-5 *(approximately two weeks)* *Use Hands-On or Online Manipulatives:* ***Base-10 Blocks, grid paper*** *Teaching Tools 9 & 10* **-Topic 3 Review What You Know Prerequisite Skills** **-Topic 3 & 4 Vocabulary Cards** ****Array-bow of Colors 3 Act Math Task** **4.NBT.5** **-Graham Fletchers Conceptual Multiplication Cards**	**4.NBT.5** Multiplication Strategy: Doubling and Halving Double and Halve Multiplication Race (1 x 3-digit) Decomposing Factors for Partial Products **4.OA.1** Multiplication as Comparison Problems Review: Multiplication and Division Concept Card Sort FAL Salute Fact Fluency Game Fill the Grid The Baker GA Multiplication and Division Unit Kendall Hunt Illustrative Math Multiplication and Division

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enVision Topic 4 – Use Strategies and Properties to Multiply by 2-Digit Numbers 4.NBT.5 4.OA.1 4.OA.3 *Possibly omit lessons 4-3, 4-4, 4-11 May need 2 days for lessons 4-2, 4-5, 4-6, 4-7,4-9 (May need to review 3.OA.7 single digit factors and related quotients with unknowns in all positions)* *(approximately four weeks)* *Use Hands-On or Online Manipulatives:* **Base-10 Blocks, grid paper** *Teaching Tools 9 & 10* **Topic 4 Review What You Know Prerequisite Skills** ******Multi Digit Multiplication Card Sort KDE Lesson ******Krispy Kreme Me 3 Act Math Task **4.NBT.5, 4.OA.3**	How to teach Whole Numbers with Base 10 blocks Math Learn Center Multi Digit Multiply Unit Examples of Algorithms for Multiplication Desmos four-function calculator **4.OA.3** Thousands & Millions Fourth Graders Karl's Garden Where's the Beef 3 Act Math Task **4.NBT.5** Multiplication Base Ten Blocks Video Area Model Multiplication Video Desmos Two Digit Multiplication Card Sort Activity *Review:* Multiplication Distributive Property Card Sort FAL -Multi Digit Multiplication Concept Card Sort slides
enVision Topic 5 – Use Strategies and Properties to Divide by 1-digit Numbers 4.NBT.6 4.OA.2 4.OA.3 *Possibly omit lessons 5-8, 5-9, 5-10 (May need to review 3.OA.7 single digit factors and related quotients with unknowns in all positions)* *(approximately three weeks)* *Use Hands-On or Online Manipulatives:* **Base-10 Blocks, grid paper** *Teaching Tools 9 & 10* **Topic 5 Review What You Know Prerequisite Skills** **Topics 4-6 Vocabulary Cards** ******Sugar Packets 3 Act Math Task **4.NBT.6** The Spinner 3 Act Math Task **4.NBT.6**	GA Multiplication and Division Unit Kendall Hunt Illustrative Math Multiplication and Division Division with Base Ten Blocks Desmos four-function calculator **4.OA.2** *Lesson 5-1 Reteach Lesson5-5CenterGames* Comparing Money Raised Division Concepts Word Problems: Multiplicative Comparison **4.OA.3** Word Problems: Interpreting Remainders Bikes and Trikes Tablespoon of Oil Carnival Tickets Jar of Pennies **4.NBT.6** Who Has the Largest Quotient? Division Strategy: Partial Quotients Estimate the Quotient Mental Division Strategy Partial Quotient Tutorial Video

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Embed multi-step word problems from Topic 6 into topics 3-5 enVision Topic 6 – Use Operations with Whole Numbers to Solve Problems **Topic 6 Review What You Know Prerequisite Skills**	***Need to supplement Order of Operations with this practice link: **4th grade Order of Operations Practice*** Desmos four-function calculator

Summative Assessment
(Common Unit Assessment in ADAM) This unit assessment will focus on conceptual models of factors, multiples, primes and composites as well as multiple strategies for multiplication and division of whole numbers with various representations with place value showing partial products and partial quotients and using order of operations to solve problems..……