Dear Parents,
We will begin our next unit of study in math soon. The information below will serve as an overview of the unit as you work to support your child at home. If you have any questions, please feel free to contact me. I appreciate your ongoing support.

Sincerely,
Your Child's Teacher

Unit Name: Develop Multiplication/Division Strategies

North Carolina Content State Standards:

NC.4.NBT.5
Multiply a whole number of up to three digits by a one-digit whole number, and multiply up to two two-digit numbers with place value understanding using area models, partial products, and the properties of operations. Use models to make connections and to develop the algorithm.

NC.4.NBT.6
Find whole number quotients and remainders with up to three-digit dividends and one-digit divisors with place value understanding using rectangular arrays, area models, repeated subtraction, partial quotients, properties of operations, and/or the relationship between multiplication and division.

NC.4.MD.3
Solve problems with area and perimeter.

- Find areas of rectilinear figures with known side lengths.
- Solve problems involving a fixed area and varying perimeters with a fixed perimeter and varying areas.
- Apply the area and perimeter formulas for rectangles in real world and mathematical problems.

NC.4.OA.3 Solve two-step word problems involving the four operations with whole numbers.

- Use estimation strategies to assess reasonableness of answers.
- Interpret remainders in word problems.
- Represent problems using equations with a letter standing for unknown quantity.

Supporting Standards
NC.4.OA.1
Interpret a multiplication equation as a comparison. Multiply or divide to solve word problems involving multiplicative comparisons using models and equations with a symbol for the unknown number. ~~Distinguish multiplicative comparison from additive comparison.~~

NC.NBT.1
Explain that in a multi-digit whole number, a digit in one place represents 10 times as much as it represents in the place to its right, up to 100,000.

Math Language:

- Multiplication
- Place Value
- Area Model
- Sum
- Estimate
- Division
- Quotient
- Interpret
- Factor
- Digit
- Area
- Partial Products
- Round
- Divisor
- Difference
- Unknown
- Product
- Base Ten Blocks
- Expanded Notation
- Algebraic Notation
- Rectangle Section
- Properties of Operations
- Partial Quotients
- Inverse Operation
- Multiplier
- Array
- Array Model
- Decompose
- Strategy
- Dividend
- Remainders
- Operation

- Perimeter
- Equivalent
- Sides
- Rectangle
- Formula
- Dimensions
- Side Length
- Length
- Square Units
- Parallel Sides
- Width
- Attribute

Unit Overview:

In this unit, students will continue to apply place value understandings to develop a strong conceptual understanding of multi-digit multiplication (3 digits by 1 digit and 2 digits by 2 digits) and division (only 3 digits by 1 digit). They will build conceptual understanding through the use of base ten blocks, area models, partial products, and the properties of operations for multiplication. For division, they will build conceptual understanding through use of rectangular arrays, area models, repeated subtraction, partial quotients, properties of operations, and/or the relationship between multiplication and division. When dividing, students will learn to interpret the remainders (the number left over), when applicable. Students will compare and discuss different ideas and strategies to solving problems can lead them to deeper conceptual understanding and multiplicative reasoning. Students will continue to work towards efficient, accurate strategies, but should not use procedural strategies without understanding. Real world application of multiplication and division situations should be incorporated throughout the unit along with connections of the area model of multiplication to area and perimeter.

Why are they doing it that way?

Parents often ask why students are not learning how to multiply or divide using the traditional algorithm (the way we were taught). The answer to the question is: They will! But first…Our major emphasis is on developing efficient and flexible methods for solving problems.

Students study a variety of algorithms for a number of reasons:

- One method may be better suited to a particular problem, set of numbers, or scenario. Ex. To solve 99 x 3, it is more efficient to solve 100 x 3 (300) and then subtract a group of 3 (297) rather than using the traditional algorithm.
- By developing a variety of approaches, students learn which ones they are comfortable with and can gradually apply these approaches to harder problems.
- Students understand how these algorithms work and what the numbers represent.
- The skills learned build foundations for mathematical concepts used later in Algebra.
- Once students are firmly grounded in understanding the operation and problem solving, they study the traditional multiplication algorithm. They learn how the "shortcut" relates to concrete models. As a result, the "shortcut" makes sense, rather than being a series of mysterious steps. Students are more accurate when multiplying and are less likely to make careless mistakes.
- The traditional division algorithm will not be introduced in 4^{th} grade. Students will continue to work on building an understanding of division through the use of strategies.

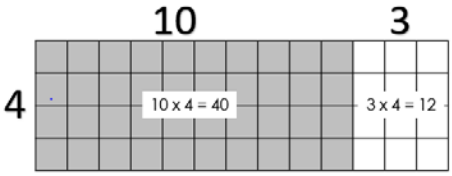
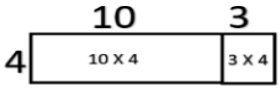
Skills/Strategies:

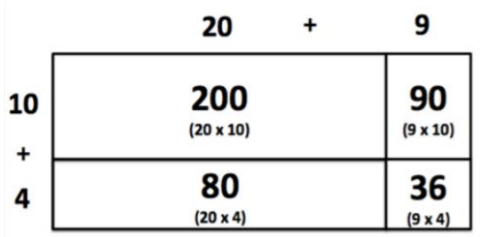
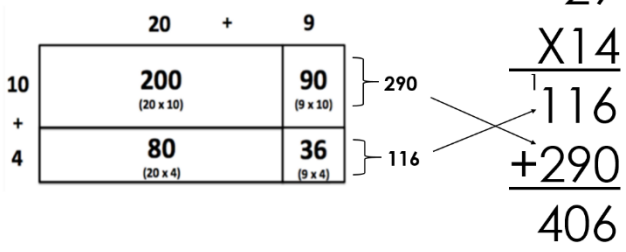
Students will be able to:

- Multiply a whole number of up to three-digits by a one-digit whole number with place value understanding using area models, partial products, and other appropriate strategies
- Multiply up to two two-digit whole numbers with place value understanding using area models, partial products, and other appropriate strategies

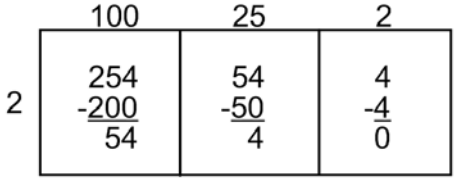
- Divide a whole number up to three digits by a one digit whole number with rectangular arrays, area models, repeated subtraction, partial quotients, properties of operations, and/or the relationship between multiplication and division
- Use formulas for area and perimeter to solve real-world problems
- Find the area of rectilinear figures with known side lengths
- Solve problems involving a fixed area and varying perimeters
- Solve problems involving a fixed perimeter and varying areas

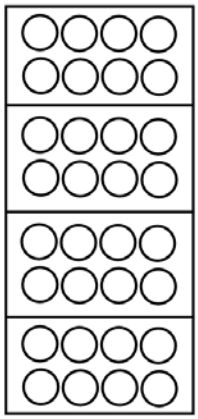
Multiplication Examples of Strategies:

Strategies	Examples
Partial Products: In this model, students will use place value understanding in order to break apart (decompose)larger numbers to create simpler problems.	26 = (20 + 6) 45 = (40 + 5) We can then multiply each of the "parts" and add them back together. (20 x 40) + (20 x 5) + (40 x 6) + (6 x 5) 800 + 100 + 240 + 30 900 + 240 + 30 1,140 + 30 1,170
Properties of Operations: This model also uses strategies to make numbers easier to work with. Students use the Commutative Property (ex: 4 x 2 is the same as 2 x 4) and the Associative Property (ex: (2 x 3) x 4 is the same as 2 X (3 X 4)) to solve more complex problems.	18 X 5 This is a difficult problem. Halve 18 ↓ Double 5 ↓ Make it easier! 9 X 10 I can do this! 18 X 5 (9 x 2) x 5 = 9 x (2 x 5)
Area Models: This strategy uses models and the distributive property to solve multiplication problems.	Area model with grid lines provides structured support for students to make connections with place value: 13 x 4 = (10 x 4) + (3 x 4) = 40 + 12 = 52  This is the same model without the grid lines. It is called an open model.  13 X 4 (10 + 3) x 4 (4 x 10) + (3 x 4) The open model also works well with 2 or 3-digit factors. This supports development of algorithms later as well as mental mathematics.

	Consider 29 x 14:  200 + 90 + 80 + 36 = 406 So, 29 x 14 = 406
Traditional Algorithm: In the traditional algorithm, students will multiply 4 X 29 and then 29 X10 and add the two products together for the total.	

Division Examples of Strategies:

Strategies	Examples
Area Models and Rectangular Arrays: Students can take out chunks that make sense to them using multiplication facts they know.	254 ÷ 2 = 127  100 + 25 + 2 = 127
Repeated Subtraction: Students can repeatedly take out groups of the same size, finding how many groups were taken out and how many are remaining.	31 ÷ 9 = 3 r4 31 - 9 = 22 22 - 9 = 14 13 - 9 = 4

Partial Quotients: Students take out groups that make sense and relate to multiplication facts they know. They decide how many groups they took out in all to find their answer.	107 r1 4 | 429 -400 | 100 29 -20 | 5 9 -8 | 2 1 100 + 5 + 2 = 107
Relationship Between Multiplication and Division: Students understand that they can use the multiplication facts they know to solve division problems.	 4 groups of 8 is 32 4 x 8 = 32 32 objects divided into 4 groups is 8 12 ÷ 4 = 8

Video Support:

Video support can be found on The WCPSS Academics YouTube Channel.

- http://tinyurl.com/WCPSSAcademicsYouTube

- ES 4 Math Whole Number Multiplication w/ Expanded Notation
- ES 4 Math Whole Number Multiplication w/ Area Model
- ES 4 Math Whole Number Multiplication w/ Base Ten Blocks
- ES 4 Math Division with Area Model
- ES 4 Math Division with Area Model 2
- ES 4 Math Division with Expanded Notation
- ES 4 Math Division with Base Ten

Video support can be found on LearnZillion. https://learnzillion.com/

- Solve Division Problems: using array

Additional Resources:

- NCDPI Additional Resources

Questions to Ask When Helping Your Child with Math Homework

Keep in mind that homework in elementary schools is designed as practice. If your child is having problems, please let the classroom teacher know. When helping your child with his/her math homework, you don't have to know all the answers! Instead, we encourage you to ask probing questions so your child can work through the challenges independently. Some examples may include the following:

- What is the problem you're working on?

- What do the directions say?
- What do you already know that can help you solve the problem?
- What have you done so far and where are you stuck?
- Where can we find help in your notes?
- Are there manipulatives, pictures, or models that would help?
- Can you explain what you did in class today?
- Did your teacher work examples that you could use?
- Can you go onto another problem & come back to this one later?
- Can you mark this problem so you can ask the teacher for an explanation tomorrow?