

04_Multi-digit Multiplication

Content Area: **Math**
Course(s):
Time Period: **Full Year**
Length: **5 Weeks**
Status: **Published**

General Overview, Course Description or Course Philosophy

In Grade 4, instructional time should focus on three critical areas:

1. Developing understanding and fluency with multi-digit multiplication, and developing an understanding of dividing to find quotients involving multi-digit dividends;
2. Developing an understanding of fraction equivalence, addition, and subtraction of fractions with like denominators, and multiplication of fractions by whole numbers;
3. Understanding that geometric figures can be analyzed and classified based on their properties, such as having parallel sides, perpendicular sides, particular angle measures, and symmetry.

OBJECTIVES, ESSENTIAL QUESTIONS, ENDURING UNDERSTANDINGS

Essential Questions:

- Is the result of my computation reasonable?
- What makes a computational strategy reasonable?
- How do operations affect numbers?
- How can algorithmic thinking be used to solve problems?

Enduring Understandings:

Students will understand that:

- The products of multi-digit numbers can be found by extending multiplication skills and applying the partial-products method.
- The area of rectangles can be found by using knowledge of multiplication.
- Units of measurement are converted by using multiplication.

STUDENT LEARNING TARGETS

Refer to the 'Declarative Knowledge' and 'Procedural Knowledge' sections.

Declarative Knowledge

Students will understand that:

- Fact extensions are a powerful mental-arithmetic strategy for all operations involving larger numbers
- The partial-products algorithm is an extension of previously known concepts in multiplication and place value.
- Using the lattice method to multiply requires the multiplication of one-digit numbers only and requires the application of place value concepts.
- A millimeter is one one-thousandth the length of a meter. ($0.001\text{ m} = 1\text{ mm}$, meaning there is one one-thousandth of a meter in one millimeter)
- A meter is one thousand times the length of a millimeter.
- ($1000\text{ mm} = 1\text{ m}$, meaning there are one thousand millimeters in one meter)

Procedural Knowledge

Students will be able to:

- Calculate fact extensions for problems multiplying 10s by 10s.
- Solve multistep number stories.
- Partition rectangles to solve multiplication problems.
- Convert whole numbers of liters to milliliters.
- Accurately multiply with multi-digit numbers.
- Apply partial-product multiplication to solve problems.
- Convert whole numbers of kilograms to grams.
- Correctly match partial-product multiplication models to rectangular models
- Decompose 2-digit numbers into tens and ones.
- Find the area of rectilinear figures using a formula.
- Write appropriate number models for a multi-step multiplication number story and solve it.
- Apply the lattice method of multiplication.

CONTENT AREA STANDARDS

4.OA

A. Use the four operations with whole numbers to solve problems

B. Gain familiarity with factors and multiples

C. Generate and analyze patterns

4.NBT

A. Generalize place value understanding for multi-digit whole numbers

B. Use place value understanding and properties of operations to perform multi-digit arithmetic

4.NF

A. Extend understanding of fractions equivalence and ordering

B. Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers

C. Understand decimal notation for fractions and compare decimal fractions

4.M

A. Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit

MA.4.OA.A.2	Multiply or divide 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.
MA.4.OA.A.3	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 computation and estimation strategies including rounding.
MA.4.NBT.B.4	Fluently add and subtract multi-digit whole numbers using the standard algorithm.
MA.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.
MA.4.NF.C.6	Use decimal notation for fractions with denominators 10 or 100.
MA.4.MD.A.2	Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.
MA.4.MD.A.3	Apply the area and perimeter formulas for rectangles in real world and mathematical problems.

INTERDISCIPLINARY CONNECTIONS

Science

- Students will calculate the magnification levels of microscopes and convert between different unit

levels like 100x to 1000xx.

RELATED STANDARDS (Technology, 21st Century Life & Careers, ELA Companion Standards are Required)

LA.SL.4.1.A	Explicitly draw on previously read text or material and other information known about the topic to explore ideas under discussion.
LA.SL.4.1.B	Follow agreed-upon rules for discussions and carry out assigned roles.
LA.SL.4.1.C	Pose and respond to specific questions to clarify or follow up on information, and make comments that contribute to the discussion and link to the remarks of others.
LA.SL.4.1.D	Review the key ideas expressed and explain their own ideas and understanding in light of the discussion.
CS.3-5.8.1.5.DA.1	Collect, organize, and display data in order to highlight relationships or support a claim.
WRK.K-12.P.4	Demonstrate creativity and innovation.
WRK.K-12.P.5	Utilize critical thinking to make sense of problems and persevere in solving them.
WRK.K-12.P.8	Use technology to enhance productivity increase collaboration and communicate effectively.
WRK.K-12.P.9	Work productively in teams while using cultural/global competence.
TECH.9.4.2.CT.1	Gather information about an issue, such as climate change, and collaboratively brainstorm ways to solve the problem (e.g., K-2-ETS1-1, 6.3.2.GeoGI.2).
TECH.9.4.2.CT.3	Use a variety of types of thinking to solve problems (e.g., inductive, deductive).
TECH.9.4.2.IML.2	Represent data in a visual format to tell a story about the data (e.g., 2.MD.D.10).

EVIDENCE OF LEARNING

Refer to the 'Formative, Summative, and Benchmark Assessments' sections.

Alternate Assessments

- Portfolios
- Verbal Assessment (instead of written)
- Multiple choice
- Modified Rubrics
- Performance Based Assessments

Formative Assessments

- Journal Pages
- Homelinks
- Math Boxes

Summative Assessments

- Unit 4 Progress Checks (1 & 2)
- Mid-Year Assessment
- Department Interim Assessment #1

Benchmark Assessments

- IXL Screener / Diagnostic Snapshot BOY
- Trimester 1 Benchmark Assessment
- IXL Diagnostic Snapshot MOY
- Trimester 2 Benchmark Assessment
- IXL Diagnostic Snapshot EOY
- Trimester 3 Benchmark Assessment

RESOURCES (Instructional, Supplemental, Intervention Materials)

Core Instructional Materials:

- Everyday Math Unit 4 Resources
 - Math Masters
 - Student Journal Volume 1
 - [ConnectED](#)

Supplemental Materials:

- [IXL](#)
- Illustrative Math Tasks
- Games
 - Rugs and Fences (Lessons 4-1, 4-11): Finding the perimeter and area of rectangles using formulas
 - Beat the Calculator, Extended Multiplication Facts Version (Lesson 4-1): Practicing extended multiplication facts

- Spin-and-Round (Lesson 4-2): Rounding large numbers up to one million
- Factor Captor (Lesson 4-3): Applying strategies for finding factors of larger numbers
- Polygon Capture (Lesson 4-4): Identifying polygons by their properties
- Fraction/Decimal Concentration (Lesson 4-7): Finding fraction and decimal equivalences
- How Much More? (Lesson 4-8): Solving number stories involving additive and multiplicative comparisons
- Fraction Top-It (Lesson 4-9): Comparing fractions
- Multiplication Top-It, Extended Facts Version (Lesson 4-9): Practicing 2-digit by 2-digit multiplication
- Multiplication Wrestling (Lesson 4-10): Multiplying 2-digit numbers by 2-digit numbers
- Fraction Match (Lesson 4-11): Recognizing equivalent fractions
- Number Top-It (Lesson 4-12): Comparing large numbers
- Decimal Top-It (Lesson 4-13): Making the largest possible decimal numbers
- Beat the Calculator (Lesson 4-13): Practicing basic multiplication facts
- Manipulatives
 - Base-10 blocks
 - Beakers
 - Centimeter cubes
 - Counters
 - Eyedropper
 - Fraction circles
 - Graduated cylinder
 - Number cards 0-8, 1-9, , 0-9, 0-10, 4 of each
 - Rulers
 - Straws
 - Two 6-sided dice;
 - One 10-sided die labeled 0-9

Intervention Materials:

- Number Worlds
- Touch Math Now

ACCOMMODATIONS & MODIFICATIONS FOR SUBGROUPS

See link to the Accommodations & Modifications document in course folder.