02. Whole Number Place Value and Operations

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

General Overview, Course Description or Course Philosophy

In Grade 5, instructional time should focus on three critical areas:

1. Developing fluency with addition and subtraction of fractions, and developing understanding of the multiplication of fractions and of division of fractions in limited cases (unit fractions divided by whole numbers and whole numbers divided by unit fractions)
2. Extending division to 2-digit divisors, integrating decimal fractions into the place value system and developing understanding of operations with decimals to hundredths, and developing fluency with whole number and decimal operations
3. Developing understanding of volume

In this unit, students will know how to estimate and compute multi- digit whole numbers, as well as various strategies to multiply.

OBJECTIVES, ESSENTIAL QUESTIONS, ENDURING UNDERSTANDINGS

Students will understand that:

- Patterns and structure in the 10-base place value number system are applied when estimating and computing with multi-digit whole numbers.

- Strategies for multiplying, such as partial products and traditional algorithm, are dependent on the place value system.

Essential Questions:

- How does understanding the base-10 place value system assist in recognizing patterns within multi-digit whole numbers?
- In what ways do patterns within the place value system influence the estimation and computation of multi-digit numbers?
- In what scenarios would one multiplication strategy be more efficient than another based on the place value structure?
- How do the principles of the 10-base place value system influence not only multiplication but also addition, subtraction, and division of multi-digit numbers?

STUDENT LEARNING TARGETS

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

Declarative Knowledge

Students will know:

- Numbers are written using a base-10 place-value system in which the value of a digit depends on its place in a number

- In base-10, the value of each digit is 10 times what it would be in the place to its right and a digit in a given place represents 1/10 of what it represent in the place to its left

- Dividing by 10 is the same as taking 1/10 of the value

- Powers of 10 are numbers that can be written as a product of 10s

- Exponential notation is a way of representing repeated multiplication by the same factor

- The number of zeros in a power of 10 written in standard notation matches both the exponent in exponential notation and the number of times 10 is used as a factor

Procedural Knowledge

Students will be able to:

- Explain patterns in the number of zeros when multiplying by powers of 10

- Use whole-number exponents to denote powers of 10

- Estimate with powers of 10 to solve multiplication problems

- Assess the reasonableness of products

- Use partial products and the standard algorithm for multiplication to multiply multi-digit numbers

- Use unit conversions within the U.S. customary system to solve multi-step problems

- Use the relationship between multiplication and division to mentally divide multi-digit numbers

- Apply strategies for using partial quotients division to divide whole numbers

- Solve division number stories and interpret remainders

CONTENT AREA STANDARDS

5.OA

A. Write and interpret numerical expressions

B. Analyze patterns and relationships

5.NBT

A. Understand the place value system

B. Perform operations with multi-digit whole numbers & with decimals to hundredths

5.NF

A. Use equivalent fractions as a strategy to add and subtract fractions

B. Apply and extend previous understandings of multiplication and division to multiply and divide fractions

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.5.OA.A.1	Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols.
MA.5.OA.A.2	Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them.
MA.K-12.6	Attend to precision.
MA.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.
MA.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.
MA.5.NBT.B.5	Fluently multiply multi-digit whole numbers using the standard algorithm.
MA.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.
MA.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.

INTERDISCIPLINARY CONNECTIONS

History and Mathematics:

- Number Systems Throughout History: Students will research and present how different civilizations developed number systems. Students will also compare and contrast these systems with the 10-base place value system, emphasizing the importance of the place value concept.

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

CS.K-12.2.d	Evaluate and select technological tools that can be used to collaborate on a project.
CS.K-12.7.a	Select, organize, and interpret large data sets from multiple sources to support a claim.
WRK.K-12.P.8	Use technology to enhance productivity increase collaboration and communicate effectively.
TECH.9.4.5.CT.1	Identify and gather relevant data that will aid in the problem-solving process (e.g., 2.1.5.EH.4, 4-ESS3-1, 6.3.5.CivicsPD.2).
TECH.K-12.P.4	Demonstrate creativity and innovation.
TECH.K-12.P.5	Utilize critical thinking to make sense of problems and persevere in solving them.

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
- Observations
- Classwork

- Homework Assignments
- Do Now Questions
- Exit Tickets
- Self Assessment Questions

Summative Assessments

- Check Points
- Unit Assessment
- Graded Assignments
- Project-based assessments

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 2 Resources (Math Masters, Student Journal Volume 1) / ConnectED
- Calendar Math

Supplemental Materials:

- Illustrative Math
- IXL
- Games
  - Number Top-It (Lessons 2-1, 2-4): Using place-value to build and compare multi-digit numbers
  - High-Number Toss (Lessons 2-2, 2-13): Reading, writing, and comparing numbers in standard and exponential notation
  - Power Up (Lessons 2-2, 2-12): Using exponents to denote powers of 10 and multiplying whole numbers by powers of 10
  - Multiplication Top-It: Extended Facts (Lesson 2-3): Solving extended multiplication facts
  - Multiplication Top-It: Larger Numbers (Lessons 2-5, 2-8): Multiplying multi-digit numbers

- o Baseball Multiplication (lesson 2-5): Practicing multiplication facts
- o Prism Pile-Up (Lesson 2-6): Finding volumes of rectangular prisms
- o Multiplication Bull's Eye (Lesson 2-7): Estimating products and solving multiplication problems
- o Multiplication Wrestling (Lesson 2-7): Using partial products to multiply 2-digit numbers
- o Name That Number (Lesson 2-8): Writing expressions and using grouping symbols
- o Division Dash (Lesson 2-10): Solving division problems involving multiples of 10
- o Division Arrays (Lesson 2-10): Representing division with arrays
- o Division Top-It: Larger Numbers (Lessons 2-11): Dividing 3-digit numbers by 1-digit numbers
- o Buzz (Lesson 2-12): Finding multiples of numbers
- Manipulatives
  - o Base-10 blocks
  - o Number card sets 1-9, 0-9, 1-10, 10-20, 11-20
  - o 6-sided dice
  - o Counters
  - o Rulers
  - o Square pattern blocks
  - o Stopwatch
  - o Tape measure

Intervention Materials:

- Number Worlds
- Touch Math Now

ACCOMMODATIONS & MODIFICATIONS FOR SUBGROUPS
See link to Accommodations & Modifications document in course folder.