Using Models to Compute

Content Area: **Math**
Course(s):
Time Period: **MP2**
Length: **45**
Status: **Published**

Unit Overview

Unit Summary	Unit Rationale
This unit focuses on the concepts of decimal multiplication and division, and fluency with whole number multiplication. The unit begins with learners analyzing and explaining patterns in the number of zeros and the placement of the decimal point in the context of multiplying by powers of 10. They continue work building fluency with multiplication of whole numbers using the standard algorithm. These concepts lay the foundation for introducing learners to multiplication of decimals to hundredths. As with other operations, learners represent these concepts with models and drawings, before using other various strategies. Similarly, learners divide whole numbers and use concrete models, drawings, and various strategies to divide decimals to hundredths Next the unit focuses on fraction ideas and introduces a number of fractions concepts. Learners build upon many fraction concepts developed in earlier grades. They use fraction equivalence from grades 3 and 4 to add and subtract fractions with unlike denominators. Learners solve word problems involving addition and subtraction of fractions, using benchmark fractions and number sense of fractions to estimate mentally and to assess the reasonableness of their answers.	Computation of whole numbers, decimals, and fractions should be understood through models and strategies that students use and apply in problem solving and explaining their reasoning. This will support conceptual awareness of general computation of numbers, or the standard algorithm (which will be learned later), and deeper understanding of computations in future real-world applications and further math study.

NJSLS

MATH.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.

MATH.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.
MATH.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.
MATH.5.NBT.B.7	Add, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.
MATH.5.NF.A.1	Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators.
MATH.5.NF.A.2	Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators, e.g., by using visual fraction models or equations to represent the problem. Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers.

Standards for Mathematical Practice

MATH.K-12.1	Make sense of problems and persevere in solving them
MATH.K-12.2	Reason abstractly and quantitatively
MATH.K-12.3	Construct viable arguments and critique the reasoning of others
MATH.K-12.4	Model with mathematics
MATH.K-12.5	Use appropriate tools strategically
MATH.K-12.6	Attend to precision
MATH.K-12.7	Look for and make use of structure
MATH.K-12.8	Look for and express regularity in repeated reasoning

Unit Focus

Enduring Understandings	Essential Questions
• Patterns can be identified and used to multiply decimals by 10, 100, and 1,000. Representations such as symbols, diagrams, and words can help you multiply and communicate mathematical ideas. • Place-value models can be used to represent multiplying a whole number and a decimal. Products can be found using the models. • The steps involved in multiplying a decimal and a whole number are similar to the steps used in multiplying two whole numbers.	• What patterns can help you multiply decimals by powers of 10? • How can you model multiplying a decimal by a whole number? • How do you multiply a decimal by a whole number? • How can you model decimal multiplication? • How can you use properties to multiply decimals? • How can you use area models and properties

Place value in the factors determines the placement of the decimal point in the product. • Steps for multiplying decimals are similar to steps for multiplying whole numbers. Place value determines the placement of the decimal point in a product. • The Associative and Commutative Properties can be used to break apart and multiply two decimals. • Area models and properties are two ways to find quotients with multi-digit numbers. • Dividing with 2-digit divisors is just an extension of the steps for dividing with 1-digit divisors. Estimation and place value can help determine the placement of digits in the quotient. • Different strategies can be used to divide with 2-digit divisors. Estimating quotients and the relationship between multiplication and division are used with most strategies. • Place value patterns can be used to divide decimals by powers of 10. • Strategies for dividing decimals are an extension of strategies for dividing whole numbers. Place-value blocks can be used as a tool for dividing decimals. • An area model uses the inverse relationship between multiplication and division to show dividing a decimal by a 2-digit whole number. • Models and the relationship between multiplication and division can be used to divide a decimal by a decimal. • Good math thinkers know how to reason about words and numbers to solve problems. • Fractions with unlike denominators can be represented using equivalent fractions with like denominators. • Fractions with unlike denominators can be added by replacing them with equivalent fractions that have common denominators. • Fractions with unlike denominators can be subtracted by replacing them with equivalent fractions that have common denominators. • Addition and subtraction of fractions may both be needed to solve a problem. • Models can be used to show different wats of adding mixed numbers. • Adding mixed numbers is an extension of adding fractions.	to find quotients? • How can you use partial quotients to solve division problems? • What are some different strategies I can use to solve a division problem? • How can you divide decimals by powers of 10? • How can you use models to find a decimal quotient? • How can you divide decimals by 2-digit numbers? • How can you divide a decimal by a decimal? • How can you use reasoning to solve problems? • How can you find common denominators? • How can you add fractions with unlike denominators? • How can you subtract fractions with unlike denominators? • How can adding and subtracting fractions help solve problems? • How can you model addition of mixed numbers? • How can you add mixed numbers? • How can you model subtraction of mixed numbers? • How can you subtract mixed numbers?

• Models can be used to show different ways of subtracting mixed numbers. Subtracting mixed numbers can be thought about as taking away just as subtracting whole numbers and subtracting fractions can be thought about as taking away. • Subtracting mixed numbers is an extension of subtracting fractions.	

Instructional Focus

Learning Targets

- multiply multi-digit whole numbers with accuracy and efficiency.
- explain patterns in the placement of the decimal point when multiplying or dividing a decimal by powers of 10.
- write powers of 10 using whole-number exponents.
- divide to find whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors using strategies based on place value, properties of operations, and the relationship between multiplication and division
- represent these operations with equations, rectangular arrays, and area models.
- explain the calculation by referring to the model (equation, array, or area model).
- add and subtract decimals to hundredths using concrete models and drawings.
- multiply and divide decimals to hundredths using concrete models and drawings.
- add, subtract, multiply, and divide decimals to hundredths using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction.
- relate the strategy to the written method and explain the reasoning used.
- produce an equivalent sum (or difference) of fractions with like denominators from the original sum (or difference) of fractions that has unlike denominators.

- add and subtract fractions with unlike denominators by replacing given fractions with equivalent fractions.
- add and subtract fractions, including mixed numbers, with unlike denominators to solve word problems.
- represent calculations and solutions with visual fraction models and equations
- estimate answers using benchmark fractions and explain whether the answer is reasonable.
- estimate answers by reasoning about the size of the fractions and explain whether the answer is reasonable.

Prerequisite Skills

Area and perimeter

Distinguish the difference between the numerator and denominator

Models to help compare and order fractions

Compare and order fractions

Find equivalent fractions

Solve problems that involve fractions.

Common Misconceptions

Students often mix models when adding, subtracting or comparing fractions. Students may believe a certain shape is needed to represent certain fractions, circles for thirds or rectangles for fourths. Often students attempt to add and subtract all numbers in a fraction expression and do not understand how fractions work.

Spiraling For Mastery

Current Unit Content/Skills	Spiral Focus	Activity
• multiply decimals by powers of 10 • use number sense to multiply whole numbers and decimals • use estimation to decide whether or not a product is reasonable	• explore patterns in multiplying whole numbers by powers of 10 • use strategies and properties to multiply 1-digit numbers by numbers with up to 4 digits or two 2-digit numbers	• Math Diagnostic and Intervention System Activities • IXL

• multiply a whole number by a decimal • multiply two decimals using a model. • find quotients using area models and properties • use partial quotients to solve division problems • use different strategies to solve division problems. • divide decimals by powers of 10 • use models to find decimal quotients • divide a decimal by a 2-digit number • divide a decimal by a decimal. • add and subtract fractions with unlike denominators.	• use rounding and compatible numbers to estimate decimal sums and differences • estimate whole number products • multiply whole numbers using the standard algorithm. • use round numbers to estimate quotient computations • use strategies and properties to divide whole numbers with 1-digit divisors • use the Distributive Property to break apart the dividend. • explore the patterns in multiplying decimals by powers of 10 • use models and strategies to divide whole numbers • divide whole numbers with up to 4 digits by 1-digit numbers • estimate decimal products to evaluation computation for reasonability. • find equivalent fractions • add and subtract fractions and mixed numbers with like denominators.	

Assessment

Formative Assessment	Summative Assessment
• Homework • Lesson Checks • MathXL • Quizzes • Exit Tickets	• Topic Tests (Common Assessments) • Unit 2 Benchmark (Link-It)

• Lesson Reflections • Performance Tasks	

Resources

Key Resources	Supplemental Resources
• Savvas EnVision Grade 5 • Pacing Guide	• IXL • Delta Math • Desmos • Khan Academy

Career Readiness, Life Literacies, and Key Skills

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.4	Compare and contrast the way information is shared in a variety of contexts (e.g., social, academic, athletic) (e.g., 2.2.2.MSC.5, RL.2.9).

Interdisciplinary Connections

ELA.L.RF.5.4.A	Read grade-level text with purpose and understanding.
ELA.L.KL.5.1.A	Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases.
ELA.L.VL.5.2.C	Consult reference materials (e.g., dictionaries, glossaries, thesauruses), both print and digital, to find the pronunciation and determine or clarify the precise meaning of key words and phrases.
SCI.5.ESS3.C	Human Impacts on Earth Systems
	Represent data in graphical displays (bar graphs, pictographs and/or pie charts) to reveal patterns that indicate relationships.
	Similarities and differences in patterns can be used to sort, classify, communicate and analyze simple rates of change for natural phenomena.