Unit 2: Multiplication and Division Relationships

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Unit 2: Multiplication and Division Relationships

Department of Curriculum and Instruction

Belleville Public Schools

Curriculum Guide

Mathematics: Grade 4

Unit 2: Multiplication and Division Relationships

Belleville Board of Education

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Unit Overview

Unit 2 will cover four topics including (T3) Multiply by 1-Digit Numbers, (T4) Multiply by 2-Digit Numbers, (T5) Divide by 1-Digit Numbers, and (T6) Whole-Number Operations to Solve Problems.

Enduring Understandings

Topic 3 focuses on:

- Basic facts and place-value patterns can be used to find products when one factor is 10, 100, or 1,000.
- Rounding is one way to estimate products.
- The properties of multiplication can be used to simplify computation and to verify mental math and paper and pencil algorithms.
- Properties of multiplication and place-value understanding can be used to multiply without paper and pencil.
- The expanded algorithm for multiplication can be represented with arrays. In the algorithm, numbers are broken apart using place value, and the parts are used to find partial products.
- The expanded algorithm for multiplication breaks numbers apart using place value, and the parts are used to find partial products. The partial products are then added together to find the product.
- The standard multiplication algorithm is a shortcut for the expanded algorithm. Regrouping is used rather than showing all the partial products.
- The standard algorithm for multiplication involves breaking apart numbers using place value, finding partial products, and then adding partial products to get the final product. The process is the same regardless of the size of the factors.
- Good math thinkers choose and apply math they know to show and solve problems from everyday life.

Topic 4 focuses on:

- Basic facts and place-value patterns can be used to mentally multiply a two-digit number by a power of 10.
- Place-value blocks, area models, and arrays provide ways to visualize and find products.
- Products of 2-digit by 2-digit multiplication problems can be estimated by replacing each factor with the closest multiple of ten.
- Products can be estimated by replacing factors with other numbers that are close and easy to multiply mentally.
- The expanded algorithm for multiplying with two-digit numbers is an extension of the expanded algorithm for multiplying with 1-digit numbers.
- The distributive property can be used to multiply two 2-digit numbers by breaking the computation down into 4 simpler products and adding the partial products together.
- The expanded algorithm for multiplication can be represented with arrays. In the algorithm, numbers are broken apart using place value, and the parts are used to find partial products.
- The standard algorithm for multiplying a 2-digit number by a multiple of 10 is an extension of the algorithm for multiplying multi-digit numbers by a 1-digit number.
- The standard multiplication algorithm involves breaking down the calculation into simpler ones using place value and properties of operations. Regrouping is used rather than showing all partial products.

Topic 5 focuses on:

- Basic facts and place-value patterns can be used to divide multiples of 10 and 100 by 1-digit numbers.
- There is more than one way to estimate a quotient. Substituting compatible numbers is an efficient technique for estimating quotients.
- There is more than one way to estimate a quotient. Using place-value patterns and compatible numbers are efficient techniques for estimating quotients.
- When dividing, the remainder must be less than the divisor. When solving a real-world problem, the kind of questions asked determines how to interpret the remainder.
- Sharing is one way to think about division.
- Division with partial quotients involves breaking apart the dividend, dividing the parts, and adding the partial quotients.
- Division with partial quotients involves breaking apart the dividend, dividing the parts, and adding the partial quotients.
- The standard division algorithm breaks the calculation into simpler calculations using basic facts, place value, the relationship between multiplication and division, and estimation.
- Good math thinkers choose and apply the math they know to show and solve problems from everyday life.

Topic 6 focuses on:

- Both addition and multiplication can be used to make comparisons. Bar diagrams and equations can be used to show both situations and to distinguish between them.
- Bar diagrams and equations can be used to solve problems involving multiplicative comparison.
- Sometimes there is a hidden question that must be answered before solving a problem. Bar diagrams and equations can represent problems and are helpful in answering both parts of a problem.
- Sometimes there are hidden questions that must be answered before solving a problem. Bar diagrams and equations can represent problems and are helpful in answering all parts of a problem. Good math

thinkers make sense of problems and think of ways to solve them. If they get stuck, they don't give up.

Essential Questions

(T3): Multiply by 1-Digit Numbers

- How can you multiply by multiples of 10, 100, and 1,000?
- How can you estimate when you multiply?

(T4): Multiply by 2-Digit Numbers

- How can you use a model to multiply?
- How can you use the Distributive Property to multiply?
- How can you use multiplication to solve problems?

(T5): Divide by 1-Digit Numbers

- How can mental math be used to divide?
- How can questions be estimated?
- How can the steps for dividing be explained?

(T6): Whole-Number Operations to Solve Problems

- How is comparing with multiplication different from comparing with addition?
- How can you use equations to solve multi-step problems?

Exit Skills

Topics 3, 4, 5, 6 Cluster:

- Use strategies and properties to multiply by 1-digit numbers
- Use strategies and properties to multiply by 2-digit numbers
- Use strategies and properties to divide by 1-digit numbers
- Use the four operations with whole numbers to solve problems

New Jersey Student Learning Standards (NJSLS)

The Math Practices, as put forth by the National Council of Teachers of Mathematics (NCTM), are connected within all lessons:

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.

MA.4.OA.B	Gain familiarity with factors and multiples.
MA.4.OA.B.4	Find all factor pairs for a whole number in the range 1–100. Recognize that a whole number is a multiple of each of its factors. Determine whether a given whole number in the range 1–100 is a multiple of a given one-digit number. Determine whether a given whole number in the range 1–100 is prime or composite.
MA.4.OA.C	Generate and analyze patterns.
MA.4.OA.C.5	Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself.
MA.4.NBT.B.6	Find whole-number quotients and remainders with up to four-digit dividends and one-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.

Interdisciplinary Connections

LA.RL.4.1	Refer to details and examples in a text and make relevant connections when explaining what the text says explicitly and when drawing inferences from the text.
LA.RI.4.1	Refer to details and examples in a text and make relevant connections when explaining what the text says explicitly and when drawing inferences from the text.
LA.RF.4.3	Know and apply grade-level phonics and word analysis skills in decoding and encoding words.
LA.RF.4.3.A	Use combined knowledge of all letter-sound correspondences, syllabication patterns, and morphology (e.g., roots and affixes) to read accurately unfamiliar multisyllabic words in context and out of context.
LA.L.4.4	Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grade 4 reading and content, choosing flexibly from a range of strategies.
4-PS3-3.1.1	Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships.

Learning Objectives

After completing Unit 2, students will be able to:

Topic 3:

- Multiply multiples of 10, 100, and 1,000 using mental math and place-value strategies.
- Use rounding to estimate products and check if answers are reasonable.
- Use the Distributive Property to multiply larger numbers.
- Use place value and properties of operations to multiply mentally.
- Use arrays and partial products to multiply 3- and 4- digit numbers by 1-digit numbers.
- Use place value and partial products to multiply 3- and 4-digit numbers by 1-digit numbers.
- Use place value and the standard algorithm to multiply 2- and 3-digit numbers by 1-digit numbers.
- Use the standard algorithm to multiply 4-digit numbers by 1-digit numbers.
- Use the standard algorithm to multiply 2-, 3-, and 4-digit numbers by 1-digit numbers. Estimate to check if answers are reasonable.
- Use previously learned concepts and skills to represent and solve problems.

Topic 4:

- Use mental-math strategies to multiply 2-digit by 2-digit multiples of ten.
- Use models and properties of operations to multiply 2-digit numbers by multiples of ten.
- Estimate products for 2-digit by 2-digit multiplication problems by rounding the factors to multiples of ten.
- Use compatible numbers to estimate products of 2-digit by 2-digit multiplication problems.
- Use arrays, place value, partial products, and properties of operations to multiply two 2-digit numbers.
- Use the Distributive Property and an area model to multiply two 2-digit numbers.
- Use place value and partial products to calculate products of 2-digit by 2-digit multiplication problems.
- Use area models and place-value strategies to multiply 2-digit numbers by multiples of 10.
- Use the expanded and the standard algorithm to multiply 2-digit by 2-digit numbers. Estimate to check if the products are reasonable.
- Use models and algorithms to solve 2-digit by 2-digit multiplication problems.

Topic 5:

- Use mental-math and place-value strategies to divide multiples of 10 and 100 by 1-digit divisors.
- Use compatible numbers to estimate quotients.
- Use place-value patterns and division facts to estimate quotients for 4-digit dividends.
- Solve division problems and interpret remainders.
- Use place-value and drawings to divide 2- and 3-digit numbers by 1-digit numbers.
- Use partial quotients to divide.
- Use partial quotients and place-value understandings to divide with greater dividends.
- Divide 2- and 3-digit numbers by 1-digit numbers using the standard division algorithm.

- Divide 4-digit numbers by 1-digit numbers using the standard division algorithm.
- Use previously-learned concepts and skills to model and solve problems.

Topic 6:

- Interpret comparisons as multiplication or addition equations.
- Use multiplication and division to compare two quantities.
- Solve two-step problems by finding and solving the hidden question first.
- Solve multi-step problems by finding and solving hidden questions first.
- Make sense of a multi-step problem and keep it working until it is solved.

Suggested Activities & Best Practices

- Consider Extension Activity e.g. Topic 6-1, pg. 325

- Further suggested activities embedded within each Topic

Assessment Evidence - Checking for Understanding (CFU)

- Common Formative Assessments (Formative)
- Common Summative Assessments (Summative)
- District Benchmark (Benchmark)
- Do Now
- Exit Tickets
- Higher-order Questioning / Rich Discussion
- Journals
- KWL Chart
- Learning Center Activities
- Performance Task (Alternative)
- Quick Check (enVisionmath)
- Quick Write
- Quizzes (Formative)
- Rubrics
- Study Guide
- Surveys
- Teacher Observation Checklist
- Think-Pair-Share

- Turn-and-Talk / Share-out
- Unit Assessments (Summative)
- WIK / WINK

Primary Resources & Materials

EnVision Math Teacher Edition

PearsonRealize.com

Ancillary Resources

New Jersey Student Learning Standards for Mathematics

NJSLS Mathematics Crosswalk

IXL Learning

NCTM Illuminations

Technology Infusion



Alignment to 21st Century Skills & Technology

Mastery and infusion of **21st Century Skills & Technology** and their Alignment to the core content areas is essential to student learning. The core content areas include:

- English Language Arts;
- Mathematics;
- Science and Scientific Inquiry (Next Generation);
- Social Studies, including American History, World History, Geography, Government and Civics, and Economics;
- World languages;

- Technology;
- Visual and Performing Arts.

CRP.K-12.CRP2.1	Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation.
CRP.K-12.CRP4.1	Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others' time. They are excellent writers; they master conventions, word choice, and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.
CRP.K-12.CRP6.1	Career-ready individuals regularly think of ideas that solve problems in new and different ways, and they contribute those ideas in a useful and productive manner to improve their organization. They can consider unconventional ideas and suggestions as solutions to issues, tasks or problems, and they discern which ideas and suggestions will add greatest value. They seek new methods, practices, and ideas from a variety of sources and seek to apply those ideas to their own workplace. They take action on their ideas and understand how to bring innovation to an organization.
CRP.K-12.CRP8.1	Career-ready individuals readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem. They are aware of problems when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to introducing solutions. They carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through their own actions or the actions of others.
CRP.K-12.CRP11.1	Career-ready individuals find and maximize the productive value of existing and new technology to accomplish workplace tasks and solve workplace problems. They are flexible and adaptive in acquiring new technology. They are proficient with ubiquitous technology applications. They understand the inherent risks-personal and organizational-of technology applications, and they take actions to prevent or mitigate these risks.
CAEP.9.2.4.A.4	Explain why knowledge and skills acquired in the elementary grades lay the foundation for future academic and career success.
TECH.8.1.5.A	Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.
TECH.8.1.5.A.1	Select and use the appropriate digital tools and resources to accomplish a variety of tasks including solving problems.
TECH.8.1.5.A.CS1	Understand and use technology systems
TECH.8.1.5.A.CS2	Select and use applications effectively and productively.

21st Century Skills/Interdisciplinary Themes

- Communication and Collaboration
- Creativity and Innovation
- Critical thinking and Problem Solving
- ICT (Information, Communications and Technology) Literacy

- Information Literacy
- Life and Career Skills
- Media Literacy

21st Century Skills

- Civic Literacy
- Environmental Literacy
- Financial, Economic, Business and Entrepreneurial Literacy
- Global Awareness
- Health Literacy

Differentiation

- Use the "Quick Check" feature on Pearson Realize (embedded in each Unit) to help determine the strategy for differentiating instruction; the "Assess and Differentiate" page will prescribe the differentiated instructional activity

Differentiations:

- Small group instruction
- Small group assignments
- Extra time to complete assignments
- Pairing oral instruction with visuals
- Repeat directions
- Use manipulatives
- Center-based instruction
- Token economy
- Study guides
- Teacher reads assessments aloud
- Scheduled breaks
- Rephrase written directions
- Multisensory approaches
- Additional time
- Preview vocabulary
- Preview content & concepts
- Story guides
- Behavior management plan
- Highlight text
- Student(s) work with assigned partner
- Visual presentation
- Assistive technology
- Auditory presentations
- Large print edition

- Dictation to scribe

Hi-Prep Differentiations:

- Alternative formative and summative assessments
- Choice boards
- Games and tournaments
- Group investigations
- Guided Reading
- Independent research and projects
- Interest groups
- Learning contracts
- Leveled rubrics
- Literature circles
- Multiple intelligence options
- Multiple texts
- Personal agendas
- Project-based learning
- Problem-based learning
- Stations/centers
- Think-Tac-Toes
- Tiered activities/assignments
- Tiered products
- Varying organizers for instructions

Lo-Prep Differentiations

- Choice of books or activities
- Cubing activities
- Exploration by interest
- Flexible grouping
- Goal-setting with students
- Jigsaw
- Mini workshops to re-teach or extend skills
- Open-ended activities
- Think-Pair-Share
- Reading buddies
- Varied journal prompts
- Varied supplemental materials

Special Education Learning (IEP's & 504's)

- Consider Intervention Activity and/or Reteach e.g. Topic 6-1, pg. 331A

- Use suggestions under Technology Center section in Pearson Realize to target students with disabilities

- Use the Pacer Center Action Information Sheet for research-based ideas on accommodations and modifications

- Allow for open-note/open-book assessments
- Check classwork frequently for understanding
- Conduct preview of content, concepts, and vocabulary
- Consider behavior management plan
- Implement accommodations/modifications as dictated in the student's IEP/504 plan
- Modified test content/format
- Modified written assignments
- Multi-sensory presentation
- Pre-annotate text
- Preferential seating
- Promote pair work
- Provide extended time on various assignments
- Provide printed/online copies of lesson notes
- Secure attention before providing instruction/directions
- Use assistive technology

English Language Learning (ELL)

- Use Teaching Tool 48 as a graphic organizer to help students connect a visual to the vocabulary term

- Use Teaching Tool 49 to connect students' understanding of vocabulary terms with actual meanings

- Use suggestions under English Language Learners section in Pearson Realize to target beginning, intermediate, and advanced learners e.g. Topic 6-1, pg. 327A

- Use suggestions under Technology Center section in Pearson Realize to target ELLs

- Allow for multiple student revisions
- Allow for open-note / open-book assessments
- Allow multiple forms of student products (projects, models, slide-shows, etc.) to demonstrate student learning
- Ask and give information using key words
- Demonstrate listening comprehension by responding to questions
- Develop basic sight vocabulary
- Differentiate assessments to reflect selected objectives
- Express ideas in single words

- Leverage computer spell checker
- Modify reading assignments to correlate with lexile level
- Peer tutoring / Peer note-taking
- Speak using content area vocabulary in context
- Teacher-created Study Guide
- Use prior experiences to understanding meanings
- Use videos, illustrations, pictures, and drawings to explain or clarify

At Risk

- Decrease the amount of work represented or required by assigning the "Do You Understand?" and the "Do You Know How?" sections of each lesson

- Use suggestions under Technology Center section in Pearson Realize to target at-risk students

- Use suggestions under Intervention Activity e.g. Topic 6-1, Error Intervention, pg. 329-330

- Allow for multiple student revisions
- Allow for open-note / open-book assessments
- Allow multiple forms of student products (projects, models, slide-shows, etc.) to demonstrate student learning
- Allow students to select from given assignment choices
- Differentiate assessments to reflect selected objectives
- Mark students' correct and acceptable work, not the mistakes
- Peer tutoring / Peer note-taking
- Promote student collaboration on in-class / outside class assignments
- Reduce lengthy outside reading assignments
- Teach key aspects of a topic - eliminate non-essential information
- Teacher-created Study Guide
- Use authentic assessments with real-life problem-solving
- Use videos, illustrations, pictures, and drawings to explain or clarify

Talented and Gifted Learning (T&G)

- Use suggestions under Extension for Early Finishers section in Pearson Realize to target advanced learners
- Use suggestions under Advanced Activity Centers to target advanced learners e.g. Topic 6-1, pg. 331A

- Administer Unit Assessment to determine level of proficiency
- Allow gifted children to create and publish a class newspaper to distribute
- Allow students to work at a faster pace
- Complete activities aligned with above grade-level text using Benchmark results
- Consider parental input about the education of their gifted children

- Create a blog or social media page about a topic of interest
- Create a plan to solve an issue presented in the class or in a text
- Debate issues with research to support arguments
- Involve students in academic contests
- Promote advanced problem-solving
- Remember that gifted children may not excel in all areas
- Set individual goals
- Utilize exploratory connections to higher-grade concepts
- Utilize project-based learning for greater depth of knowledge