Unit 2: Understand Properties of Multiplication and the Relationship between Multiplication and Division

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Department of Curriculum and Instruction

Belleville Public Schools

Curriculum Guide

Mathematics: Grade 3

Unit 2: Understand Properties of Multiplication and the Relationship between Multiplication and Division

Belleville Board of Education

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Unit Overview

Unit 2 will cover five topics including (T3) Apply Properties: Multiplication Facts for 3, 4, 6, 7, 8, (T4) Use Multiplication to Divide: Division Facts, (T5) Fluently Multiply and Divide within 100, (T6) Connect Area to Multiplication and Addition, and (T7) Represent and Interpret Data. Within Unit 2, students will develop a deeper understanding of the relationship between multiplication and division.

Enduring Understandings

Topic 3 focuses on:

- The distributive Property can be used to break a large array into smaller arrays.
- Multiplication facts with 3 as a factor can be found by breaking apart the unknown fact into known facts. The answers to the known facts are added to get the final product.
- Basic multiplication facts with 4 as a factor can be found by breaking apart the unknown fact into known facts. The answers to the known facts are added to get the final product.
- Basic multiplication facts with 6 or 7 as a factor can be found by breaking apart the unknown facts into known facts. The answers to the known facts are added to get the final product.
- Basic multiplication facts with 8 as a factor can be found by breaking apart the unknown facts into known facts. The answers to the known facts are added to get the final product.
- Strategies such as bar diagrams and arrays with known facts can be used to solve multiplication problems.
- Three or more numbers can be grouped and multiplied in any order.
- Good math thinkers look for things that repeat, and they make generalizations.

Topic 4 focuses on:

- Multiplication and division have an inverse relationship.
- The inverse relationship between multiplication and division can be used to find division facts; every

division fact has a related multiplication facts.
- Factors and products can be identified by patterns as well as other characteristics, such as even or odd.
- Any number (except 0) divided by itself is equal to 1. Any number divided by 1 is that number. 0 divided by any number (except 0) is 0. 0 cannot be a divisor.
- Patterns and known facts can be used to find unknown multiplication facts. Division facts can be found by thinking of a related multiplication fact.
- You can use a multiplication or division fact to find the unknown value in an equation.
- Good math thinkers make sense of problems and think of ways to solve them. If they get stuck, they don't give up.

Topic 5 focuses on:

- There are patterns in the factors and the products for multiplication facts.
- Any division problem can be thought of as a missing factor multiplication problem.
- Strategies and reasoning can be used to recall multiplication and division basic facts.
- Strategies such as using properties of operations, drawings, and skip counting can be used to multiply.
- Some real-world problems can be represented and solved using different multiplication and division strategies.
- Some real-world problems that involve equal groups can be solved using multiplication.
- Some real-world problems that involve equal groups can be solved using division.
- Good math thinkers look for relationships in math to help solve problems.

Topic 6 focuses on:

- The amount of space inside a shape is its area, and area can be found or estimated using unit squares.
- Area can be measured using nonstandard units, including unit squares of different sizes.
- Standard measurement units are used for consistency in finding and communicating measurements.
- The amount of space inside a region is its area, and area can be found by counting unit squares or by multiplying the side lengths.
- The areas of rectangles can be used to model the Distributive Property.
- The area of some irregular shapes can be found by dividing the original shape into rectangles, finding the area of each rectangle, and adding all of the areas.
- Good math thinkers look for relationships in math to help solve problems.

Topic 7 focuses on:

- Certain types of graphs are appropriate for certain kinds of data. Picture graphs and bar graphs make it easy to compare data.
- The type of graph used is based on the data being presented. The key for a picture graph determines the number of pictures needed to represent the data.
- The type of graph used is based on the data being presented. In a scaled bar graph, the scale determines how long each bar needs to be to represent every number in the data set.
- Some problems can be solved by making, reading, and analyzing a graph.
- Good math thinkers are careful about what they write and say, so their ideas about math are clear.

Essential Questions

(T3): Apply Properties: Multiplication Facts for 3, 4, 6, 7, 8

- How can unknown multiplication facts be found using known facts?

(T4): Use Multiplication to Divide: Division Facts

- How can unknown division facts be found using known multiplication facts?

(T5): Fluently Multiply and Divide within 100

- What are strategies to solve multiplication and division facts?

(T6): Connect Area to Multiplication and Addition

- How can area be measured and found?

(T7): Represent and Interpret Data

- How can data be represented, interpreted, and analyzed?

Exit Skills

Topics 3 and 4 Cluster: Understand properties of multiplication and the relationship between multiplication and division

Topic 5: Select and use appropriate strategies to multiply and divide within 100

Topic 6: Understand concepts of area and relate area to multiplication and addition

Topic 7: Read and make scaled picture graphs and scaled bar graphs that represent a data set with several categories

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.3.OA.A.3	Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.
MA.3.OA.B.5	Apply properties of operations as strategies to multiply and divide.
MA.3.OA.B.6	Understand division as an unknown-factor problem.
MA.3.OA.C.7	Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that 8 × 5 = 40, one knows 40 ÷ 5 = 8) or properties of operations. By the end of Grade 3, know from memory all products of two one-digit numbers.
MA.3.OA.D.9	Identify arithmetic patterns (including patterns in the addition table or multiplication table), and explain them using properties of operations.
MA.3.MD.B.3	Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step “how many more” and “how many less” problems using information presented in scaled bar graphs.
MA.3.MD.C.5a	A square with side length 1 unit, called “a unit square,” is said to have “one square unit” of area, and can be used to measure area.
MA.3.MD.C.5b	A plane figure which can be covered without gaps or overlaps by n unit squares is said to have an area of n square units.
MA.3.MD.C.6	Measure areas by counting unit squares (square cm, square m, square in, square ft, and non-standard units).
MA.3.MD.C.7a	Find the area of a rectangle with whole-number side lengths by tiling it, and show that the area is the same as would be found by multiplying the side lengths.
MA.3.MD.C.7b	Multiply side lengths to find areas of rectangles with whole number side lengths in the context of solving real world and mathematical problems, and represent whole-number

	products as rectangular areas in mathematical reasoning.
MA.3.MD.C.7c	Use tiling to show in a concrete case that the area of a rectangle with whole-number side lengths a and $b + c$ is the sum of $a \times b$ and $a \times c$. Use area models to represent the distributive property in mathematical reasoning.
MA.3.MD.C.7d	Recognize area as additive. Find areas of rectilinear figures by decomposing them into non-overlapping rectangles and adding the areas of the non-overlapping parts, applying this technique to solve real world problems.
MA.3.MD.D.8	Solve real world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, finding an unknown side length, and exhibiting rectangles with the same perimeter and different areas or with the same area and different perimeters.

Interdisciplinary Connections

Math and Science Projects / STEM Connections embedded within TE, EnVision Math e.g. Topic 3-1 pg. 105

Topic 3: Apply Properties: Multiplication Facts for 3, 4, 6, 7, and 8

- Ask students what they notice first about the picture on page 105 in their workbook. If they don't mention the colors of the flowers, then point out the rows of the same type of flower in different colors.
- Explain to sudents that flowers inherit traits from parents just like humans do. Disucss inherited traits of organisms, leading to wath is inherited versus what is learned.
- Have students research characteristics of organisms are inherited.
- Have the students write a report/journal entry about the information they have gathered.

Topic 4: Use Multiplication to Divide: Division Facts

- Have students help you list exampels of things that are tested, such as cars, computers, and video games.
- Explain that when a new product is being made, people test the product many times.
- Have students research models or prototypes that were tested. Have them identify how the testing was done.
- Have the sutdents write a report/journal entry about the information they have gathered.

Topic 5: Fluently Multiply and Divide within 100

- Ask students what they think when they hear the word weather. Then point out the image and have students help you list things in the picture that make them think of weather.
- Have the students rearch what the weather is like in different places on Earth. Find the weather at different times of the day.
- Have the students write a report/journal entry with the information gathered.

Topic 6: Connect Area to Multiplication and Addition

- Discuss situations in whcih people may need protection from the weather, such as tornadoes and hurricanes.
- Have students help you list other designs that help protect us from unsafe weather. Talk about why math and research are important when designing ways to protect us against weather.
- Have students research designs that help protect against weather.

- Have the students write a report/journal entry to include the information they have gathered.

Topic 7: Represent and Interpret Data

- Discuss the seasons with your students.
- Explain that the changing seasons are caused by the increasing number of daylight hours and Earth's tilt. Different seasons have different weather patterns, such as temperature and the amount of rainfall or snowfall.
- Have the students research information about patterns of temperature in the different seasons where you live.
- Have the students write a report/journal entry with the information they gathered

LA.W.3.8	Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories.
LA.SL.3.1	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher led) with diverse partners on grade 3 topics and texts, building on others' ideas and expressing their own clearly.
LA.SL.3.1.A	Explicitly draw on previously read text or material and other information known about the topic to explore ideas under discussion.
LA.SL.3.1.B	Follow agreed-upon norms for discussions (e.g., gaining the floor in respectful ways, listening to others with care, speaking one at a time about the topics and texts under discussion).
LA.SL.3.1.C	Ask questions to check understanding of information presented, stay on topic, and link their comments to the remarks of others.
LA.SL.3.1.D	Explain their own ideas and understanding in light of the discussion.

Learning Objectives

After completing Unit 2, students will be able to:

Topic 3:

- Use the Distributive Property to solve problems involving multiplication within 100.
- Use appropriate tools and the Distributive Property to break apart unknown facts with 3 as a factor.
- Use the Distributive Property to break apart unknown facts with 4 as a factor.
- Use the Distributive Property to break apart unknown facts with 6 or 7 as a factor.
- Use the Distributive Property and known facts to break apart unknown facts with 8 as a factor.
- Use strategies such as bar diagrams and arrays with known facts to solve multiplication problems.
- Use the Associative Property of Multiplication to group 3 factors and multiply.
- Use repeated reasoning with known facts to make generalizations when multiplying.

Topic 4:

- Use multiplication facts to divide.
- Use multiplication facts to find division facts.

- Use multiplication facts to find the related division facts.
- Use knowledge of even and odd numbers to identify multiplication patterns.
- Use properties to understand division involving 0 and 1.
- Use patterns and known facts to find unknown multiplication facts. Use multiplication facts to find related division facts.
- Use multiplication and division facts to find unknown values in equations,.
- Use previously learned concepts to find and answer hidden questions to solve problems.

Topic 5:

- Use the multiplication table and the Distributive Property to find patterns in factors and products.
- Use a multiplication table to find the missing factor in a division problem.
- Use number sense and reasoning while practicing multiplication and division basic facts.
- Use strategies such as skip counting and properties of operations to multiply.
- Solve multiplication and division problems that involve different strategies and representations.
- Use multiplication to write and solve real-world problems involving equal groups.
- Use division to write and solve real-world problems involving equal groups. Use the structure of multiplication and division to compare expressions.

Topic 6:

- Use unit squares to find the area of a shape.
- Use unit squares to find the area of a figure.
- Use standard units to measure the area of a shape.
- Use unit squares and multiplication to find the area of squares and rectangles.
- Use areas of rectangles to model the Distributive Property of Multiplication.
- Use areas of rectangles to find the area of irregular shapes.
- Solve problems by breaking apart or changing the problem in simpler problems.

Topic 7:

- Use graphs to compare and interpret data.
- Use frequency tables and picture graphs to compare and interpret data.
- Use scaled bar graphs to represent data sets.
- Use graphs to solve problems.
- Use words, symbols, and numbers to accurately and precisely solve math problems.

Suggested Activities & Best Practices

- Consider Extension Activity e.g. Topic 3-1, pg. 105

- 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
- EnVision Performance Task (Alternative)
- Exit Tickets
- Higher-order Questioning / Rich Discussion
- Journals
- KWL Chart
- Learning Center Activities
- Quick Check (enVisionmath)
- Quick Write
- Quizzes (Formative)
- Rubrics
- 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]

[Prodigy Game]

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 3-1, pg. 113A

- 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 3-1, pg. 109A

- 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 3-1, Error Intervention, pg. 111-112

- 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 3-1, pg. 113A

- 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