Unit 2: Operations and Algebraic Thinking

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Unit 2: Operations and Algebraic Thinking

Department of Curriculum and Instruction

Belleville Public Schools

Curriculum Guide

Mathematics: Grade 5

Unit 2: Operations & Algebraic Thinking

Belleville Board of Education

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Unit Overview

Unit 2 will cover four topics including (T3) Fluently Multiply Multi-digit Whole Numbers, (T4) Use Models and Strategies to Multiply Decimals, (T5) Use Models and Strategies to Divide Whole Number, and (T6) Use Models and Strategies to Divide Decimals.

Enduring Understandings

Topic 3 focuses on:

- Place-value patterns and mental math can be used to write the product of a whole number and a power of 10 by simply annexing the correct number of zeros to the whole number factor.
- Estimating products is a useful technique to quickly solve mathematical problems and understand the value of numbers used in real-world situations. There is more than one way to estimate a product.
- Multiply 3-digit numbers by 2-digit numbers by combining equal groups. Rounding to the nearest 10 or using compatible numbers help estimate with greater accuracy when multiplying with greater numbers.
- The process for multiplying factors with zeros is always the same regardless of the size of the numbers with zeros. Estimation is a strategy that can be used to check the final product for reasonableness.
- No matter the size of the numbers, the standard algorithm for multiplying whole numbers is always based on properties of operations and can be used to solve problems.
- Using a bar diagram and writing an equation are two strategies that can be used to solve multi-step problems.
- Good math thinkers use math to explain why they are right. They can talk about the math that others do, too.

Topic 4 focuses on:

- 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.

- You can estimate the product of a decimal and a whole number by using compatible numbers and rounding. Comparing two strategies can help you decide which strategy provides an estimate that is closer to the exact answer.
- The standard multiplication algorithm used with decimals is an extension of the standard algorithm used when multiplying whole numbers. You can use models to represent multiplication problems and communicate ideas to others.
- The steps involved in multiplying a decimal by a whole number are similar to the steps used in multiplying two whole numbers. Place value in the factors determines the placement of the decimal point in the product.
- The process for multiplying a decimal by a decimal is similar to the process for multiplying whole numbers but the decimal point must be located in the correct place.
- The partial products process for multiplying whole numbers can be used for multiplying with decimals. You can use models and other strategies to find the answer and determine if it is reasonable.
- The Associative and Commutative Properties can be used to break apart and multiply two decimals.
- Thinking about the relative size of the decimals being multiplied can help you determine the relative size of the product, and the location 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.
- Good math thinkers choose and apply math they know to show and solve problems from everyday life.

Topic 5 focuses on:

- Division problems with dividends and divisors that are multiples of ten can be solved using basic facts and patterns. Multiplication can be used to check whether quotients are reasonable.
- Using compatible numbers is one of many estimation strategies that can be used to estimate a quotient. Multiplication can be used to check whether quotients are reasonable.
- Area models and arrays are two ways to represent division with multi-digit whole 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.
- Compatible numbers can be used to simplify division problems involving dividing 3-digit dividends by 2-digit multiples of ten. Estimation and number sense can be used to check whether quotients are reasonable.
- Estimation and place-value understandings can be used to determine where to place the first digit in a quotient.
- Dividing by 2-digit divisors is an extension of the standard algorithm for dividing with 1-digit divisors. Estimation can help determine the placement of digits and be used to check whether quotients are reasonable.
- Good math thinkers make sense of problems and think of ways to solve them. If they get stuck, they don't give up.

Topic 6 focuses on:

- Place-value patterns can be used to divide decimals by powers of 10.
- Rounding and compatible numbers can be used to estimate quotients with decimals.

- The standard algorithm used for dividing decimals is an extension of the standard algorithm for dividing whole numbers. Place-value blocks can be used as a tool to show this connection.
- The standard algorithm used for dividing decimals is an extension of the standard algorithm for dividing whole numbers. When dividing by a whole number, place the decimal point in the quotient directly above the decimal point in the dividend.
- An area model uses the inverse relationship between multiplication and division to show dividing a decimal by a 2-digit whole number.
- Number sense and reasoning can be used to place the decimal point in the quotient when dividing a decimal by a decimal.
- The standard algorithm for dividing a decimal by a decimal is an extension of the standard algorithm for dividing a decimal by a whole number.
- Good math thinkers know how to think about words and numbers to solve problems.

Essential Questions

(T3) Fluently Multiply Multi-digit Whole Numbers

- What are the standard procedures for estimating and finding products of multi-digit numbers?

(T4) Use Models and Strategies to Multiply Decimals

- What are the standard procedures for estimating and finding products involving decimals?

(T5) Use Models and Strategies to Divide Whole Number

- What is the standard procedure for division and why does it work?

(T6) Use Models and Strategies to Divide Decimals

- What are the standard procedures for estimating and finding quotients involving decimals?

Exit Skills

Topics 3-6 Cluster:

- Fluently multiply multi-digit whole numbers
- Use models and strategies to multiply decimals
- Use models and strategies to divide whole numbers

- Use models and strategies to divide decimals

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.5.NBT.A	Understand the place value system.
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.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.

Interdisciplinary Connections

LA.RL.5.1	Quote accurately from a text, and make relevant connections when explaining what the text says explicitly and when drawing inferences from the text.

LA.RF.5.3	Know and apply grade-level phonics and word analysis skills in decoding and encoding words.
LA.RF.5.3.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.5.4	Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grade 5 reading and content, choosing flexibly from a range of strategies.

Learning Objectives

After completing Unit 2, students will be able to:

Topic 3:

- Use place-value understandings and patterns to mentally multiply whole numbers and powers of 10.
- Use rounding and compatible numbers to estimate products.
- Multiply 3-digit by 2-digit numbers by combining equal groups and adding partial products.
- Use knowledge about place value and multiplying with 2-digit and 3-digit numbers to multiply with zeros.
- Use properties and the standard algorithm for multiplication to find the product of multi-digit numbers.
- Use models and strategies to solve word problems.
- Critique the reasoning of others by asking questions, looking for flaws, and using prior knowledge of estimating products.

Topic 4:

- Use knowledge about place value and patterns to find the product of a decimal number and a power of 10.
- Use rounding and compatible numbers to estimate the product of a decimal and a whole number.
- Use models to represent multiplying a decimal and a whole number.
- Use place-value understanding and the standard multiplication algorithm to multiply a decimal by a whole number.
- Use grids to model decimals and find the product of a decimal and a decimal.
- Multiply decimals using partial products and models.
- Use properties to multiply decimals.
- Use number sense and reasoning to place the decimals point in a product.
- Multiplying decimals using the standard algorithm for multiplication and multiplication strategies.
- Use previously learned concepts and skills to represent and solve problems.

Topic 5:

- Use place-value patterns and mental math to find quotients.
- Use compatible numbers and place-value patterns to estimate quotients.

- Use models to find quotients.
- Solve division problems using partial quotients.
- Find the quotient when the divisor is a multiple of 10.
- Decide where to place the first digit of the quotient when dividing whole numbers.
- Use estimation to decide whether a quotient is reasonable when dividing by 2-digit divisors.
- Make sense of problems and keep working.

Topic 6:

- Use mental math and place-value patterns to divide a decimal by a power of 10.
- Use reason and strategies such as rounding and compatible numbers to estimate quotients in problems with decimals.
- Use models to help find quotients in problems involving decimals.
- Use the standard algorithm for division to divide decimals by a whole number.
- Use models to visualize the relationship between division and multiplication to divide decimals by a 2-digit whole number.
- Use number sense and reasoning to place the decimal point in the quotient when dividing two decimals.
- Use the standard algorithm and place-value patterns to divide a decimal by another decimal.
- Use the standard algorithm to divide decimals, annexing zeros as needed.
- Use reasoning to solve problems by making sense of quantities and relationships in the situation.

Suggested Activities & Best Practices

- Consider Extension Activity e.g. Topic 3-1, pg. 109

- 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
- 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.9.2.8.B.3	Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career.
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. 117A

- 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. 113A

- 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. 115-116

- 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. 117A

- 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