Unit 1: Number Sense and Algebraic Equations

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Unit 1: Number Sense and Algebraic Equations

Department of Curriculum and Instruction

Belleville Public Schools

Curriculum Guide

Mathematics: Grade 4

Unit 1: Number Sense and Algebraic Equations

Belleville Board of Education

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Unit Overview

Unit 1 will cover four topics including (T1) Generalize Place Value Understanding, (T2) Fluently Add/Subtract Multi-Digit Whole Numbers, (T7) Factors and Multiples, and (T14) Algebra: Generate and Analyze Patterns.

Enduring Understandings

Topic 1 focuses on:

- Our number system is based on groups of ten. Whenever we get 10 in one place value, we move to the next greater place value.
- In a multi-digit whole number, a digit in one place represents ten times what it would represent in the place immediately to its right.
- Place value can be used to compare numbers.
- Rounding whole numbers is a process for finding the multiple of 10, 100, and so on closest to a given number.
- Good math thinkers use math to explain why they are right. They can talk about the math that others do, too.

Topic 2 focuses on:

- Representing numbers and numerical expressions in equivalent forms can make some calculations easy to do mentally. There is more than one way to do a mental calculation.
- There is more than one way to estimate a sum or difference. Estimation gives a way to replace numbers with other numbers that are close and easier to compute with mentally.
- The standard addition algorithm for multi-digit numbers breaks the calculation into simpler calculation into simpler calculations using place value.
- The standard addition and subtraction algorithms for multi-digit numbers break the calculation into simpler calculations using place value starting with the ones, then the tens, and so on.

- Good math thinkers know how to think about words and numbers to solve problems.

Topic 7 focuses on:

- Factors of a number *n* can be shown by arranging *n* counters into rows with the same number of counters in each row. The number of rows and the number of counters in each row are factors of *n*.
- Factors of a number can be found in pairs by thinking about multiplication.
- Good math thinkers look for things that repeat, and they make generalizations.
- Prime numbers have exactly 2 factors and composite numbers have more than 2.
- The product of any nonzero whole number and a given nonzero whole number is a multiple of both. Factors and multiples are closely related.

Topic 14 focuses on:

- Rules can be used to create or extend number sequences that form a pattern. Those patterns sometimes have features not described by the rule.
- Rules can be used to create or extend patterns in tables. Patterns sometimes have features not described by the rule.
- It is possible to predict a shape in a repeating pattern of shapes.
- Good math thinkers look for relationships in math to help solve problems.

Essential Questions

(T1): Generalize Place Value Understanding

- How are greater numbers written?
- How can whole numbers be compared?
- How are place values related?

(T2): Fluently Add/Subtract Multi-Digit Whole Numbers

- How can sums and differences of whole numbers be estimated?
- What are standard procedures for adding and subtracting whole numbers?

(T7): Factors and Multiples

- How can you use arrays or multiplication to find the factors of a number?
- How can you identify prime and composite numbers?
- How can you find multiples of a number?

(T14): Algebra: Generate and Analyze Patterns

- How can you use a rule to continue a pattern?
- How can you use a table to extend a pattern?
- How can you use a repeating pattern to predict a shape?

Exit Skills

Topics 1, 2, 7, 14 Cluster:

- General place value understanding for multi-digit whole numbers
- Use place value understanding and properties of operations to perform multi-digit arithmetic
- Gain familiarity wit factors and multiples
- Generate and analyze patterns

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	Operations and Algebraic Thinking
MA.4.OA.A.1	Interpret a multiplication equation as a comparison, e.g., interpret 35 = 5 × 7 as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations.
MA.4.OA.A.2	Multiply or divide to solve word problems involving multiplicative comparison, e.g., by

	using drawings and equations with a symbol for the unknown number to represent the problem, distinguishing multiplicative comparison from additive comparison.
MA.4.OA.A.3	Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.
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.L.4.3.A	Choose words and phrases to convey ideas precisely.
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.

Learning Objectives

After completing Unit 1, students will be able to:

Topic 1:

- Read and write numbers in expanded form with numerals, and use number names.
- Recognize the relationship between adjacent digits in a multi-digit number.
- Use place value to compare multi-digit numbers.
- Use place value to round multi-digit numbers.
- Use previously learned concepts and skills to construct arguments about place value.

Topic 2:

- Add and subtract whole numbers mentally using a variety or methods.
- Round greater whole numbers to estimate sums and differences.
- Add numbers to one million with and without regrouping using the standard algorithm.
- Use place value and an algorithm to subtract whole numbers.
- Use number sense and regrouping to subtract across zeros.
- Use previously learned concepts and skills to reason and abstractly and make sense of quantities and their relationships in problem situations.

Topic 7:

- Use arrays to find the factors of a given whole number.
- Use multiplication to find all the factor pairs for a whole number.
- Use repeated reasoning to generalize how to solve problems that are similar.
- Use factors to determine whether a whole number greater than 1 is prime or composite.
- Use multiplication to find multiples of a given number.

Topic 14:

- Create or extend a number sequence based on a rule. Identify features of the pattern in the sequence that are not described by the the rule.
- Use a rule to extend a number pattern and solve a problem. Identify features of the pattern.
- Generate a shape pattern that follows a given rule and predict a shape in the pattern.
- Solve problems by using patterns.

Suggested Activities & Best Practices

- Consider Extension Activity e.g. Topic 14-1, pg. 729

- 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.9.2.4.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 14-1, pg. 737A

- 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 14-1, pg. 733A

- 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 14-1, Error Intervention, pg. 735-736.

- 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 14-1, pg. 737A

- 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

Sample Lesson

Unit Name: Place Value Relationships

NJSLS: 4.NBT.A.1

Interdisciplinary Connections:

Music: Music countdown, choose a CD and use the number sold to explore place value.

Science: Create a temperature chart comparing 6 states comparing the temperatures using place value.

Health: Make calorie cards and compare the numbers.

Social Studies: Make a population chart for 4 different cities and compare the populations using place value.

Objective: Recognize the relationship between adjacent digits in a multi-digit number.

Anticipatory Set/Do Now: Daily Common Core Review/Review what you know.

Learning Activity: Students read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form. Place-value blocks are used to develop this understanding in order to see the relationship between adjacent place values.

Student Assessment/CFUs: Teacher observation, hand signals, choral response

Materials: en-Vision 2.0, Topic 1, pg. 1

21st Century Themes and Skills: Economics

Differentiation/Modifications: Ongoing intervention (during the core lesson), Strategic intervention (at the end of the lesson), Intensive intervention (as needed)

Integration of Technology: Technology Center on PearsonRealize.com