Unit 4: Fraction Operations

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Department of Curriculum and Instruction

Belleville Public Schools

Curriculum Guide

Mathematics: Grade 5

Unit 4: Fraction Operations

Belleville Board of Education

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Unit Overview

Unit 4 will cover three topics including (T7) Use Equivalent Fractions to Add and Subtract, (T8) Multiply Fractions, and (T9) Divide Fractions.

Enduring Understandings

Topic 7 focuses on:

- A number line can be used to determine if estimates are reasonable.
- Fractions with unlike denominators can be represented using equivalent fractions with like denominators.
- Fractions with unlike denominators can be added by replacing them with equivalent fractions that have common denominators.
- Fractions with unlike denominators can be subtracted by replacing them with equivalent fractions that have common denominators.
- Addition and subtraction of fraction may both be needed to solve a problem.
- Sums and differences of mixed numbers can be estimated by rounding to the nearest whole number, or by using benchmark fractions.
- Models can be used to show different ways of adding mixed numbers.
- Adding mixed numbers is an extension of adding fractions.
- Models can be used to show different ways of subtraction mixed numbers.
- Subtracting mixed numbers is an extension of subtracting fractions.
- Addition and subtraction of mixed numbers may both be needed to solve a problem.
- Good math thinkers choose and apply math they know to show and solve problems from everyday life.

Topic 8 focuses on:

- Models can be used to show that the product of a whole number and a fraction can be interpreted as repeated addition.

- Multiplying a fraction and a whole number involves both multiplication and division. Models can be used to represent multiplying a fraction by a whole number.
- Different methods can be used to multiply fractions and whole numbers. In one method, the whole number is renamed as a fraction, the numerators are multiplied, and then the denominators are multiplied.
- Visual models, such as fraction strips, number lines, area models, and bar diagrams, can be used to represent multiplication of a fraction by a fraction.
- To find the product of two fractions, multiply the numerators, and then multiply the denominators, and then multiply the denominators. Recognize when a product is less than or greater than 1.
- An area model can be used to represent the product of two fractions.
- Multiplying mixed numbers is an extension of multiplying fractions.
- The relative size of the factors can be used to determine the relative size of the product.
- Good math thinkers make sense of problems and think of ways to solve them. If they get stuck, they don't give up.

Topic 9 focuses on:

- A fraction can be interpreted as division of the numerator by the denominator.
- A fraction or mixed number can represent the quotient of two whole numbers.
- Models can be used to show how dividing a whole number by a fraction relates to multiplication.
- Visual fraction models can be used to represent and solve problems involving whole numbers divided by unit fractions.
- Dividing a unit fraction by a non-zero whole number can be modeled by showing part of a whole divided into equal parts.
- Area models and number lines can be used to represent and solve division problems involving whole numbers and unit fractions.
- Some problems can be solved by first finding and solving one or more sub-problems and then using the answer(s) to solve the original problem.
- Good math thinkers look for things that repeat, and they make generalizations.

Essential Questions

(T7) Use Equivalent Fractions to Add and Subtract

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

(T8) Multiply Fractions

- What does it mean to multiply whole numbers and fractions?
- How can multiplication with whole numbers and fractions be shown using models and symbols?

(T9) Divide Fractions

- How are fractions related to division?
- How can you divide with whole numbers and unit fractions?

Exit Skills

Topics 7, 8, 9 Cluster:

- Use equivalent fractions as a strategy to add and subtract fractions
- Apply and extend previous understandings of multiplication and division to multiply and divide fractions

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.NF.A	Use equivalent fractions as a strategy to add and subtract fractions.
MA.5.NF.A.1	Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators.
MA.5.NF.A.2	Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators, e.g., by using visual fraction models or equations to represent the problem. Use benchmark fractions and number sense of

	fractions to estimate mentally and assess the reasonableness of answers.
MA.5.NF.B	Apply and extend previous understandings of multiplication and division to multiply and divide fractions.
MA.5.NF.B.3	Interpret a fraction as division of the numerator by the denominator ($a/b = a \div b$). Solve word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers, e.g., by using visual fraction models or equations to represent the problem.
MA.5.NF.B.4	Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction.
MA.5.NF.B.4a	Interpret the product $(a/b) \times q$ as a parts of a partition of q into b equal parts; equivalently, as the result of a sequence of operations $a \times q \div b$.
MA.5.NF.B.4b	Find the area of a rectangle with fractional side lengths by tiling it with unit squares of the appropriate unit fraction side lengths, and show that the area is the same as would be found by multiplying the side lengths. Multiply fractional side lengths to find areas of rectangles, and represent fraction products as rectangular areas.
MA.5.NF.B.5a	Comparing the size of a product to the size of one factor on the basis of the size of the other factor, without performing the indicated multiplication.
MA.5.NF.B.5b	Explaining why multiplying a given number by a fraction greater than 1 results in a product greater than the given number (recognizing multiplication by whole numbers greater than 1 as a familiar case); explaining why multiplying a given number by a fraction less than 1 results in a product smaller than the given number; and relating the principle of fraction equivalence $a/b = (n \times a)/(n \times b)$ to the effect of multiplying a/b by 1.
MA.5.NF.B.6	Solve real world problems involving multiplication of fractions and mixed numbers, e.g., by using visual fraction models or equations to represent the problem.
MA.5.NF.B.7	Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions.
MA.5.NF.B.7b	Interpret division of a whole number by a unit fraction, and compute such quotients.
MA.5.NF.B.7c	Solve real world problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions, e.g., by using visual fraction models and equations to represent the problem.

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 4, students will be able to:

Topic 7:

- Estimate sums and differences of fractions by using the nearest half or whole number.
- Find common denominators for fractions with unlike denominators.
- Add fractions with unlike denominators using equivalent fractions with a common denominator.
- Subtract fractions with unlike denominators.
- Write equivalent fractions to add and subtract fractions with unlike denominators.
- Estimate sums and differences of fractions and mixed numbers.
- Add mixed numbers using models.
- Add mixed numbers using equivalent fractions and a common denominator.
- Use models to subtract mixed numbers.
- Subtract mixed numbers using equivalent fractions and a common denominator.
- Add and subtract mixed numbers using equivalent fractions and a common denominator.
- Represent a problem situation with a mathematical model.

Topic 8:

- Multiply a whole number by a fraction.
- Multiply a fraction by a whole number.
- Multiply fractions and whole numbers.
- Use models to multiply two fractions.
- Multiply two fractions.
- Find the area of a rectangle using fractions and diagrams.
- Use models, equations, and previously learned strategies to multiply mixed numbers.
- Compare the size of the product to the size of one factor without multiplying to consider multiplication as scaling.
- Use previously learned knowledge to make sense of problems and preserve in solving them.

Topic 9:

- Understand how fractions are related to division.
- Implement division of fractions to show quotients as fractions and mixed numbers.
- Use multiplication to divide a whole number by a unit fraction.
- Use models such as pictorial models as a number line to show dividing a whole number by a unit fraction.
- Use models to divide unit fractions by non-zero whole numbers.
- Use models to divide whole numbers and unit fractions. Check your answer using multiplication.
- Solve multi-step problems involving division with unit fractions.
- Notice repetition in calculations and generalize about how to divide whole numbers and unit fractions.

Suggested Activities & Best Practices

- Consider Extension Activity e.g. Topic 9-1, pg. 523

- 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

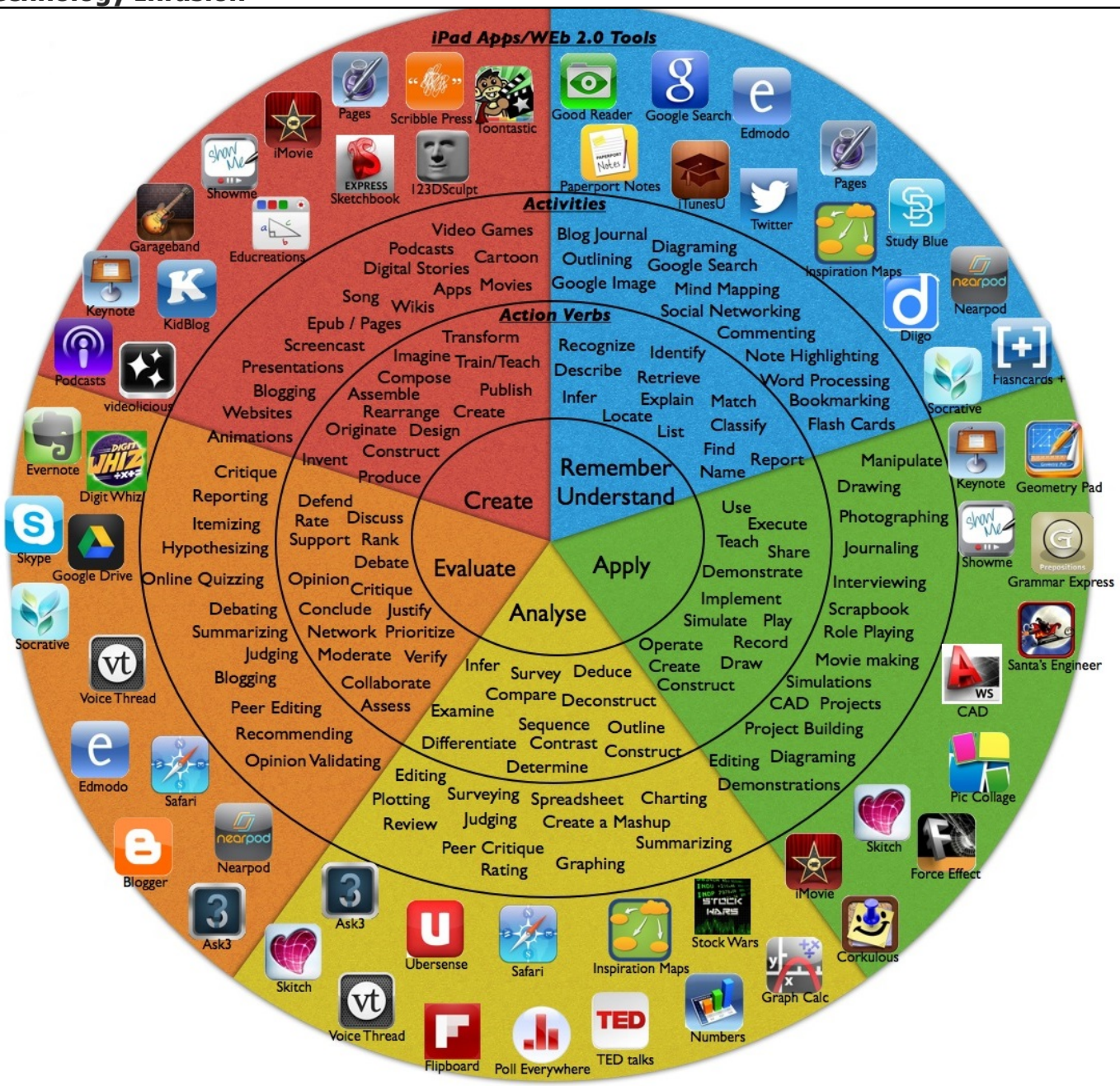
[New Jersey Student Learning Standards for Mathematics]

[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

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 9-1, pg. 531A

- 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 9-1, pg. 527A

- 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 9-1, Error Intervention, pg. 529-530

- 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 9-1, pg. 531A

- 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 exploratory connections to higher-grade concepts
- Utilize project-based learning for greater depth of knowledge
- Utilize project-based learning for greater depth of knowledge