NEW MEXICO
Public Education Department

5.NF.A: NUMBERS AND OPERATIONS - FRACTIONS

Cluster Statement: Use equivalent fractions as a strategy to add and subtract fractions.

Major Cluster (Students should spend the large majority of their time (65-85%) on the major work of the grade/course. Supporting work and, where appropriate, additional work should be connected to and engage students in the major work of the grade.)

Standard Text	**Standard for Mathematical Practices**	**Students who Demonstrate Understanding Can:**
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. *For example, 2/3 + 5/4 = 8/12 + 15/12 = 23/12. (In general, a/b + c/d = (ad + bc)/bd.)*	SMP 4: Students can model with mathematics by using appropriate models including are models, fraction bars, and the number line will help students to develop efficient strategies and subtracting fractions and mixed numbers.	• Explain why fractions with unlike denominators need to be replaced with equivalent fractions with like denominators when adding or subtracting • Generate equivalent fractions to find the like denominator. • Solve addition and subtraction problems involving fractions (including mixed numbers) with like and unlike denominators using an equivalent fraction strategy. **Depth of Knowledge:** 1 **Bloom's Taxonomy:** Apply
Standard Text	**Standard for Mathematical Practices**	**Students who Demonstrate Understanding Can:**
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. *For example, recognize an incorrect result 2/5 + 1/2 = 3/7, by observing that 3/7 < 1/2. Use equivalent fractions as a strategy to add and subtract fractions.*	SMP 1: Students can make sense of problems and persevere in solving them when developing their conceptual understanding of addition and subtraction of fractions using both mixed numbers and unlike denominators. SMP 2: Students can reason abstractly and quantitatively by assessing the reasonableness of answers.	• Assess the reasonableness of answers, using mental estimation. • Add and subtract fractions, including those with unlike denominators. • Solve word problems using addition and subtraction of fractions, including those with unlike denominators. **Depth of Knowledge:** 1 **Bloom's Taxonomy:** Apply

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Previous Learning Connections	Current Learning Connections	Future Learning Connections
• Connect to comparing fractions with different denominators by creating common denominators. (4.NF.1,2) • Connect to adding and subtracting fractions with like denominators. (4.NF.3) • Connect to making a line plot to display a data set of measurements in fractions of a unit. (4. MD.4)	• Connect to making a line plot to display a data set and will add and subtract fractions of a unit to solve problems involving the information presented in the line plot. (5.MD.2)	• Connect to solving algebraic equations and real-world problems using rational numbers. (6.EE.7)

Clarification Statement:

5.NF.A.1: Builds on the work in fourth grade where students add fractions with like denominators. In fifth grade, the example provided in the standard 2/3 + 3/4 has students find a common denominator by finding the product of both denominators. This process should come after students have used visual fraction models (area models, number lines, etc.) to build understanding before moving into the standard algorithm described in the standard. The use of these visual fraction models allows students to use reasonableness to find a common denominator prior to using the algorithm. Fifth grade students will need to express both fractions in terms of a new denominator with adding unlike denominators.

5.NF.A.2: This standard refers to number sense, which means students' understanding of fractions as numbers that lie between whole numbers on a number line. Number sense in fractions also includes moving between decimals and fractions to find equivalents, also being able to use reasoning such as 7/8 is greater than 3/4 because 7/8 is missing only 1/8 and 3/4 is missing 1/4 so 7/8 is closer to a whole. Also, students should use benchmark fractions to estimate and examine the reasonableness of their answers. Example here such as 5/8 is greater than 6/10 because 5/8 is 1/8 larger than 1/2 (4/8) and 6/10 is only 1/10 larger than 1/2 (5/10).

Common Misconceptions

- Students often mix models when adding, subtracting or comparing fractions. Students will use a circle for thirds and a rectangle for fourths when comparing fractions with thirds and fourths. Remind students that the representations need to be from the same whole models with the same shape and same size.

Multi-Layered System of Supports (MLSS)/Suggested Instructional Strategies

Pre-Teach

Pre-teach (targeted): *Pre-teach Targeted: What pre-teaching will prepare students to productively struggle with the mathematics for this cluster within your HQIM?*

- For example, some learners may benefit from targeted pre-teaching that rehearses prior learning when studying the use of equivalent fractions as a strategy to add and subtract fractions because "to add or subtract fractions with unlike denominators, students use their understanding of equivalent fractions to create fractions with the same denominators. Start with problems that require the changing of one of the fractions and progress to changing both fractions. Allow students to add and subtract fractions using different strategies such as number lines, area models, fraction bars or strips. Have students share their strategies and discuss commonalities in them."

Pre-teach (intensive): *What critical understandings will prepare students to access the mathematics for this cluster?*

- 4.NF.A.1 Explain why a fraction a/b is equivalent to a fraction (n × a)/(n × b) by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size: This standard provides a foundation for work with the use of equivalent fractions as a strategy to add and subtract fractions because students need to understand what an equivalent fraction is, in order to understand why it is important to first create equivalent fractions

when adding and subtracting fractions. If students have unfinished learning within this standard, based on assessment data, consider ways to provide intensive pre-teaching support prior to the start of the unit to ensure students are ready to access grade level instruction and assignments.

Core Instruction

Access

Physical Action: *How will the learning for students provide a variety of methods for navigation to support access?*

- For example, learners engaging with the use of equivalent fractions as a strategy for adding and subtracting fractions benefit when learning experiences ensure information is accessible to learners through a variety of methods for navigation, such as varying methods for response and navigation by providing alternatives that allow students to connect a visual representation to the procedure because allowing students to use multiple forms of representation will allow students to connect the concrete model to the representational drawing to the abstract number, equation, and procedure. As such, multiple forms of representation allow for alternative learner responses and alternative ways of navigating through a problem-solving experience. In this case, concrete and representational models are crucial to the learner's foundational understanding of how the model and procedure are connected to the creation of equivalent fractions as a strategy to add and subtract fractions.

Build

Effort and Persistence: *How will the learning for students provide options for sustaining effort and persistence?*

- For example, learners engaging with the use of equivalent fractions as a strategy for adding and subtracting fractions benefit when learning experiences attend to students attention and affect to support sustained effort and concentration such as encouraging and supporting opportunities for peer interactions and supports (e.g., peer-tutors) because students will have multiple ways of representing the problems mathematically. By engaging in peer interactions students are able to make sense of and understand multiple representations that lead to the understanding of the procedure. Students who are struggling to create a model can gain support from students who have a deeper understanding of creating equivalent fractions and using them to add and subtract fractions. Students who are already proficient in creating models can gain understanding of other forms of representation and ways of thinking.

Language and Symbols: *How will the learning for students provide alternative representations to ensure accessibility, clarity and comprehensibility for all learners? (e.g., a graph illustrating the relationship between two variables may be informative to one learner and inaccessible or puzzling to another; picture or image may carry very different meanings for learners from differing cultural or familial backgrounds)*

- For example, learners engaging with the use of equivalent fractions as a strategy for adding and subtracting fractions benefit when learning experiences attend to the linguistic and nonlinguistic representations of mathematics to ensure clarity can comprehensibility for all learners such as presenting key concepts in one form of symbolic representation (the procedure) with an alternative form (a tape diagram, drawing, physical or virtual manipulative) because students must understand what the procedure is doing in order to fully understand why it works. Students must be able to visually see the creation of equivalent fractions in order to understand the procedure involved in creating equivalent fractions. They must also be able to see why we need to create equivalent fractions before adding and subtracting fractions in order to understand the importance of that step of the procedure.

Expression and Communication: *How will the learning provide multiple modalities for students to easily express knowledge, ideas, and concepts in the learning environment?*

- For example, learners engaging with the use of equivalent fractions as a strategy for adding and subtracting fraction benefit when learning experiences attend to the multiple ways students can express knowledge, ideas, and concepts such as providing differentiated feedback (e.g., feedback that is accessible because it can be customized to individual learners) because students' understanding will vary based on their experiences. Some students may be able to make quick connections to the concepts and others may struggle to make a connection between the concrete (model/representation) and the abstract (procedure). Differentiated feedback is important to ensure students are validated in their thinking, and misconceptions are addressed before becoming solidified in their thinking.

Internalize

Comprehension: *How will the learning for students support transforming accessible information into usable knowledge, knowledge that is accessible for future learning and decision-making?*

- For example, learners engaging with the use of equivalent fractions as a strategy for adding and subtracting fraction benefit when learning experiences attend to students by intentionally building connections to prior understandings and experiences; relating important information to the learning goals; providing a process for meaning making of new learning; and, applying learning to new contexts such as providing scaffolds that connect new information to prior knowledge because students have prior knowledge of adding and subtracting fractions with common denominators. The teacher can use this as an entry point into the new concepts of creating equivalent fractions as a strategy to add and subtract fractions. Students also have experience creating equivalent fractions and modeling with fractions. These skills can be combined to aid in the understanding of new concepts.

Re-teach

Re-teach (targeted): *What formative assessment data (e.g., tasks, exit tickets, observations) will help identify content needing to be revisiting during a unit?*

- For example, students may benefit from re-engaging with content during a unit on the use of equivalent fractions as a strategy to add and subtract fractions by revisiting student thinking through a short mini-lesson because "students need to develop the understanding that when adding or subtracting fractions, the fractions must refer to the same whole. Any models used must refer to the same whole. Students may find that a circular model might not be the best model when adding or subtracting fractions."

Re-teach (intensive): *What assessment data will help identify content needing to be revisited for intensive interventions?*

- For example, some students may benefit from intensive extra time during and after a unit on the use of equivalent fractions as a strategy to add and subtract fractions by addressing conceptual understanding because students need to understand what the procedure is doing in order to develop fluency and proficiency with the procedure for using equivalent fractions as a strategy for adding and subtracting fractions. Some students may need practice representing fractions visually or physically before understanding the idea of equivalent fractions and why they are needed when adding and subtracting fractions.

Extension Ideas

What type of extension will offer additional challenges to 'broaden' your student's knowledge of the mathematics developed within your HQIM?

For example, some learners may benefit from an extension such as the application of and development of abstract thinking skills when studying the use of equivalent fractions as a strategy to add and subtract fractions because some students may understand the concepts quickly and easily. These students will not benefit from the continued creation of models, if they already understand the reasoning behind the procedure. Allow these students to communicate their thinking through images, concepts, facts, language and procedures (ICFLP Dr. Lorenzo Gonzales). Expose these students to more complex problems involving mixed numbers, fractions with denominators that are not compatible, and problems that require changing both fractions. Allow these students to explore and create procedures for creating equivalent fractions as a strategy to add and subtract fractions. Encourage these students to explain their thinking, test hypothesis, and modify procedures as necessary. Valid their thinking and address any misconceptions that arise quickly.

Culturally and Linguistically Responsive Instruction:

Validate/Affirm: How can you design your mathematics classroom to intentionally and purposefully legitimize the home culture and languages of students and reverse the negative stereotypes regarding the mathematical abilities of students of marginalized cultures and languages?
Build/Bridge: How can you create connections between the cultural and linguistic behaviors of your students' home culture and language the culture and language of school mathematics to support students in creating mathematical identities as capable mathematicians that can use mathematics within school and society?

Building Procedural Fluency from Conceptual Understanding: Instruction should build from conceptual understanding to allow students opportunities to make meaning of mathematics before focusing on procedures. When new learning begins with procedures it privileges those with strong prior familiarity with school mathematics procedures for solving problems and does not allow learning to build for more methods for solving tasks that occur outside of school mathematics. For example, when studying the use of creating equivalent fractions as a strategy to add and subtract fractions the types of mathematical tasks are critical because students must connect their mathematical models to the development of procedures used to add and subtract fractions with unlike denominators, in order to fully understand the concepts that make up the procedure. Students can create models that represent items they see and interact with daily. From those models, students can connect the procedural routine of creating equivalent fractions as a strategy to add and subtract fractions. By using objects that students are familiar with, the teacher can build fluency with a connection to procedural understanding. Students who understand the reason behind the procedure are more likely to build fluency and precision when using the procedure involved in creating equivalent fractions as a strategy to add and subtract fractions.

Standards Aligned Instructionally Embedded Formative Assessment Resources:
Source: PARCC Released Item 2018
Part A
Robin and Josie shared a bottle of green paint for an art project. Robin used $\frac{3}{5}$ of the bottle of green paint. Together they used $\frac{17}{20}$ of the bottle of green paint.

What fractional part of the bottle of green paint did Josie use? Write your answer as a fraction.
Part B
Josie chose a bottle of red paint with some paint missing. During art class, she used $\frac{1}{5}$ of the whole bottle of red paint. At the end of class, $\frac{2}{3}$ of the whole bottle of red paint was left.

What fractional part of red paint was in the bottle at the beginning of the art class? Write your answer as a fraction.

Answer Key

Part A: $\frac{1}{4}$ (or equivalent fraction) Part B: $\frac{13}{15}$ (or equivalent fraction)	
Relevance to families and communities: During a unit focused on the use of creating equivalent fractions as a strategy to add and subtract fractions, consider options for learning from your families and communities the cultural and linguistic ways this mathematics exists outside of school to create stronger home to school connections for students, for example, connect fraction addition and subtraction to cooking within the home. Students may also be familiar with carpentry and may be able to connect this mathematical concept to this task seen within the home and/or community. By allowing students to interact with fractions on a personal level, students see the relevance to their everyday lives and can connect with the mathematical concepts.	**Cross-Curricular Connections:** STEM: Students add fractions from given or collected data to find the total.