Crane Elementary District Dynamic Curriculum Strategies

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Arizona Context

- ELA and Mathematics newly revised standards adopted in December 2016 by State Board.
- New social studies and science standards are expected to be adopted within a year.
- Newly revised standards will be assessed in 2018-19.
- 2017-18 Transition year for teachers to learn the new standards and practice teaching them.

LHUSD Context

- Prior to 2015 call for revisions, ELA and Mathematics standards were “paced” by grade level and content area. (Quarterly Calendars)
- Groups of teachers unpacked the original standards.
- Groups of teachers created Units of Study to align with the standards, but not all standards have been addressed.
- Resources are located in folders on the “Allshared” drive for teachers to use.

LHUSD Context

- Instructional planning time is provided for teachers to:
  - Identify the standard(s) being taught
  - Identify how students will demonstrate they have learned the standard (assessment)
  - Identify the curricular material that will support the content knowledge
  - Identify the instructional strategies that will engage learning to the level of rigor required
- Often referred to as “Backwards Design”

LHUSD Context

- Teachers having a shared understanding of the standards and what they mean is essential.
- Curriculum is standards driven.
- This structure allows us to control our curriculum at the local level – we decide the resources and the how.

Crane Elementary District K-8 Dynamic Curriculum Strategies (DCS)

- DCS is not a curriculum. All districts are expected to teach the same State Board adopted standards.
- The newly revised Arizona Standards are much more rigorous than previous standards.
- The majority of available curricula products are costly and are disconnected from student interests and local context
- Crane's DCS is a resource and tool for teachers.
- It is housed in one area on a digital platform which saves teachers time.

Advantages of DCS

- The Crane resource has unwrapped every standard including the newly revised standards for ELA and mathematics, and it will also include social studies and science.
- It provides teachers with a wealth of knowledge in one location, including resources on how to teach a specific standard and how to address common misconceptions.

MATH- Unit Description

Duration, Domain, Cluster, Rigor components, Critical Area

Suggested Duration: 10 day(s)

5.NF.1-2 Add and Subtract Fractions w/Unlike Denominators & Solve Word Problems by +/- Fractions
Domain: Number Operations and Fractions

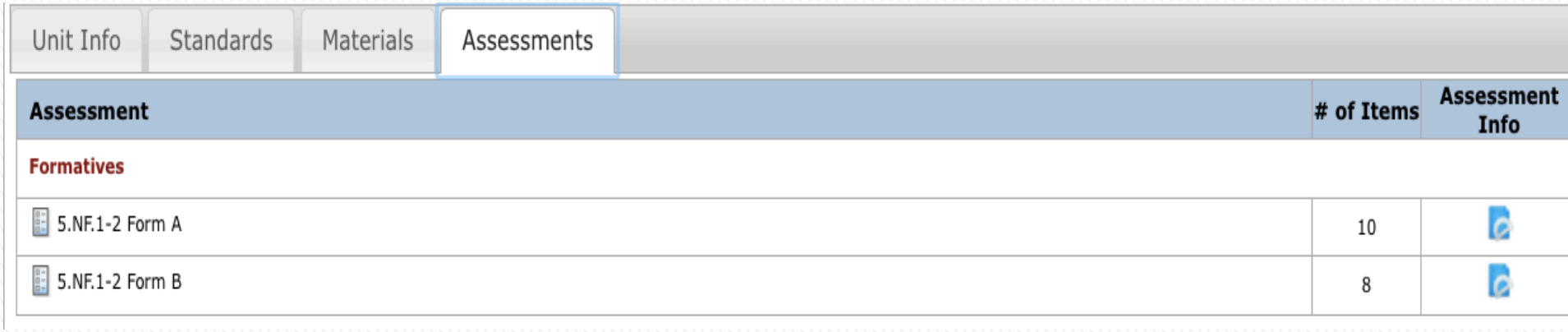
Cluster: Use equivalent fractions as a strategy to add and subtract fractions.

Rigor:
Build conceptual understanding.
Use real-world problems for application.***
Develop fluency (efficiency, flexibility, and accuracy).

Critical Area:
(1) **Students apply their understanding of fractions and fraction models to represent the addition and subtraction of fractions with unlike denominators as equivalent calculations with like denominators. They develop fluency in calculating sums and differences of fractions, and make reasonable estimates of them.** Students also use the meaning of fractions, of multiplication and division, and the relationship between multiplication and division to understand and explain why the procedures for multiplying and dividing fractions make sense. (Note: this is limited to the case of dividing unit fractions by whole numbers and whole numbers by unit fractions.)

Digital Curriculum- Assessment

Each unit has a common assessment attached (Grades 1-2 available paper/electronic)



Grades 3-8 only available electronically due to Tech-Enhanced (TE) items

Digital Curriculum– Assessment

Each math assessment will have a guidance document that details the standard and proficiency level according to AzMERIT PLDs (Grades 3–8 only)

Question	Rigor: Conceptual, Application, Procedural Fluency	Performance Level Descriptor	Standards	Solutions
AZ-5.NBT.A.1 Multiple Choice DOK 1 In which number is the value of digit 1 ten times less than the value of the underlined digit in the number below? 2.1 ● A. 5.41 ○ B. 10.2 ○ C. 31.08 ○ D. 76.109	Application	Proficient Recognizes (in any multi-digit number, including decimals to thousandths) that 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. Explains patterns in the number of zeroes of the product when multiplying a number by powers of 10, and explains patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Uses whole number exponents to denote powers of 10, including 10 to the power of zero.	NBT.A.1	● A. 5.41
AZ-5.NBT.A.1 Selectable Text DOK 1 In the number below, select the 7 with a value that is one-tenth the value of the underlined 7. Legend: Correct Hotspot Incorrect Hotspot 77.777	Application	Proficient Recognizes (in any multi-digit number, including decimals to thousandths) that 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. Explains patterns in the number of zeroes of the product when multiplying a number by powers of 10, and explains patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Uses whole number exponents to denote powers of 10, including 10 to the power of zero.	NBT.A.1	77.777

MATH- Standards for Mathematical Practice

Descriptions in bulleted list & Prompts to elicit thinking

Standards for Mathematical Practice	Questions to Develop Mathematical Thinking
MPs to emphasize with 5.NF.1: 2, 4, 7 **MPs to emphasize with 5.NF.2: 1-8**	**MPs to emphasize with 5.NF.1: 2, 4, 7** **MPs to emphasize with 5.NF.2: 1-8**
MP.1. Make sense of problems and persevere in solving them. • Interpret and make meaning of the problem to find a starting point. Analyze what is given in order to explain to themselves the meaning of the problem. • Plan a solution pathway instead of jumping to a solution. • Monitor their progress and change the approach if necessary. • See relationships between various representations. • Relate current situations to concepts or skills previously learned and connect mathematical ideas to one another. • Continually ask themselves, "Does this make sense?" Can understand various approaches to solutions.	**MP.1. Make sense of problems and persevere in solving them.** How would you describe the problem in your own words? How would you describe what you are trying to find? What do you notice about...? What information is given in the problem? Describe the relationship between the quantities. Describe what you have already tried. What might you change? Talk me through the steps you've used to this point. What steps in the process are you most confident about? What are some other strategies you might try? What are some other problems that are similar to this one? How might you use one of your previous problems to help you begin? How else might you organize...represent... show...?
MP.2. Reason abstractly and quantitatively. • Make sense of quantities and their relationships. • Decontextualize (represent a situation symbolically and manipulate the symbols) and contextualize (make	**MP.2. Reason abstractly and quantitatively.** What do the numbers used in the problem represent? What is the relationship of the quantities? How is _____ related to _____?

MATH- Standard Progression by Grade

Related standards are detailed by grade (2 prior and 1 after)

Standards Progression by Grade

3rd Grade	4th Grade	5th Grade	6th Grade
3.NF.1 **Understand a fraction** 1/b as the quantity formed by 1 part when a whole is partitioned into b equal parts; understand a fraction a/b as the quantity formed by a parts of size 1/b.	**4.NF.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. Use this principle to recognize and generate equivalent fractions	**5.NF.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.)	**6.NS.1** **Interpret and compute quotients of fractions**, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem.
3.NF.2 **Understand a fraction as a number on the number line; represent fractions on a number line diagram.** a. Represent a fraction 1/b on a number line diagram by defining the interval from 0 to 1	**4.NF.3** Understand a fraction a/b with a > 1 as a sum of fractions 1/b. a. **Understand addition and subtraction of fractions** as joining and separating parts referring to the same whole.	**5.NF.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	

MATH- Standard Progression Narrative

Descriptions about standard progression from authors

Standards Progression Narrative

Find the full Number and Operations—Fractions, 3–5 Progression Narrative here.
Find the full Number System, 6-8 Progression Narrative here.

3rd Grade:

In Grades 1 and 2, students use fraction language to describe partitions of shapes into equal shares (2.G.3). In Grade 3 they start to develop the idea of a fraction more formally,building on the idea of partitioning a whole into equal parts. The whole can be a shape such as a circle or rectangle, a line segment,or any one finite entity susceptible to subdivision and measurement. In Grade 4, this is extended to include wholes that are collections of objects. Grade 3 students start with unit fractions (fractions with numerator 1), which are formed by partitioning a whole into equal parts and taking one part, e.g., if a whole is partitioned into 4 equal parts then each part is 1/4 of the whole, and 4 copies of that part make the whole. Next, students build fractions from unit fractions, seeing the numerator 3 of 3/4 as saying that 3/4 is the quantity you get by putting 3 of the 1/4's together (3.NF.1). They read any fraction this way, and in particular there is no need to introduce "proper fractions" and"improper fractions" initially; 5/3 is the quantity you get by combining 5 parts together when the whole is divided into 3 equal parts.

The goal is for students to see unit fractions as the basic building blocks of fractions, in the same sense that the number 1 is the basic building block of the whole numbers; just as every whole number is obtained by combining a sufficient number of 1s, every fraction is obtained by combining a sufficient number of unit fractions.

4th Grade:

The meaning of addition is the same for both fractions and whole numbers, even though algorithms for calculating their sums can be different. Just as the sum of 4 and 7 can be seen as the length of the segment obtained by joining together two segments of lengths 4 and 7, so the sum of 2/3 and 8/5 can be

MATH- Rigor Components

Descriptions of 3 components of rigor provided

Rigor: Conceptual Understanding, Procedural, Application

5.NF.1-2

Conceptual Understanding

- Understand factors and multiples
- Understand how to find equivalent fractions
- Understand how to convert mixed numbers to improper fractions and improper fractions to mixed numbers
- Understand that denominators tell the size of the parts and having same size parts makes adding and subtracting fractions easier
- Understand that when adding and subtracting fractions, there is an underlying assumption that the wholes are the same size
- Understand that real-world scenarios occur and require adding and subtracting fractions

Procedural Understanding

- Use models/manipulatives to represent conversions (between mixed and improper), equivalent fractions, and computation
- Create equivalent fractions with common denominators
- Add and subtract fractions including mixed numbers
- Accurately solve word problems involving addition and subtraction of fractions
- Use visual models and/or equations to represent the problem
- Estimate the sum or difference and then use fraction sense to evaluate the reasonableness of calculations

Application

- Use estimation and compare to actual computations
- Flexibly manipulate numbers to make situations true (i.e. use specific digits to form fractions with a specific sum)
- Solve real-world problems or use problem solving tasks involving addition and subtraction of fractions

MATH- Terminology

Information on how to teach terminology is included

Mathematical Terminology

***See Materials for post-able vocabulary cards**

- fraction
- mixed numbers
- equivalent fractions
- estimate
- numerator
- denominator
- benchmark fractions
- unlike denominators
- common denominators

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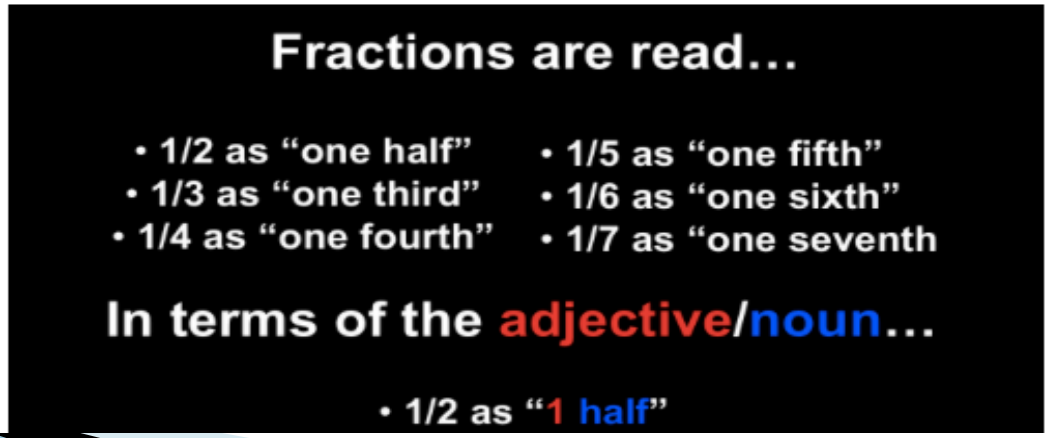
The way we teach vocabulary with fractions is very important. Students do not need to remember to find a common denominator if they understand the adjective noun theme. Similar to trying to add 35 feet and 3 yards - you must change units. Students should relate this to 1 half and 3 sixths with the numerical quantity as the adjective and the fractional name as the noun. For more information on using adjective/noun theory check out the power points in lesson 3 of this page.



MATH- Questions, Stems, & Prompts
Multiple examples provided for teachers

Essential Questions, Stems, and Prompts

5.NF.1

- What strategies can you use to find common denominators?
- What if two students find different common denominators before doing their calculations? How will this impact their solutions?
- Explain your thinking while adding/subtracting these fractions.
- How are equivalent fractions helpful when solving problems?
- How can a fraction be greater than 1?
- How can a fraction model help us make sense of a problem?
- How can comparing factor size to 1 help us predict what will happen to the product?
- How can decomposing fractions or mixed numbers help us model fraction multiplication?
- How can decomposing fractions or mixed numbers help us multiply fractions?
- How can fractions be used to describe fair shares?
- How can fractions with different denominators be added together?
- How can looking at patterns help us find equivalent fractions?
- How can making equivalent fractions and using models help us solve problems
- When adding 7/12 + 3/12, why do you add the numerators but keep the denominator the same?
- The difference of two fractions is ¾. What could the fractions be?
- Two fractions less than 1 result in a sum of 1 ⅔. What could the fractions be?
- How do you know that 2 1/2 + 3 2/3 > 6?
- Emily says the answer to 7/9 - 2/6 is 5/3. Is Emily correct? If not, help her understand her mistake?
- Use the digits 2, 3, 4, 5, 8, and 9 to form two different mixed numbers with a difference between 1 and 2.
- Show the sum of ⅔ + ⅜ using a number line?

5.NF.2

- How does the model or equation you used represent the problem situation?
- Is your answer reasonable? How might you use benchmark fractions and number sense to decide?
- Compare and explain the various strategies and models used to solve the word problem.
- How can we describe how much someone gets in a fair-share situation if the fair share is less than 1?

- Write a word problem that can be solved with ⅔ - ⅗?
- Is the sum of 4/5 and 7/8 under or over one? Explain how you know.
- There is ⅕ of the pepperoni pizza left over, and ¾ of the Hawaiian pizza left over. Sydney says that there are 1 ½ total pizzas left. Do you agree? Explain why or why not.
- Write a subtraction problem that has the same difference as ¾ - ⅛.
- Why doesn't 2/6 - 1/4 = 1/2?
- Why can you use mental computation to solve 5 - 3 1/2?
- Is 3 ¾ + 2 ⅛ greater or less than 6? Explain.

MATH- Examples & Explanations

Explanations and Examples

Find the full Standards Flip Book here.

5.NF.1

This standard builds on the work in fourth grade where students add fractions with like denominators. In fifth grade, the example provided in the standard has students find a common denominator by finding the product of both denominators. For 1/3 + 1/6, a common denominator is 18, which is the product of 3 and 6. This process should be introduced using visual fraction models (area models, number lines, etc.) to build understanding before moving into the standard algorithm.

Students should apply their understanding of equivalent fractions developed in fourth grade and their ability to rewrite fractions in an equivalent form to find common denominators.They should know that multiplying the denominators will always give a common denominator but may not result in the smallest denominator.

Examples:

- $\frac{2}{5}+\frac{7}{8}=\frac{16}{40}+\frac{35}{40}=\frac{51}{40}$
- $3\frac{1}{4}-\frac{1}{6}=3\frac{3}{12}-\frac{2}{12}=3\frac{1}{12}$

Example:
Present students with the problem 1/3 + 1/6. Encourage students to use the clock face as amodel for solving the problem. Have students share their approaches with the class anddemonstrate their thinking using the clock model.

5.NF.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, 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).

Example:
Your teacher gave you 1/7 of the bag of candy. She also gave your friend 1/3 of thebag of candy. If you and your friend combined your candy, what fraction of the bagwould you have? Estimate your answer and then calculate. How reasonable was your estimate?

Student 1:

1/7 is really close to 0. 1/3 is larger than 1/7, but still less than 1/2. If we put themtogether we might get close to 1/2.
1/7 + 1/3= 3/21 + 7/21 = 10/21. The fraction does not simplify. I know that 10 is half of 20, so 10/21 is a little less than 1/2.

MATH- Instructional Strategies

Includes pictures and videos – just like Pinterest ☺

Instructional Strategies

Find the full Standards Flip Book here.

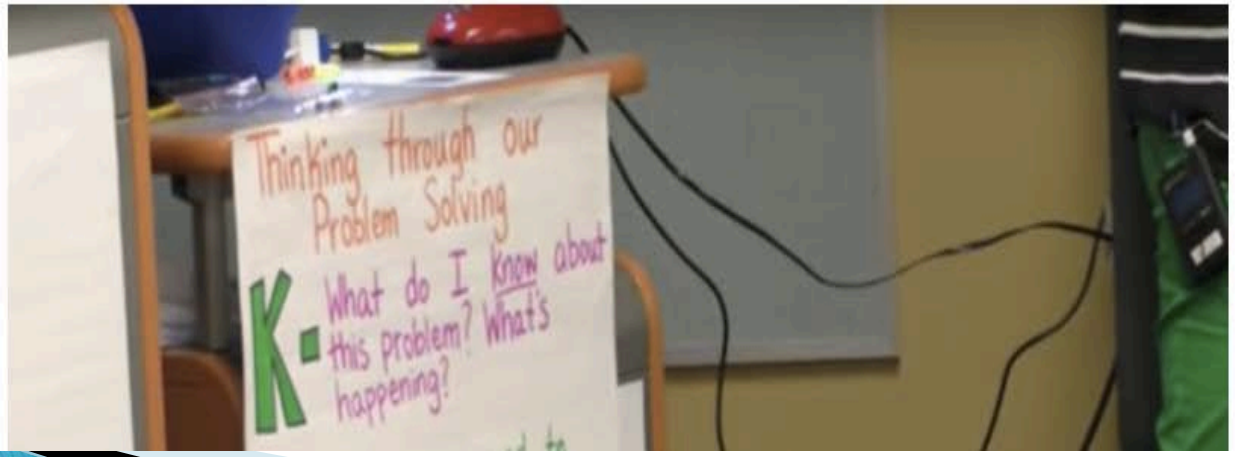
Instructional Strategies (5.NF.1-2)

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 or 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 strat discuss commonalities in them.

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 circu not be the best model when adding or subtracting fractions.

As with solving word problems with whole number operations, regularly present word problems involving addition or subtraction of fractions. The concept of adding or subtracting fractions with unlike denominato through solving problems. Mental computations and estimation strategies should be used to determine the reasonableness of answers. Students need to prove or disprove whether an answer provided for a probl

When teaching kids to CLOSE read and understand word problems use the KFA model. Here is a video of a 2nd grade teacher digging deep into a word problem model. You can find several posters and organizers to support this strategy in the materials section.



MATH- Common Misconceptions
Important info highlighted for teachers

Common Misconceptions

Expect students to need a review of making equivalent fractions! Though this unit is about adding and subtracting fractions the emphasis is doing it by making equivalent fractions in a meaningful way. It will be well worth it to pretest and if needed spend some time reviewing these 4th grade fraction skills.

Find the full Standards Flip Book here.

5.NF.1 - 2

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 size.

These models of fractions are difficult to compare because the size of the whole is not the same for all representations

These models of fractions use the same size rectangle to represent the whole unit and are therefore much easier to compare fractions.

MATH- Avoid Answer Getting Methods

Provide teachers with what to avoid – why and how

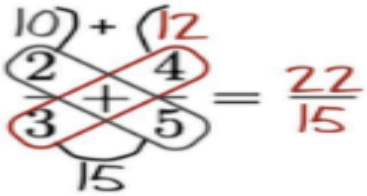
Nix The Tricks

Link to Phil Daro's Video Focus in Math

Nix: Butterfly Method

Because:

Students have no idea why it works and there is no mathematical reasoning behind the butterfly, pretty it is.



Fix:

If students start with visuals such as fraction strips they will discover the need to have like terms before they can ad
wants to add 1/2 + 1/4. They may start with a representation of each fraction, then add the fractions by placing ther
representation is valid, but there is no way to translate this new diagram into a single fraction. To do so, students ne
whole into equal parts. After some experience, students will realize they need common denominators to add. After st
experience adding fractions with common denominators, students will realize they can simply add the numerators (w
to counting the number of shaded pieces) while keeping the denominator the same (as the size of the pieces does no

MATH- AzMERIT Blueprint
(Connects to Major & Supporting Content)

AzMERIT Blueprint

Grade 4		
Domain	**Min.**	**Max.**
Operations, Algebraic Thinking, and Numbers in Base Ten	46%	54%
Number and Operations-Fractions	29%	33%
Measurement, Data, and Geometry	15%	19%

Grade 5		
Domain	**Min.**	**Max.**
Operations, Algebraic Thinking, and Numbers in Base Ten	38%	42%
Number and Operations-Fractions	31%	35%
Measurement, Data, and Geometry	24%	28%

For more info: AZ Merit Support Materials

Current AND Grade Level Prior!

MATH- AzMERIT Performance Level Descriptors

Differences in proficiency levels highlighted for teachers

AzMERIT Performance Level Descriptors (PLD)

Grade 4

4.NF.1-2

Minimally Proficient	Partially Proficient	Proficient	Highly Proficient
Uses area fraction models to represent equivalent fractions by partitioning unit fraction pieces into smaller equal pieces. Uses a visual fraction model to compare two fractions with different numerators and different denominators.	Uses area fraction models to represent equivalent fractions by partitioning unit fraction pieces into smaller pieces (and understands that this is the same), and multiplies by 1 represented as a fraction.	Uses area fraction models and double number linesto generate and explain why fraction *a/b* is equivalent to a fraction *(n x a)/(n x b)*, where *n* is a non-negative whole number. Compares two fractions with different numerators and different denominators and justifies answers using visual fraction models.	Uses a variety of strategies to generate and fraction *a/b* is equivalent to a fraction *(n x a b)*, where *n* is a non-negative whole numbe understanding to compare and order fractio numerators and different denominators.

4.NF.3

Minimally Proficient	Partially Proficient	Proficient	Highly Proficient
Adds and subtracts fractions with like denominators by joining and separating parts referring to the same whole with or without context using visual or manipulative models. Converts mixed numbers to equivalent fractions.	Adds and subtracts fractions with like denominators by joining and separating parts referring to the same whole using visual or manipulative models with or without context. Decomposes a fraction into a sum of fractions with the same denominator and records the decomposition using an equation. Converts mixed numbers into equivalent fractions and adds and subtracts them.	Adds and subtracts fractions with like denominators by joining and separating parts referring to the same whole, with or without context. Decomposes a fraction into a sum of fractions with the same denominator in more than one way and records the decomposition using an equation.	Adds and subtracts more than 2 fractions with denominators by joining and separating parts same whole, with or without context. Decomp into a sum of fractions with the same denomin ways and records the decomposition using an

Current AND Grade Level Prior!

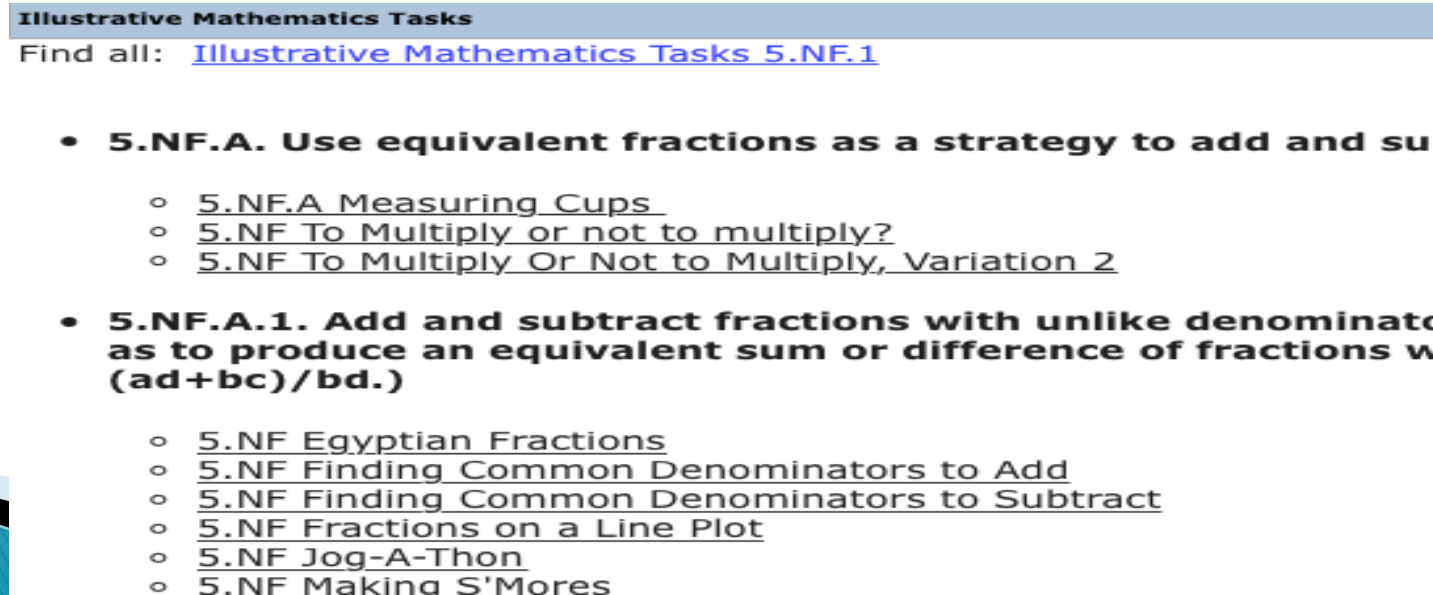
Grade 5

5.NF.1-2

Minimally Proficient	Partially Proficient	Proficient	Highly Proficien
Adds/subtracts fractions with unlike denominators, where one	Adds/subtracts fractions with unlike denominators, where one denominator is a	Adds and subtracts fractions with unlike denominators	Adds or subtracts at le

Also Includes

- Samples of Assessment items from
  - AZMerit
  - PARCC
  - SBAC
- Samples of Mathematics tasks for each component with live links



Illustrative Mathematics Tasks

Find all: Illustrative Mathematics Tasks 5.NF.1

- **5.NF.A. Use equivalent fractions as a strategy to add and su**
  - 5.NF.A Measuring Cups
  - 5.NF To Multiply or not to multiply?
  - 5.NF To Multiply Or Not to Multiply, Variation 2
- **5.NF.A.1. Add and subtract fractions with unlike denominato as to produce an equivalent sum or difference of fractions w (ad+bc)/bd.)**
  - 5.NF Egyptian Fractions
  - 5.NF Finding Common Denominators to Add
  - 5.NF Finding Common Denominators to Subtract
  - 5.NF Fractions on a Line Plot
  - 5.NF Jog-A-Thon
  - 5.NF Making S'Mores

Advantages of DCS

- It will assist us with consistency across schools and grade levels in understanding what is being asked by the standards.
- It will assist us in the alignment of standards and the new implementation expectations.
- It provides a platform that is navigable and will include all our resources in one place.

Advantages of DCS

- In addition to saving us money and time, this gives us the standards' base for the creation of a district curriculum council to review our resources and make suggestions.
- The platform and curriculum strategies were presented to all administrators. All supported the recommendation to purchase the resource.