National Center and State Collaborative

NCSC Curriculum Resource to Prepare Students for AA-AAS

Mathematics Content: Fractions and Decimals

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July 2013

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Curriculum Resource to Prepare Students for AA-AAS
Mathematics Content: Fractions and Decimals

The purposes of the Curriculum Resource Guides Are:
• To provide guidance for teaching Florida Standards to students with Significant Cognitive Disabilities (SWSCD) that both aligns with these standards and provides differentiation for individual student needs • To provide examples for differentiating instruction for a wide range of SWSCD. These examples can be used in planning specific lessons, alternate assessment items, and professional development.

1a.What are "fractions" and how are they taught in general education settings?

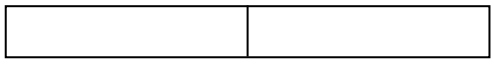
1a.1 The essential knowledge in this content area

The concept of a fraction refers to equal parts of a whole region or set. Students are expected to represent fractions as equal parts of the whole. Initially this should be taught by working with "fair shares" of an item (e.g., There are 4 of us and we want to divide our apple into 4 equal parts so that we each have a fair share). Next students should only work with fractions using region models (square, etc.), and linear models are preferred. Then the symbolic representation can be taught. [1]

$$\frac{3}{8} = \frac{Numerator}{Denominator} = \frac{how\ many\ of\ the\ equal\ parts\ are\ counted}{total\ number\ of\ equal\ parts\ in\ the\ whole}$$ [2]

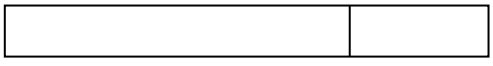
Students should know that fractions parts must be equal in size.

Example



These are halves.

Non-example

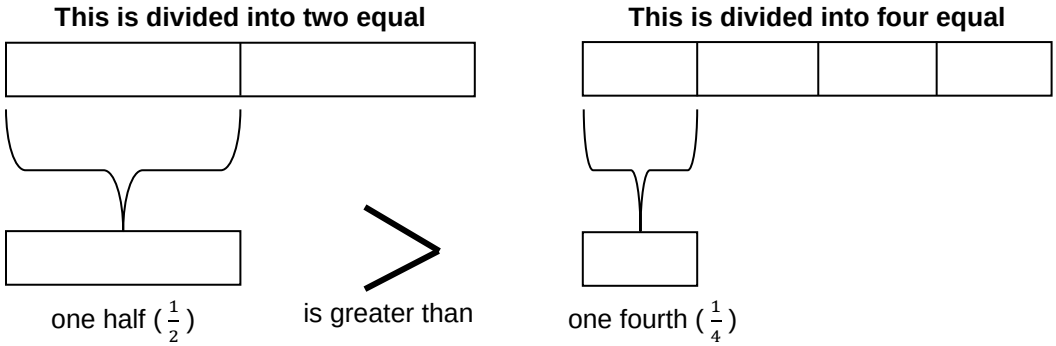


These are not halves.

[1] Hake, S., Saxon, J. H. (2004). Saxon math 5/4. Norman, OK: Saxon Publishers, p. 96.
TERC (Firm), Pearson Education, Inc., & Scott, Foresman and Company.(2004). Investigations in number, data, and space. Glenview, IL: Scott Foresman, p. 10-11.
[2] Hake, S., Saxon, J. H. (2004). Saxon math 5/4. Norman, OK: Saxon Publishers, p. 96.

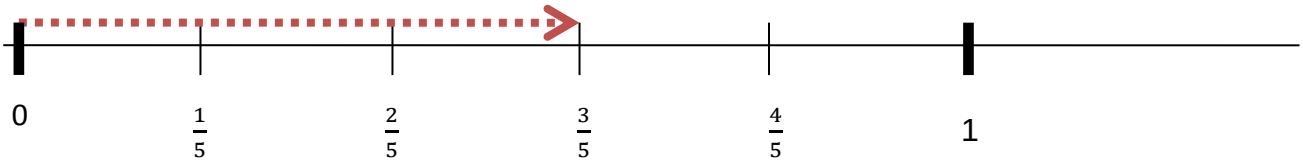
Students need to learn to compare fractions:

- When the fraction is divided into more parts the size of the fractional parts gets smaller.

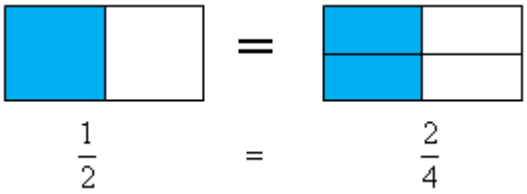


- Place fractions on a number line:
  Divide spaces between each whole number into equal parts (i.e., 5 segments between 0 and 1)

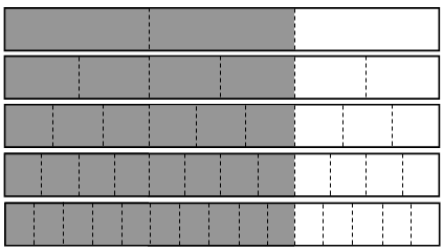
  Students identify that the distance between 0 and the first 3 segments is $\frac{3}{5}$.



- Can be determined by using visual models.



  Students should be provided many opportunities to practice making models of equivalent fractions to ensure understanding. One idea is to use fraction strips or bars to demonstrate equivalencies.[3]



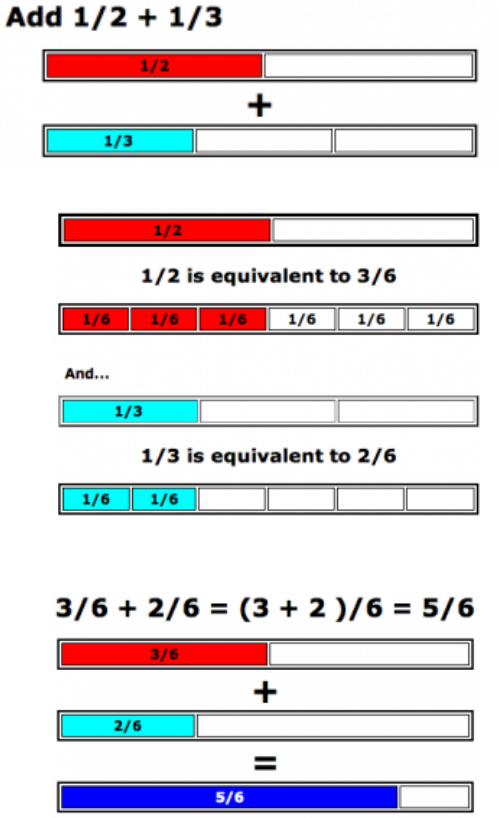
Add or subtract fractions with like denominators

[3] Maletsky, E. M., & Andrews, A. G. (2004). Harcourt math. Orlando, FL: Harcourt School Publishers, p. 326.
Greenes, C. E. (2005). Houghton Mifflin math: Grade 4. Boston, MA: Houghton Mifflin Co., p. 510.

- Make sure students understand that if the denominators are the same, they just add or subtract the numerators (or numbers on top) and the denominator stays the same.[4]
  - $\frac{1}{8} + \frac{5}{8} = \frac{6}{8}$
  - $\frac{3}{5} - \frac{2}{5} = \frac{1}{5}$

Add or subtract fractions with unlike denominators

- First, teach students using fraction strips to help them visualize the concept of adding fractions with unlike denominators.[5]



- Then, teach students to find common denominators and then add or subtract the fractions. This can be done by multiplying the denominators or by determining the least common denominator (LCD). The LCD can be found by determining the multiples of each denominator and finding the smallest number (>1) they have in common.

[4] Greenes, C. E. (2005). Houghton Mifflin math: Grade 4. Boston, MA: Houghton Mifflin Co., p. 528.
[5] Help with Fractions. (2012) Retrieved from http://www.helpwithfractions.com/adding-fractions-different-denominators.html

the original fractions: $\frac{1}{3}+\frac{1}{2}$

with a common denominator: $\frac{2}{6}+\frac{3}{6}$

result: $\frac{5}{6}$ [6]

Write fraction as decimal

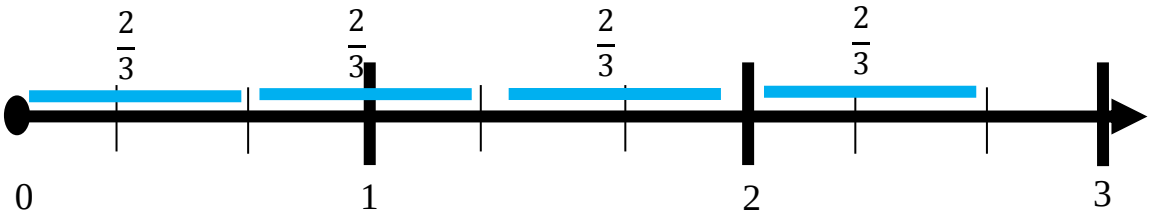
- Students learn to divide the numerator by the denominator to change a fraction to a decimal.

Multiply and divide fractions

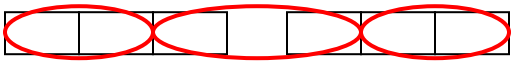
- Students can learn these concepts first by using models. Students need to understand that 4 x $\frac{2}{3}$ is asking for 4 sets of $\frac{2}{3}$. First students can draw or make several wholes divided into thirds. Then students can circle 4 sets of $\frac{2}{3}$.

In this model 2 wholes were circled and $\frac{2}{3}$ of another whole were circled. Thus, 4 x $\frac{2}{3}$ = 2 + $\frac{2}{3}$ = 2 $\frac{2}{3}$.

This could also be represented on a number line with each whole divided into thirds.



- Once students understand the underlying concept of multiplying fractions, they can begin using symbols and strategies for solving multiplication problems symbolically. For multiplication students learn to multiply the numerators, then denominators, and then find the simplest form of the fraction.
  - $\frac{1}{3} \times \frac{3}{5} = \frac{3}{15} \div \frac{3}{3} = \frac{1}{5}$
- Students need to understand the division of fractions. For example, the problem 2 ÷ $\frac{2}{3}$ is asking, "How many $\frac{2}{3}$ are in 2?" Below is a visual model to support students' understanding. First, 2 wholes are drawn. Then, the 2 wholes are divided into thirds.



There are 3 groups of $\frac{2}{3}$. Therefore 2 ÷ $\frac{2}{3}$ = 3.

[6] Free Math Help. (2013). Retrieved from http://www.freemathhelp.com/adding-subtracting-rational-functions.html

- Once students understand the underlying concept of dividing fractions, they can begin using symbols and strategies for solving division problems symbolically. For division students learn to multiply by the reciprocal of the divisor and then find the simplest form of the fraction.
    - The reciprocal of a fraction is the inverse (i.e., the reciprocal of $\frac{2}{3}\ is\ \frac{3}{2}$.)
    - $\frac{1}{4} \div \frac{3}{6} = \frac{1}{4} \times \frac{6}{3} = \frac{6}{12} = \frac{1}{2}$

1a.2 Common misunderstandings in this content area

Students understand whole numbers and apply this understanding to fractions. Therefore, when they see $\frac{1}{6}$ and $\frac{1}{5}$ they may assume that $\frac{1}{6}$ is larger because 6 is greater than 5. Students have difficulty understanding the relationship between the numerator and the denominator and instead may comprehend them as two separate whole numbers. This can result in students adding across fractions (i.e., numerator plus numerator over denominator plus denominator). Students also might have difficulty understanding that all $\frac{1}{2}$s are not equal. For example $\frac{1}{2}$ of a large pizza is larger than $\frac{1}{2}$ of a medium pizza. This relates to understanding the $\frac{1}{2}$ always relates to the specific "whole" that is being referred to by the fraction.[7]

1a.3 Prior Knowledge/skills needed (can be taught concurrently)

- Number sense with whole numbers
- Addition, subtraction, multiplication and division
- Understanding greater than/less than
- Sequencing numbers

1b. What are "decimals" and how are they taught in general education settings?

1b.1 The essential knowledge in this content area

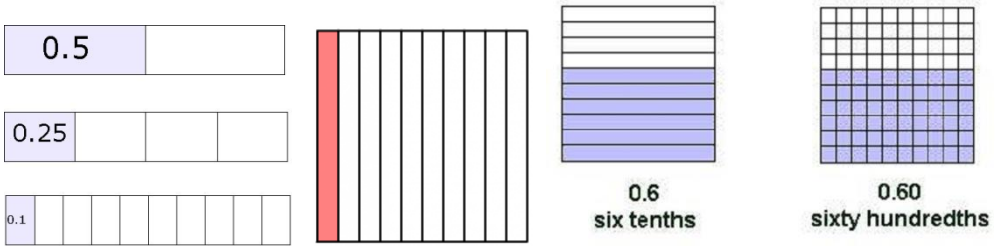
Students need to understand that the numerals that come after the "dot" in a number represent an amount less than one. It will be helpful to use a place value chart to teach decimal labels.

Hundreds	Tens	Ones	Decimal	Tenths	Hundredths
			●	4	5

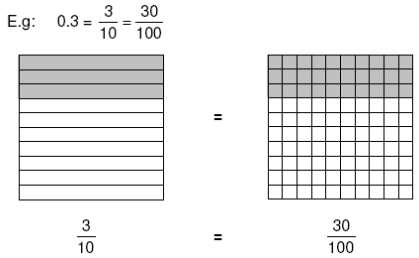
In this example the decimal is .45. It could be represented by a fraction as 45/100 or 4/10 +5/100. Students would name this fraction/decimal as forty-five hundredths.

Similar to a fraction, a decimal represents a part of a whole.[7] Students should have extensive practice with models to ensure comprehension of the concept.

[7] TERC (Firm), Pearson Education, Inc., & Scott, Foresman and Company.(2004). Investigations in number, data, and space. Glenview, IL: Scott Foresman, p. 93, 109.



Students can then learn to order decimals first by using representations, and then numerically. It is important for students to be able to convert decimals to fractions. This will be easier for them to comprehend having used models to represent the concepts.



2. What are some of the types of activities general educators will use to teach this skill?

2.1 Activities from General Education Resources

Fractions

- 8 Using ten counters, lay them out so that some are red and some are yellow. Tell what fraction of the counters are red and what fraction are yellow.[8]
- 2 Have students make a quilt by gluing 16 precut squares of three different colors onto their paper. Now have them describe the number of colors used in fractions (i.e. “Use a fraction to tell me how much of the quilt is purple.”).[8]
- 4 1 To explore equivalent fractions have students fold a circle in half, draw a line on the fold and color one part of the circle. Then take another circle that is the same size and fold it in half; then fold in half again. Draw lines on the folds and this time color two parts of the circle. Then ask the students to describe how the colored portions are the same and how they are different. Last have them write fractions to represent the colored portions.[8]
- 6 4 Students make a healthy fruit snack by following directions that include fractions of a cup in the ingredients list.[8]

[8] Greenes, C. E. (2005). Houghton Mifflin math: Grade 4. Boston, MA: Houghton Mifflin Co., p. 500, 552, 563.

- 2 4 Students make a bracelet using two different color beads then describe the colors used to make the bracelet in fractions.[9]
- 4 Give students counters and ask them to demonstrate a fraction and one that is equivalent to it (e.g., $\frac{3}{4}$ and $\frac{6}{8}$)[10]
- 5 2 Using a number line to 20, have students place counters above all the multiples of 2. Then have them place counters of a different color above all the multiples of 3. Ask them to identify the smallest number that 2 and 3 have in common.[10]
- 2 2 Students use grid paper to demonstrate addition of fractions with common denominators. First they trace the perimeter of the total number of squares (denominator), then they use two different colors to represent the two fractions summed, last they count the total number of squares colored and write the answer.[10]
- 4 4 Use pennies, dimes, and dollars to demonstrate one-hundredths, tenths, and 1 whole. Write as decimals and fractions.[8]
- 4 2 Use graph paper to model multiplying whole numbers by decimals. Have students color in the decimal and then repeat the number of times it is multiplied. Then count to find the answer.
- 2 3 Write several familiar fractions on note cards and several decimals that are close to the fractions but not exactly the same. Have students play a matching game matching the decimals and fractions.
- 5 2 Create a decimal number line. Then have students place a list of several decimals in numerical order on the number line.

Links Across Content Areas

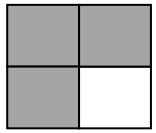
- 6 4 Using measurements to conduct a science experiment.
- 4 3 Reading music to play an instrument.
- 5 Measuring distance between destinations in social studies.

[9] Maletsky, E. M., & Andrews, A. G. (2004). Harcourt math. Orlando, FL: Harcourt School Publishers, p. 348.
[10] Glencoe/McGraw-Hill. (2009). Math connects: Concepts, skills and problem solving. Columbus, OH: Glencoe/McGraw-Hill, p. 202, 216, 256.

3. What Florida Standard Access Points Are Addressed in Teaching "Fractions and Decimals"?

Grade Differentiation	Access Points
3rd grade	MAFS.3.NF.1.AP.1a Identify the number of highlighted parts (numerator) of a given representation (rectangles and circles).
	MAFS.3.NF.1.AP.1b Identify the total number of parts (denominator) of a given representation (rectangles and circles).
	MAFS.3.NF.1.AP.1c Identify the fraction that matches the representation of partitioned rectangles and circles into halves, fourths, thirds, and eighths.
	MAFS.3.MD.1.AP.1b Determine the equivalence between the number of minutes and the number of hours (e.g., 60 minutes = 1 hour) on a number line..
	MAFS.3.G.1.AP.2a Partition a rectangle into equal parts with equal area.
4th grade	MAFS.4.NF.1.AP.2a Use =, <, or > to compare two fractions (fractions with a denominator or 10 or less).
	MAFS.4.NF.3.AP.7a Use =, <, or > to compare two decimals (decimals in multiples of .10).
	MAFS.4.NF.3.AP.6a Identify the equivalent decimal form for a benchmark fraction.
	MAFS.4.NF.1.AP.1a Determine equivalent fractions using visual fraction models and a number line.
	MAFS.4.NF.1.AP.2b Compare two given fractions that have different denominators.
	MAFS.4.NF.3.AP.6b Match a fraction (with a denominator of 10 or 100) with its decimal equivalent (5/10 = 0.5).
	MAFS.4.NF.3.AP.5a Find the equivalent fraction with denominators that are multiples of 10.
	MAFS.4.NF.3.AP.6c Read, write, or select decimals to the tenths place.
	MAFS.4.NF.3.AP.6d Read, write, or select decimals to the hundredths place.
	MAFS.4.NF.3.AP.7b Compare two decimals expressed to the tenths place with a value of less than one using a visual model.
	MAFS.4.NF.3.AP.7c Compare two decimals expressed to the hundredths place with a value of less than one using a visual model.
	MAFS.4.NF.2.AP.3a Using a representation, decompose a fraction into multiple copies of a unit fraction (e.g., ¾ = ¼ + ¼ + ¼).
	MAFS.4.NF.2.AP.3b Add and subtract fractions with like denominators (2, 3, 4, or 8) using representations.
	MAFS.4.NF.2.AP.3c Solve word problems involving addition and subtraction of fractions with like denominators (2, 3, 4 or 8).
5th grade	MAFS.5.NBT.1.AP.3a Read, write, or select a decimal to the hundredths place.
	MAFS.5.NBT.1.AP.3b Compare two decimals to the hundredths place, whose values are less than one.
	MAFS.5.NBT.1.AP.4a Round decimals to the nearest whole number.
	MAFS.5.NBT.1.AP.4b Round decimals to the tenths place.
	MAFS.5.NBT.1.AP.4c Round decimals to the hundredths place.
	MAFS.5.NF.1.AP.1a Add and subtract fractions with like denominators with sums greater than one represented by mixed numbers using visual fraction models.
	MAFS.5.NF.1.AP.1b Add or subtract fractions with unlike denominators within one whole unit on a number line.

Grade Differentiation	Access Points
	MAFS.5.NF.2.AP.4a Multiply a fraction by a whole or mixed number using visual fraction models.
	MAFS.5.NBT.2.AP.7a Solve one-step problems using decimals.
	MAFS.5.NF.1.AP.2a Solve word problems involving the addition and subtraction of fractions using visual fraction models.
6th grade	MAFS.6.RP.1.AP.3a Use ratios and reasoning to solve real-world mathematical problems (e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations).
	MAFS.6.NS.1.AP.1a Divide fractions using visual fraction models.
7th grade	MAFS.7.RP.1.AP.1a Solve one-step problems involving unit rates associated with ratios of fractions.
8th grade	MAFS.8.NS.1.AP.1a Distinguish between rational and irrational numbers. Show that any number that can be expressed as a fraction is a rational number.
	MAFS.8.NS.1.AP.1b Using whole number dividends from 8 to 20 and odd whole number divisors from 3 to 7, identify irrational decimal quotients.

Performance Examples and Essential Understandings for Priority Access Points			
Grade 3			
Access Point	**Performance Example**	**Essential Understandings: Concrete Understandings and Representations**	
Geometry: MAFS.3.G.1.AP.2a Partition a rectangle into equal parts with equal area.	A) Selects the square that is divided into 4 equal parts Choice Selection:  B) Answers: How do you know that these parts *have the same area*? (The response provided by the test example is that that the square has the same number of parts in it. Again, this is not technically correct because one could divide the square into four parts of different sizes.)	**Concrete Understandings:** • Understand the concept of equal parts (e.g., fold rectangular pieces of paper into two or four equal pieces). • Partition with concrete objects. • Find the rectangle that is the same or match two congruent rectangles.	**Representation:** • Partition rectangles into two, three, or four equal shares. • Understand the following concepts and vocabulary: equal, partition, area, rectangle, halves, thirds, half of, a third of.
Numbers: MAFS.3.NF.1.AP.1c Identify the fraction that matches the representation of partitioned rectangles and circles into halves, fourths, thirds, and eighths.	Student selects fraction to represent the picture. "Choose the fraction that tells how much of the square is colored in."  $\frac{1}{3}$ $\frac{2}{2}$ $\frac{3}{4}$	**Concrete Understandings:** • Identify the parts of a region and the whole region when a region is partitioned when item is divided. • Count the number of the parts selected (e.g., three of the four parts; have fraction present but not required to read ¾).	**Representation:** • Recognize that fraction bars of equal lengths can be divided into different numbers of equal parts/units. • Understand a fraction a/b as the quantity formed by a parts of size 1/b. • Recognize that the more equal parts, the smaller the part. • Understand the following concepts, symbols, and vocabulary: numerator, denominator, _/_.
Grade 4			
Access Point	**Performance Example**	**Essential Understandings: Concrete Understandings and Representations**	
Symbols	Student selects symbol to compare two numbers.	**Concrete Understandings:**	**Representation:**

MAFS.4.NF.1.AP.2a Use =, <, or > to compare two fractions (fractions with a denominator or 10 or less).	Choose the symbol that shows whether 1/3 is less than, equal to or greater than 2/6. $\frac{1}{3}$ $\frac{2}{6}$ < > = Choose the symbol that shows whether 5/8 is less than equal to or greater than 2/4. $\frac{5}{8}$ $\frac{2}{4}$ < > =	• Understand the concept of a fraction (i.e., Describe that the denominator of a fraction represents the number of equal parts within a whole [length unit or region].). • Understand the concept of comparison (greater than, less than, equal). • Identify concrete representation of a fractional part of a whole as greater than, less than, or equal to another (e.g., divide a rectangle into fourths and compare ¼ to ¾; can do by showing with parts of the whole so it relates to fractions— break into four equal parts…which is more, the three parts or the one part?)	• Apply understanding of the symbols of <, >, and = with whole numbers. • Label pictorial representations of fractions.
Numbers: MAFS.4.NF.1.AP.1a Determine equivalent fractions using visual fraction models and a number line.	Given a fraction, student selects equivalent fraction. This fraction is two-thirds. Show me the fraction that is equal to two-thirds. $\frac{2}{3} =$ ___ $\frac{1}{6}$ $\frac{2}{6}$ $\frac{4}{6}$	**Concrete Understandings:** • Equivalency (what is and what is not equivalent; this may begin with numbers/sets of objects: e.g., 3 = 3). • Concept of fraction and decimal (part to whole). • Ability to identify two equivalent fractions, both represented either symbolically (i.e., in numbers – 1/2 = 2/4) or as a model (i.e., picture – pizza cut in halves and in fourths with 1/2 and 2/4 shaded in).	**Representation:** • Represent fractions using shaded grids by generating pictorial representations (shading circles, or rectangles; drawing on graph paper, etc.). • Understand the following concepts, symbols and vocabulary: fraction, equivalent fractions, numerator, denominator.

		• If using symbolic representations, limit denominators to 2, 4, and 8 and numerators to 1-7. Use a real-world context (e.g., pizza).	
Grade 5			
Access Point	**Performance Example**	**Essential Understandings: Concrete Understandings and Representations**	
Numbers: MAFS.5.NBT.1.AP.3a Read, write, or select a decimal to the hundredths place.	"I want you to find a number that has a digit in the thousandths place. A digit is a single symbol, 0-9. Which of these numbers has a digit in the thousandths place? 45.72 4572 4.572	**Concrete Understandings:** • Recognize part/whole when materials are divided into tenths. • Count tenths to determine how many (e.g., four tenths; 0.4 have the decimal present but not required to read).	**Representation:** • Count to 100. • Understand place value to the hundredths. • Understand where to write a decimal point. • Understand the following concepts, symbols, and vocabulary: decimal, decimal point, tenths place, hundredths place.
Numbers: MAFS.5.NF.1.AP.2a Solve word problems involving the addition and subtraction of fractions using visual fraction models.	Given a word problem (teacher may read aloud), student shows work and solves the equation. Jesse and her mother baked 24 cookies. They ate ¼ of the cookies. How many cookies did they eat? Show your work as you solve the problem.	**Concrete Understandings:** • Understand that the numerator tells the number of parts and the denominator tells the type of parts (e.g., fourths, halves). • Identify what actions to take given the context and language used in the problem (e.g., "in all" means we add, "left" means we subtract). • Build models to match fractions in a given equation (e.g., 1/3 + 2/3 = ___, student will build model of each fraction).	**Representation:** • Identify key information in a word problem to represent the total and fraction. • Solve fraction problems using: o Picture o Models o Representation cards o Number sentences o Mathematical word problems o Graphic representation • Understand the following concepts, symbols and vocabulary: +, -, ×, ÷.
Grade 6: NONE			

4. What are Some Additional Activities That Can Promote Use of this Academic Concept in Real World Contexts?

-  Measuring out fractions of ingredients for cooking.
-  Using a ruler to measure out fractions of a foot and inch to cut wood to make a birdhouse.
-  Students can learn to sort items using the Dewey decimal system in the library.[8]
-  Working as a cashier and counting money to make change.
-  Calculating batting averages for sports team.
-  Balancing a checkbook
-  Measuring out medications
-  Calculating a cost of an item in sales promotion (1/2 off sale)
-  Measuring someone's height in a doctor's office.
-  Cutting hair (customer wants 2 and ½ inches cut)

5. How Can I Further Promote College and Career Readiness when Teaching "Fractions and Decimals"?

Ideas for Promoting Career/ College Ready Outcomes

Communicative competence

Students will increase their vocabulary to include concepts related to "fractions and decimals." In addition, they will be learning concepts such as: "half", "whole", "more", "less", "almost," "greater than," "less than," and "equal to."

Fluency in reading, writing, and math

Students will have an opportunity to increase their numeracy and sight word fluency while participating in problem solving related to "fractions and decimals," such as number recognition, counting, one-to-one correspondence, comparing quantities, and reading concepts that include the use and understanding of descriptors related to size.

Age appropriate social skills

Students will engage in peer groups to solve problems related to "fractions and decimals" that will provide practice on increasing reciprocal communication and age appropriate social interactions. For example, students might work together with their peers to measure out ingredients for a science experiment or cooking activity.

Independent work behaviors

By solving real life problems related to “fractions and decimals” students will improve work behaviors that could lead to employment, such as assisting in the library, measuring in construction, and preparing food in a kitchen. When providing opportunities for real life problems leave some materials out and prompt/teach the students to determine who they should ask and what they should ask for to be able to solve the problem.

Skills in accessing support systems

At times, students will need to ask for assistance to complete activities related to “fractions and decimals” which will give them practice in accessing supports. Students will gain practice asking for tools such as talking calculators, a digital tape measure, or measuring cups. They can ask a peer to complete the physical movements of the tasks they are not able to do themselves. Be sure to teach students to ask versus having items or supports automatically given to them.

6. How Do I Make Instruction on “Fractions and Decimals” Accessible to ALL the Students I Teach?

6.1 Teach Prerequisites and Basic Numeracy Skills Concurrently: Remember that students can continue to learn basic numeracy skills in the context of this grade level content.

Basic numeracy skills that can be worked on as a part of a lesson relating to fractions and decimals:

- number identification
- more and less
- one to one correspondence
- symbol identification (+, -, =)

6.2b Incorporate UDL: Universal Design of Learning When Teaching Fractions and Decimals

	Visual Impairment or Deaf/Blind	**Physical impairment: Little/no hand use**	**Lacks basic numeracy concepts**	**Motivational/attention issues**
Representation	Use a talking calculator when solving equations or converting fractions to decimals and vice versa; use objects to represent fractions and decimals (e.g., Cuisenaire rods®); use raised lines to represent portions of the whole object. Create fraction models using cardboard (rectangular and circular) with textured surfaces to indicate parts. Use items that are velcroed together to represent the whole and have the student separate the whole into parts. Another option would be to use snap cubes.	Count the parts of fractions or decimals using a step by step process which progresses through numbers; student scans an array of possible options and uses a switch to select the number to identify the numerator; use computer representation of fractions that can be manipulated with switch; place fraction representations on a slant board or eye gaze board; create a grid on a large surface on the floor that the student can walk over or ride over in wheelchair.	Use fraction and decimal manipulatives that can be separated and placed on a number line. Use real world objects that have been partitioned to represent fractions (e.g., graham cracker, candy bar). Students can use one to one correspondence to match equal number of parts on representation of fraction or decimals. Color code equations and corresponding parts of calculator to support students correctly entering numerals and equations.	Find fractions of motivating objects (e.g., pizza, coloring markers in a box, pieces of a Lego set). Incorporate technology including computer representations, videos, animations, and talking calculators. Use token economy system that embeds fractions (e.g., "You earned ¼ of your Lego piece, you have ¾ left and then you get Lego time.)
Expression	Student states answer or scans raised numbers to select correct answer; use voice output devices for student to select the correct answer; teach tangible symbols that mean fraction and decimal.	Student scans and selects number that represents numerator or denominator; uses a switch to indicate correct answers; use an eye gaze board to select answer; use a blink response to count parts or select answer; phrase questions so that they require a "yes/no" response, these can easily be answered using an eye gaze, head turn, two switches, etc.; count parts of fractions out loud having student move in some voluntary way (e.g., nod head, tap hand, tap foot) to count along.	Student selects numerals and fractions versus writing them; selection of correct answer is done after a model; student points to each part of a fraction or decimal while teacher or peer counts aloud; student answers "yes/no" questions regarding fractions or decimals after parts have been counted aloud (e.g., 1,2,3,4. There are 4 colored parts. Is this the number we write as the numerator?); matches the parts of a fraction to the correct number (matches 4 to 4).	Have students express fractions using high interest manipulatives (e.g., Legos, food items such as chocolate bar or graham crackers, stickers of favorite characters, or jewelry beads). Provide students with response options that keep them engaged (e.g., options provided on AAC device, tablet, response cards, or interactive whiteboard.)

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Engagement	Teach students to use their hands to scan the raised or textured parts of each whole item; use textures or concrete objects to represent fractions; start with simple, clearly defined fractions; use items that are familiar and reinforcing to students.	Use bright colors to call attention to numerators; use a computer with AT where the student can click to answer; use figures that are large enough to accommodate the movements that the student is able to make; pair student with another student without a physical impairment and have them work together to create fraction and decimal representations.	Student uses talking calculator and AAC device or other response board, limit fractions and decimals to numerals less than 10, use bright colors to represent fractions and numerals, use familiar objects to represent fractions.	Use visuals and concrete representations and technology. Provide frequent opportunities for responding. Use token economy system that embeds fractions ("you earned ¼ of your Lego piece, you have ¾ left and then you get Lego time.").

Promoting Career and College Readiness	Standards for Mathematical Practice
1 Communicative Competence	1 Make sense of problems and persevere in solving them.
2 Fluency in reading, writing & math	2 Reason abstractly and quantitatively.
3 Age appropriate social skills	3 Construct viable arguments and critique the reasoning of others.
4 Independent work behaviors	4 Model with mathematics
5 Skills in accessing support systems	5 Use appropriate tools strategically.
	6 Attend to precision.
	7 Look for and make use of structure.
	8 Look for and express regularity in repeated reasoning