Add and Subtract Fractions

Unit Placement: **4**   Unit Title: **Math Overview for Healthcare**   Location: **Martin**   Author: **Sarah Simpson**

CSR Standards for Mathematics and the Key Shifts in Mathematics Instruction	
Shift 1: FOCUS *Major Work of the Level (MWOTL)*	**Major Work of the Level (MWOTL)** • Level C 　○ Number: Understanding fraction equivalence and comparison 　○ Number: Developing fluency with sums and differences of fractions **Focus Standard(s)** • Number and Ratios 　○ **4.NF.3c** 　　Add and subtract mixed numbers with like denominators, e.g., by replacing each mixed number with an equivalent fraction, and/or by using properties of operations and the relationship between addition and subtraction. 　○ **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, $a/b + c/d = (ad + bc)/bd$.) **Supporting Standard(s)** • **4.NF.3a** 　Understand addition and subtraction of fractions as joining and separating parts referring to the same whole. • **4.NF.3d** 　Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators, e.g., by using visual fraction models and equations to represent the problem. • **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 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 $3/7 < 1/2$.
Shift 2: COHERENCE *Designing learning around coherent progressions level to level*	**Across-Level and Within-level Connections** Across Level: This lesson builds on skills used to compute whole number operations. It also uses and builds on skills in the previous lesson about finding fractions equivalents. This prepares students for algebraic concepts about equivalencies, such as the distributive properties, and prepares them for using fractions within algebraic expressions and equations. Within Level: his lesson builds on base ten understandings of place value, adding, and subtracting. Adding and subtracting with fractions will give students a foundation for making connections when moving on to multiplying and dividing fractions.
Shift 3: RIGOR *Pursuing conceptual understanding, procedural skill and*	**Conceptual Understanding** Students will use fraction strips, number lines, drawings, and rulers to visually

fluency, and application – all with equal intensity	model adding and subtracting fractions. **Procedural Skill and Fluency** Students will have the opportunity to practice procedural skill and fluency in guided and independent practice. **Application** Students will solve real world problems with fractions in a healthcare situational context. Students will also build fluency with reading fractions on a ruler, which is a skill needed within a nursing or healthcare context.
Standards for Mathematical Practice	**Mathematical Practices** - **Model with mathematics. (MP.4)** - **Use appropriate tools strategically. (MP.5)** - **Attend to precision. (MP.6)**
Employability Standard(s)	**Employability Standard(s)** - **E.6 Identify and effectively use skills and materials needed for a particular task.** - **E.7 Accurately analyze information and respond appropriately.** - **E.8 Interact with others in a professional manner.**
Materials	Copy of ruler for each student https://www.printablerulers.net/preview/Ruler_12-inch_by_16 Sheet protectors Dry erase markers and paper towels for easy erasing Bags of student-made fraction strips (from previous lesson) Textbook: Lesmeister, M.B. (2009). Math basics for the health care professional (3rd ed.). Upper Saddle River, New Jersey: Pearson Education, Inc. Inspiration for this lesson from this recommended resource: EMPower Plus: Using Benchmarks – Fractions and Operations 2016, McGraw-Hill Education
Key Vocabulary	Fraction, part, whole, denominator, numerator, Equivalent, multiple, proper fraction, improper fraction, mixed number, reduce, simplest form, borrowing, place value, subtract, add, combine, difference, compare, sum During class discussions and practice, students will be prompted and encouraged to use this vocabulary to describe operations and processes.
Use of Technology	Promethean Board or video board to show visual models of fractions strategies; Practice and review on KYEdReady; Extension Activity for Students http://gregtangmath.com/satisfraction - set game for calculate, then choose add or subtract
Lesson Purpose	By adding and subtracting fractions using real scenarios and measuring tools, students can see and understand how relevant and applicable these skills are in a healthcare setting.
Lesson Objective(s) Student Target	**Lesson Objective(s)** At the end of this lesson, students will be able to: - add and subtract fractions with like and unlike denominators - borrow when subtracting fractions - use visual models and appropriate tools to show thinking - solve word problems with fractions

	Student Target I can add and subtract fractions with like and unlike denominators.	
Assessing Mastery of the Objective(s)	By the end of this lesson, the students will be able to add and subtract fractions with like and unlike denominators as evidenced by 80% mastery on independent practice.	

P R E - T E A C H I N G	**Introduction and Explanation**	Tell students that we will be building on what we have learned to add and subtract fractions. Review points from last lesson with with students: • using benchmark fractions, fraction strips, and number lines to compare fractions • Fractions can have many names and many equivalents ¼=2/8= 4/16=8/32; 3/6 = ½ • Operational procedure for finding fraction equivalents Also review concepts from whole number lesson: • Addition means to combine quantities • Subtraction means to take away or to find the difference between two quantities Tell students: Imagine you are a dietician trying to help your patients eat healthier. You have a patient try to convince you they are eating better. The patient says, "I ate ½ of a candy bar, and then ate another 1/3, so I only ate 2/5 of the candy bar." Ask students to figure out if this makes sense or not with fraction strips or a model drawing. Discuss with students using drawings and/or the number line that 2/5 is less than 1/2, so this could not make sense. This is often a misconception people have about adding or subtracting fractions. Show students another example with the number line. On a number line cut in halves, if we take ½ and combine it with the other ½, do we get 2/4? That does not make sense, because we know that 2/4 is another name for ½. We get 2/2, which is the same as 1, or the whole length of the number line. Tell students: We will be adding and subtracting today using a ruler, so you can visually see how fractions combine or compare when adding and subtracting. Using a ruler or other measurement tools are directly applicable to the healthcare field. You will have to understand how to read the fractions on a measurement tool to measure height, weight, and many other things. You will also have to use fractions when reading medicine cups to give medicine, when calculating dosages, in reading certain syringes, and when reading the fluid in intravenous fluid administration bags. Subtracting fractions is also useful when comparing numbers over time, such as finding the difference between a baby's beginning height and its height three months later. To find out the difference of growth, you must subtract two numbers, which will probably be fractions or decimals. **Introduce and discuss the ruler. Show on projector board if available.** How are the markings similar to using number lines as we have been? We can break down the ruler markings to half, half of a half, etc. Have students label the halves, the markings for fourths, which markings would be eighths and sixteenths. If you have a large projector board, mark them on there as well and leave it as a model for students that will continue to need a model for reference. INSTRUCTOR NOTE: Check with students to see if they have experience measuring with a ruler. If they have not, assist them with measuring a few things in the classroom like paperclips, pencils, erasers, etc.
	Instructional Delivery	INSTRUCTOR NOTE: It is recommended to teach this lesson in sets followed by guided practice to break up instruction. (Teach set 1, have guided practice for set 1, then teach set 2, followed by guided practice for set 2. Etc.) Based on the needs of

your students, you may want to split this lesson up over two separate lessons. Students not fluent in finding fractions equivalencies or have a solid conceptual foundation may have difficulty and need more practice with the first half of the lesson.

Each student should have a copy of the ruler (in materials) within a sheet protector, a dry erase marker, and a paper towel or tissue for erasing.

Add and subtract fractions with the same denominators. Use scenarios to model and foster class discussion about strategies. Use rulers to draw lengths for each scenario, modeling addition and subtraction.

- *A patient was concerned with a rash on her arm. She tells you it was 1/8" but it grew 3/8". If you use your ruler to combine these measurements, how big was the total size of the rash?* (4/8) What are some other ways to say 4/8? (1/2, 8/16, 2/4) How would we write this as a problem? (1/8 + 3/8 = 4/8 = ½)
- *What if a bruise that measured 7/8" measured was 3/8" smaller the next day?* (4/8) What is the simplest way to write this? (1/2) Note to students we always want to try and write the simplest fraction we can. Ask students to write this as a problem. (7/8 – 3/8 = 4/8 = ½)
- *A patient's scar that measured 1 1/4" grew in length another ¼" after some weight gain. How long is the scar now?* Use ruler to determine size. Which marks would we be looking at? How would we write that as a problem? (1 ¼ + ¼ = 1 2/4 = 1 ½)

INSTRUCTOR NOTE: Take this opportunity to talk to students about mixed numbers and improper fractions. Show students how 1 = 4/4 = ¼+1/4+1/4+1/4. So, 1 ¼ can also equal 5/4. Show students how to switch from mixed numbers to improper fractions and vice versa, using other examples, based on student needs.

Let students do Guided Practice set 1 with a partner.

Add and subtract fractions with the unlike denominators. Use scenarios to model and foster class discussion about strategies. Use rulers to draw lengths for each scenario, modeling addition and subtraction. Encourage use of fraction strips to show equivalent quantities.

-Present this situation to students: *A patient had ¾ cup of jello on their tray, but only ate 1/8 cup. How much was left on the tray?* What makes this problem different from the previous ones? (different denominators) Can we solve this with our ruler? Where does your line end after taking away 1/8? (5/8) Are there any other names we could use for ¾? (6/8, 12/16) If we are writing this as a math problem, would it be easier to just change the name of ¾ to make it eighths?

-Follow similar line of thinking to model these problems 1 3/8 + 3/16 = 1 9/16; 2/3-1/6 = 3/6=1/2

-Use the problem from the Introduction: ½ + 1/3. How could we find the answer? Give students opportunity to find equivalent fractions for ½ and 1/3 using fraction strips. Ask what denominators should we use? (sixths) What would the other names for our fractions be? (3/6 and 2/6) Is the real answer closer 2/5 like the patient originally said? Or is it closer to 1? (1) Do some other examples with students, and discuss how to find multiples of the denominators to find a common multiple. Model how to use multiples to find equivalent fractions. 2/3 – ½ = 1/6; 1 3/5 + ½ = 1 8/10 = 1 4/5; 3 5/6 – 1 1/4 = 2 7/12

-Let students do Guided Practice set 2 with a partner.

Borrow when subtracting fractions.

-Present this situation to students: *A common recommendation for water consumption is to drink 8 cups of water day. If Brian only drinks 3 ½ per day, how much more water should he be drinking?* Give students a few minutes to work on this problem using models or their ruler. Have a discussion on the strategies they used. Ask how we would write this as a math problem. (8 – 3 ½) Pose problem-how can we find a way to show subtracting in the problem? Ask students if there are other ways to write the number 8. Guide students to see that if we use the denominator of 2, like in the number 3 ½, we could write 8 as an addition problem (2/2 + 2/2 +2/2 + 2/2 + 2/2 + 2/2 + 2/2 + 2/2 = 1+1+1+1+1+1+1+1=8) Remind students that when we borrow in subtraction, we borrow from the tens place or the hundreds place (show example). We can also do that in fractions, except we are just borrowing a one (2/2). Show students how 8 = 7 + 2/2. If we can have 7 + 2/2, we can then subtract that half from the 2/2. Do more examples with students: 10 – 1

½; 3 – 1/4; 5 – 2 3/8.

-Next, show students how they use all their skills up to this point to work a subtraction borrowing problem with unlike denominators. For the problem 5 1/2 – 1 3/5, guide students to see that we must first get the same denominators (use fraction strips, then do it using operations) to change the names to 5 5/10 – 1 6/10. We can't take 6 from 5, but we can borrow a 10/10 from the 5. This changes the first number to 4 5/10+10/10 which is equal to 4 15/10. We can now subtract the 6/10 from the 15/10, and finally arrive at 3 9/10.

Guide students through some similar problems using borrowing in subtraction with like and unlike denominators:
3 5/16 – 1 15/16 = 1 6/16 = 1 3/8; 5 ½ - 2 7/8 = 2 5/8; 2 3/5 – 1 5/8 = 39/40

Let students do Guided Practice set 3 with a partner.

Guided Practice	Guided Practice Set 1 from *Math Basics for the Health Care Professional* Do the following problems with a partner. Give students choice of accompanying each problem with the use of a ruler, number line, fraction strips, or model drawing. Page 43 - #1-7 Page 50 - # 1-5 Guided Practice Set 2 from *Math Basics for the Health Care Professional* Do the following problems with a partner. Give students choice of accompanying each problem with the use of a ruler, number line, fraction strips, or model drawing. Page 45 - #1-8 on second half of page with unlike denominators Page 47 - #1-5 Page 50 - #8-15 Guided Practice Set 3 from *Math Basics for the Health Care Professional* Do the following problems with a partner. Give students choice of accompanying each problem with the use of a ruler, number line, fraction strips, or model drawing. Page 52 - #1-5 Page 52-53 - #1-8
Independent Practice	Independent Practice from *Math Basics for the Health Care Professional* Give students choice of accompanying each problem with the use of a ruler, number line, fraction strips, or model drawing. Encourage students to also try using operational procedures, but check their work with a model to see if it makes sense. Page 45-46 - #9-15 starting on second half of page 45 Page 47 - #6-10 Page 48 Application #1-5 Page 50 - #16-20 Page 53 - #9-15 Page 54 Application #1-5 If students need additional practice, they may work remaining problems on these pages. There is much more extra practice for borrowing with subtraction on pages 53-54. For more extra practice and review, students can access Unit 2 of the online KYAE program EdReady. https://kyae.edready.org/home?bookmarkId=-1 Lesson Extension: Online fractions game – students can choose the mode of calculate, and then choose addition or subtraction. This will aid student fluency. Each game can also be set as easy or hard depending on the needs of the student. http://gregtangmath.com/satisfraction
Reflection, Closure, and Connection	Students will complete self assessment: On a piece of paper, have students write: 1. One thing they learned in this class 2. One thing they are still struggling with from this class

If students do not have time to complete independent practice, they will complete it for homework.

Tell students that in the next class, we will continue work in fractions by moving on to multiplying and dividing fractions.