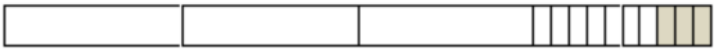
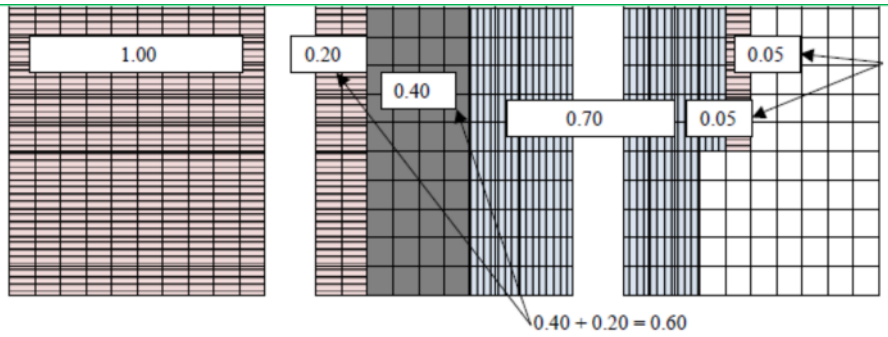
GRADE 5 - MODULE 4 - ADD AND SUBTRACT DECIMALS

Big Idea
Addition and subtraction with decimals are based on the fundamental concept of adding and subtracting the numbers in like place values.
Vocabulary
decimals, addend, place holder, place value, tenths, hundredths, minuend, subtrahend, place value chart
Prior Learning
In prior years, students added and subtracted with whole numbers using strategies based on place value, properties of operations, the relationship between addition and subtraction and using the standard algorithm for addition and subtraction fluently.
Essential Questions
• What properties of mathematics for adding and subtracting whole numbers hold true when adding and subtracting decimals? • How does estimation help with addition and subtraction of decimals? • How can models help us understand addition and subtraction of decimals? • How can I use place value to decompose decimals to find sums or differences? • How can I justify my solution for decimal addition using a model or explanation based on place value? • How can I justify my solution for decimal subtraction using a model or explanation based on place value?
Competencies
• Students will estimate the sum or difference when adding or subtracting decimals and justify the estimate. • Students will add and subtract decimals to hundredths using concrete models or drawings and strategies based on place value, properties of operations and/or the relationship between addition and subtraction. • Students will explain the strategy used to add and subtract decimal to the hundredths, using the standard algorithm.
Misconceptions
• Students might compute the sum or difference of decimals by lining up the right-hand digits as they would whole numbers. 15.34 + 12.9 16.63
Resources from The Key Elements to Mathematics Success - KEMS Grade 5 for Building the Conceptual Understanding of this Module
LESSON 9 – ADD DECIMALS Additional Activities: Quiz – T257, Add Decimals – Mystery Square–T1003 Foldable: Decimal foldable (4 section) LESSON 10 – SUBTRACT DECIMALS Additional Activities: Quiz – T288, Subtract Decimals – Mystery Square – T1004 Foldable: Decimal foldable (4 section).

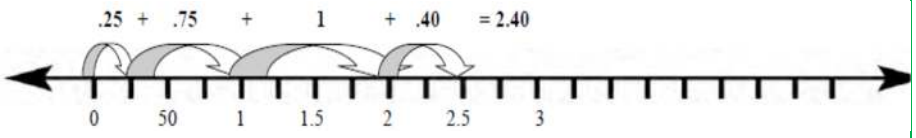
NYS Next Generation Learning Standard	Examples
5.NBT.7 Using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between operations: • add and subtract decimals to hundredths; • ~~multiply and divide decimals to hundredths.~~ Relate the strategy to a written method and explain the reasoning used. **Notes on and/or**: Students should be taught to use concrete models and drawings; as well as strategies based on place value, properties of operations, and the relationship between operations. When solving any problem, students can choose to use a concrete model or a drawing. Their strategy must be based on place value, properties of operations, or the relationship between operations. **Note:** ~~Division problems are limited to those that allow for the use of concrete models or drawings, strategies based on properties of operations, and/or the relationship between operations (e.g., 0.25 ÷ 0.05). Problems should not be so complex as to require the use of an algorithm (e.g., 0.37 ÷ 0.05).~~	This unit focuses on adding and subtracting using concrete models and pictorial representations to explain strategies, rather than relying solely on the algorithm. The use of symbolic notations involves having students record the answers to computations (2.25− 0.79 = 1.46), but this work should not be done without models or pictures. Students should be able to express that when they add decimals they add tenths to tenths and hundredths to hundredths. So, when they are adding in a vertical format (numbers beneath each other), it is important that they write numbers with the same place value beneath each other. Before students are asked to give exact answers, they should estimate answers based on their understanding of operations and the value of the numbers. Estimation will help students in understanding and supporting the need to align the decimal points for addition and subtraction. Example 1: 3.6 + 1.7 A student might estimate the sum to be larger than 5 because 3.6 is more than $3\frac{1}{2}$ and 1.7 is more than $1\frac{1}{2}$. Example 2: 5.4 – 0.82 A student might estimate the answer to be a little more than 4.4 because a number less than 1 is being subtracted. Example 3: 4 - 0.3 3 tenths subtracted from 4 wholes. The wholes must be divided into tenths.  The solution is 3 and $\frac{7}{10}$ or 3.7. Example 4: A recipe for a cake requires 1.25 cups of milk, 0.40 cups of oil, and 0.75 cups of water. How much liquid is in the mixing bowl? Solution for Student 1: 1.25 + 0.40 + 0.75 First, I broke the numbers apart: I broke 1.25 into 1.00 + 0.20 + 0.05 I left 0.40 like it was. I broke 0.75 into 0.70 + 0.05 I combined my two 0.05s to get 0.10. I combined 0.40 and 0.20 to get 0.60. I added the 1 whole from 1.25.



I ended up with 1 whole, 6 tenths, 7 more tenths and 1 more tenth which equals 2.40

Solution for Student 2: I saw that the 0.25 in 1.25 and the 0.75 for water would combine to equal 1 whole.

I then added the 2 wholes and the 0.40 to get 2.40.



Questions for 5.NBT.7

1. Danielle added 3 decimal numbers together and got exactly 4. What might those 3 decimal numbers be? Justify your thinking.

2. Jordy collects butterflies. The table shows the wingspan of his five favorite butterflies.

Butterfly	Wingspan (cm)
Red Glider	5.715
Purple Swallowtail	5.218
Orea Banner	5.503
Peacock Butterfly	5.730
Great Copper	5.447

3. Stacey added two decimal numbers that resulted in a sum of 65.14. What two addends could she have used? Justify your solution.

4. For her birthday, Sofia and her family went to eat dinner at her favorite Italian restaurant. Sofia's father paid the bill which was $107.92. Her brother left an additional tip for $3.04. How much money did her father and brother spend altogether?

5. What is the sum of 4.5 + 5.6? Use a model to support your answer.

6. Melissa went to the mall to buy a new shirt. The shirt cost $12.87, and she gave the clerk a $20.00 bill. How much change will she get?

7. Jason is running for his track team. His current record time is 14.87 seconds for his race. He wants to improve his time, and on Tuesday is able to complete the race in 14.39 seconds. How much does Jason improve his time?

8. Ellen has $146 in her savings account. She takes out $59.99 to buy a new scooter. How much money is left in her savings account?

9. Explain the relationship between addition and subtraction in the problem below.249.45 - 98.32 = _____

10. Tom's dad had $84.50 in his wallet. He bought gas for the car for $15.45 and a birthday gift for Tom that cost $17.85. How much money does he have left?

Answer Key for Questions for 5.NBT.7

1. Answers will vary.
Ex: 1.48 + 1.35 + 1.17

2. 5.715 + 5.447 = 11.162
The combined wingspan is 11.162 cm.

3. Answers will vary.
Ex: 16.96 + 48.18

4. 107.92 + 3.04 = 110.96
Altogether, they spent $110.96.

5. 4.5 + 5.6 = 10.1
Models will vary.

6. 20.00 – 12.87 = 7.13
Melissa will receive $7.13 in change.

7. Answers will vary.
Ex: The products get 10 times bigger each time.

8. 146 – 59.99 = 86.01
Ellen has $86.01 left in her account.

9. 249.45 – 98.32 = 151.13

151.13 + 98.32 = 249.45

10. 45 + 17.85 = 33.30
84.50 – 33.30 = 51.20
Tom's dad has $51.20 left.

Tasks for 5.NBT.7

*Teacher Note: Please read the Commentary section for the Illustrative Math Tasks. Some tasks will be instructional requiring more teacher modeling and direction. Others will provide the opportunity for students to demonstrate their knowledge of a concept.

Additional: Illustrative Math Task: The Value of Education (5.NBT.7)

https://tasks.illustrativemathematics.org/content-standards/5/NBT/B/7/tasks/1293

Extra Questions for Warm-ups and Homework for 5.NBT.7

1. Tina is measuring the perimeter of her desk. The length of the desk is 24.1 inches and the width of the desk is 18.2 inches. What is the perimeter of the desk?

2. Mr. Jones bought a book for $6.95, a magazine for $2.49, and a candy bar for $0.49. How much did he spend all together?

3. Tony bought three DVDs at the mall that week. On Monday he spent $23.95 on a DVD, on Wednesday he spent $14.95 on a DVD, and on Thursday he spent $24.75 on a DVD. What is the total cost of these DVDs?

4. Jennifer and her mom walk 1.25 miles to the park. They walk home a different way so that Jennifer can stop and see her friend Kayley. The walk home is 0.98 miles. What is the total miles that Jennifer and her mom walked to the park and home?

5. The side of a square is 3.1 inches. What is the perimeter of the square?

6. Ed bought a drink for $1.50 and a sandwich for $2.75. He has $13.50 left. How much did he start with?

7. Larry spent $16.50 on two movie tickets, $7.75 on snacks, and $5.50 playing games. He came to the theater with $40. How much does he have left?

8. Destiny ran a lap in 29.31 seconds. Jerry ran a lap in 47.3 seconds. How much longer did it take Jerry to run his lap?

9. Ms. Jones went to the store to buy supplies for her classroom. She bought a stapler for $7.25, two packs of construction paper for $3.45 each, and three packs of colored pencils for $2.69 each. How much change did Ms. Jones receive from her $35.00?

10. Paul is saving money to buy a new bike. The bike cost is $178.75. He has already saved $76.85. How much more does he need to buy the bike?

11. John and his brother are saving money for a video game. John has saved $7.98 and his brother has saved $12.69. How much money have the two boys saved altogether?

12. An outdoor club is going on a two-day hike. The total hike is 8.1 miles. On the first day, they hike 4.3 miles. How far will they have to hike on Day 2?

13. Frank's family is going on vacation. Their trip is a total of 465.8 miles. On Monday they drive 157.4 miles, and on Tuesday they drive 189.6 miles. If they want to reach their destination on Wednesday, how many miles will they have to drive?

14. Tina's backpack weighed 12.09 pounds. Leanne's backpack weighed 15.3 pounds. How much heavier was Leanne's backpack?

15. Michael's family is going on a vacation to the beach. The trip is 252.6 miles. When they stop for lunch, they have traveled 164.8 miles. How many more miles is the trip?

Works Referenced in the Development of the Module	
Common Core State Standards Initiative www.corestandards.org	Ohio Department of Education http://education.ohio.gov/Topics/Learning-in-Ohio/Mathematics
Illustrative Mathematics Project https://illustrativemathematics.org/	North Carolina Math Tools for Teachers https://tools4ncteachers.com/
Mathematics Assessment Project https://www.map.mathshell.org/index.php	Smarter Balanced Assessment Consortium https://smarterbalanced.org/
PARCC http://parcconline.org/	Utah Education Network https://www.uen.org/core/math/
NOYCE Foundation: https://www.insidemathematics.org/	