Warm Up

Fourth Grade Released Test Question: 1) Which of the following has the greatest value? **A** 12.1 **B** 0.97 **C** 4.23 **D** 5.08 **Challenge**: Plot these numbers on an open number line.	2) Write the following numbers in expanded form: **25:** _____ **49**: _____ **273**: _____ **458**: _____ **Challenge:** Decompose each of the above numbers in different ways.
3) Write the definitions for each of the following: Sum: _____ Addend: _____ Commutative Property of Addition: _____ _____ Associative Property of Addition: _____ _____ **Challenge:** Give an *example* of each.	4) Write the following numbers in expanded form: **2.5:** _____ **4.9**: _____ **2.73**: _____ **4.58**: _____ **Challenge:** How are the numbers in #4 the same or different than the numbers in #2?

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Grade 4: Adding Decimals by Decomposition

Today after we review our warm up, we will be adding decimals using decomposition. Adding decimals this way will help you get ready for algebra by practicing using the **commutative and associative properties of addition**. Also, you will practice using **Like Terms**, which we will talk about after the warm up.

Debrief of warm-up:

Ask: **Number One.** Which of these has the greatest value? (12.1)

Ask: **Number Two**. What is 15 in expanded form? (10 + 5)

Ask: What is 49 in expanded form? (40 + 9)

Ask: What is 273 in expanded form? (200 + 70 + 3)

Ask: What is 458 in expanded form? (400 + 50 + 8)

Say: Raise your hand if you decomposed these numbers in any other way? (hands) Turn to your partner and listen to your partner's ideas.

Say: **Number Three**. We should all know these definitions already.

Say: Raise your hand if you know what a **sum** is. (what you get when you add numbers)Thumbs up if you agree.

Say: Raise your hand if you know what an **addend** is. (the numbers you add) Thumbs up if you agree.

Say: Raise your hand if you know what the **commutative property** of addition is. (The order of the addends doesn't matter.) Thumbs up if you agree.

Say: Raise your hand if you know what the **associative property of addition** is.(hands) (When you change the groupings of the addends, it doesn't change the sum.)

(If the students are not clear with the vocabulary, then a chart with the terms should be available for reference.)

Ask: **Number Four**: What is 2.5 in expanded form? (2 + .5)

Ask: What is 4.9 in expanded form? (4 + .9)

Ask: What is 2.73 in expanded form? (2 + .7 + .03)

Ask: What is 4.58 in expanded form? (4 + .5 + .08)

Ask: How are the numbers in # 4 the same or different from the numbers in #2?(answers vary)

Now that we've reviewed our vocabulary, we're going to add something new Like Terms. **Like terms are numbers that have the same type of value.**

Say: Say that with me: Like terms are numbers that have the same type of value.
Say: Examples of like terms are 200 and 300. They are alike because they are both hundreds.
Say: Are 40 and 50 are like terms? [Yes, because they are both tens]
Say: Are .05 and .03 are like terms? [Yes, because they are both hundredths]
Say: Are .5 and 500 are like terms? [No, they are not like terms. They both have a 5, but one is tenths and the other is hundreds.]
Say: Raise your hand if you think you understand like terms.

It's time to start adding some decimals.

Example 1:   **2.5 + 4.9 = _____**

The first thing we will do is decompose the addends into expanded form, which we've done already in the warm-up.

What are addends? [numbers you add].

What is 2.5 in expanded form? [2 + .5]

What is 4.9 in expanded form? [4 + .9]

(Write)

$$2.5 \quad + \quad 4.9$$
$$= (2 + .5) + (4 + .9)$$

I'm writing each addend in expanded form within parentheses to remind me that they represent 2.5 and 4.9.

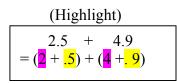Show me how many addends we now have. [4 fingers]

Now we're going to look for like terms.

Remind me what like terms are: [numbers that have the same type of value]

The first addend I see is 2. Is there another addend that is like 2? [4]

I can see that 4 is like 2 because they are both ones. I'd like to group the 2 with the 4 to make it easier to add. I'm going to highlight the 2 and 4 to remind me that they are like terms.

What are the two terms or numbers left? [.5 and .9]

Are they like terms? [yes] Why? [They are both tenths]

(Highlight)

$$2.5 \quad + \quad 4.9$$
$$= (2 + .5) + (4 + .9)$$

Now wait a minute. I have these parentheses that group these addends together. Let's remove the parentheses, so we can move the addends more easily.

(Add On)

$$2.5 \quad + \quad 4.9$$
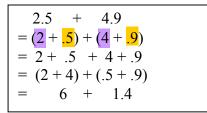$$= (2 + .5) + (4 + .9)$$
$$= 2 + .5 + 4 + .9$$

Now we can change the **order** of the addends.

What property of addition allows me to change the order of the addends? [commutative property]

Now we will put all the ones together and all the tenths together and group them together using parentheses. What property has to do with grouping the addends? [associative property]
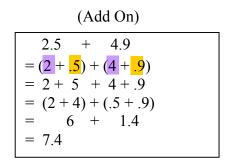
(Add On)

$$2.5 \quad + \quad 4.9$$
$$= (2 + .5) + (4 + .9)$$
$$= 2 + .5 + 4 + .9$$
$$= (2 + 4) + (.5 + .9)$$

Now we can combine the like terms.
What is the sum of 2 + 4? [6]
What is the sum of .5 + .9? [14 tenths]
When we have 14 tenths, we have 1 whole and 4 tenths.

(Add On)

$$2.5 \quad + \quad 4.9$$
$$= (2 + .5) + (4 + .9)$$
$$= 2 + .5 + 4 + .9$$
$$= (2 + 4) + (.5 + .9)$$
$$= \quad 6 \quad + \quad 1.4$$

What is the sum of 6 + 1.4? [7.4]

(If unclear, you can decompose 1.4 into 1 + .4 and then combine 6 and 1)

(Add On)

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    2.5    +    4.9
= (2 + .5) + (4 + .9)
= 2 +  5  + 4 + .9
= (2 + 4) + (.5 + .9)
=     6   +    1.4
= 7.4
```

Example 2: Find the sum of 3.43 + 5.82.

This time you will take notes, so copy everything that I write on the overhead. You will also need three different light colored markers to highlight the like terms.

Raise your hand if you remember the first step. (hands) Yes, the first step is to decompose the addends into expanded form.

What is 3.43 in expanded form? [3 + .4 + .03]
(If needed –How many ones? How many tenths? How many hundredths?)

What is 5.82 in expanded form? [5 +.8 +.02]

(Write)

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    3.43    +    5.82
= (3 + .4 +.03) + (5 + .8 + .02)
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How many addends do we have now? [6]

What do we look for now? [like terms]

The first addend is 3. Think to yourselves: What other addend is like 3?

Raise your hand if you know. Now look at your partner and share your idea.
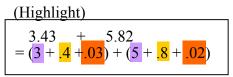
Is it .4? [no] Is it .03? [no] Is it 5? [yes]

Why are 3 and 5 like terms? [they are both ones]

The next addend is .4. Think to yourselves. What other addend is like .4?

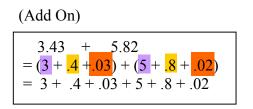Share your answer with your partner.

Is it .03? [no] Is it .8? [yes] Why? [because they are both tenths]

(Highlight)

$$3.43 + 5.82$$
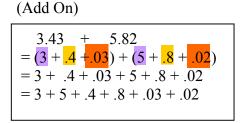$$= (3 + .4 + .03) + (5 + .8 + .02)$$

What two addends are left? [.03 and .02]

Are they like terms? [yes] Why? [because they are both hundredths]

Look back at my example. What do we do now? [remove parentheses]

(Add On)

$$3.43 + 5.82$$
$$= (3 + .4 + .03) + (5 + .8 + .02)$$
$$= 3 + .4 + .03 + 5 + .8 + .02$$

Now we can move the like terms together. What property lets us rearrange the addends? [Commutative Property)]

On the next line, rearrange the addends so that the like terms are together.

(Add On)

$$3.43 + 5.82$$
$$= (3 + .4 + .03) + (5 + .8 + .02)$$
$$= 3 + .4 + .03 + 5 + .8 + .02$$
$$= 3 + 5 + .4 + .8 + .03 + .02$$

Now we'll group the like terms together with parentheses.
What property are we using? [Associative Property]

Now on the next line combine your like terms.

(Add On)

$$3.43 + 5.82$$
$$= (3 + .4 + .03) + (5 + .8 + .02)$$
$$= 3 + .4 + .03 + 5 + .8 + .02$$
$$= (3 + 5) + (.4 + .8) + (.03 + .02)$$
$$= 8 + 1.2 + .05$$

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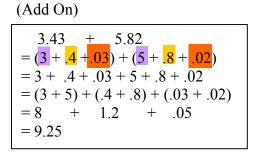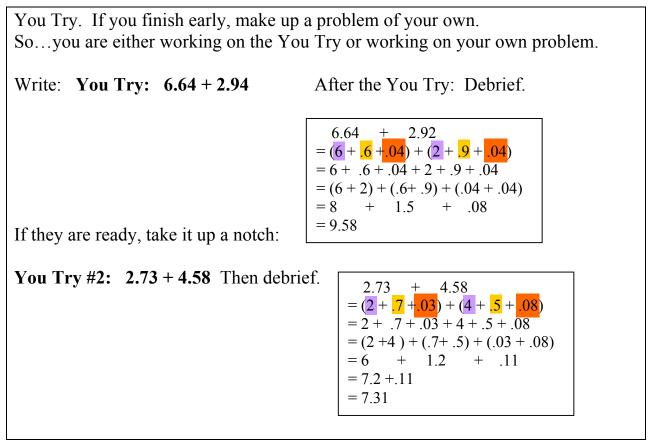What is 8 + 1.2? [9.2] What is 9.2 + .05? [9.25]

(Add On)

$$3.43 \quad + \quad 5.82$$
$$= (3 + .4 + .03) + (5 + .8 + .02)$$
$$= 3 + .4 + .03 + 5 + .8 + .02$$
$$= (3 + 5) + (.4 + .8) + (.03 + .02)$$
$$= 8 \quad + \quad 1.2 \quad + \quad .05$$
$$= 9.25$$

You Try. If you finish early, make up a problem of your own.
So…you are either working on the You Try or working on your own problem.

Write: **You Try: 6.64 + 2.94**   After the You Try: Debrief.

$$6.64 \quad + \quad 2.92$$
$$= (6 + .6 + .04) + (2 + .9 + .04)$$
$$= 6 + .6 + .04 + 2 + .9 + .04$$
$$= (6 + 2) + (.6 + .9) + (.04 + .04)$$
$$= 8 \quad + \quad 1.5 \quad + \quad .08$$
$$= 9.58$$

If they are ready, take it up a notch:

You Try #2: 2.73 + 4.58 Then debrief.

$$2.73 \quad + \quad 4.58$$
$$= (2 + .7 + .03) + (4 + .5 + .08)$$
$$= 2 + .7 + .03 + 4 + .5 + .08$$
$$= (2 + 4) + (.7 + .5) + (.03 + .08)$$
$$= 6 \quad + \quad 1.2 \quad + \quad .11$$
$$= 7.2 + .11$$
$$= 7.31$$

Extension:

Say: Raise your hand if you are ready for a challenge. Remember that we learned this method to help us get ready for algebra. Below is an expression with variables. Variables are letters that stand for numbers. See if you can find the like terms in this expression:

Write: $2x + 15y + 10xy + 6x + 4xy + 3y$
Debrief: $2x + 15y + 10xy + 6x + 4xy + 3y$

 Say: Thank you for all your hard work!